

**BRICS**

NATIONAL SYSTEMS OF INNOVATION

The  
**Promise**  
of Small  
and **Medium**  
**Enterprises**

EDITORS

Ana Arroio | Mario Scerri

ROUTLEDGE  


# The Promise of Small and Medium Enterprises

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BRICS ■ NATIONAL SYSTEMS OF INNOVATION

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# The Promise of Small and Medium Enterprises

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# List of Abbreviations

ABDI	Brazilian Agency of Industrial Development
APEX	Brazilian Export Promotion Agency
ASEAN	Association of Southeast Asian Nations
BIS	Bureau of Indian Standards
BOVESPA	São Paulo stock exchange
BNB	Banco do Nordeste
BNDES	Brazilian Development Bank
BRICS	Brazil, Russia, India, China, and South Africa
CD	Compact Disc
CDC	Consultancy Development Centre
CDIAC	Carbon Dioxide Information Analysis Center
CED	Centre for Entrepreneurship Development
CEO	Chief Executive Officer
CGCRI	Central Glass and Ceramics Research Institute
CGTMSE	Credit Guarantee Fund Trust for Micro and Small Enterprises
CHE	Council for Higher Education
CIMEC	Centre for Investment and Marketing in the Eastern Cape
CIP	Competitiveness and Innovation Programme
CNDI	National Council of Industrial Development
CNPq	National Council for Scientific and Technological Development
CNY	Chinese Yuan
CPI	Consumer Price Index
CSIO	Central Small Industries Organisation
CSIR	Council for Scientific and Industrial Research
DACST	Department of Arts Culture Science and Technology
DIC	District Industries Centre
DSIR	Department of Scientific and Industrial Research
DST	Department of Science and Technology
DTI	Department of Trade and Industry



EC	European Commission
EDI	Entrepreneurship Development Institute
EDII	Entrepreneurship Development Institute of India
EMBRAPA	Brazilian Agricultural Research Corporation
EOU	Export Oriented Unit
EPC	Export Promotion Council
ETDC	Electronics Test and Design Centre
EU	European Union
FDI	Foreign Direct Investment
FINEP	Studies and Projects Finance Organization
FIP	Brazilian Participation Fund
FNDCT	National Fund for Science and Technology
FZ	Federal Law
GDP	Gross Domestic Product
GEM	Growth Enterprise Market
GPN	Global Production Network
GRP	Gross Regional Product
GVC	Global Value Chain
HEI	Higher Education Institution
IBGE	Brazilian Institute of Geography and Statistics
ICT	Information and Communication Technology
IDB	Inter-American Development Bank
IDBI	Industrial Development Bank of India
IED	Institute of Entrepreneurship Development
IMF	International Monetary Fund
INMETRO	Brazilian Institute of Metrology, Standardization and Industrial Quality
INPI	National Institute of Industrial Property
IPO	Initial Public Offer
IPR	Intellectual Property Right
IT	Information Technology
LMT	Low and Medium-Tech
LPS	Local Productive Systems
MCO	Micro Credit Organisation
MDA	Market Development Assistance
ME	Medium-size Enterprise
MNE	Multinational Enterprise
MSE	Micro and Small Enterprise
MSME	Micro Small and Medium Enterprise

MSMED Act	Micro, Small and Medium Enterprises Development Act
NCEUS	National Commission for Enterprises in the Unorganised Sector
NFSIT	National Venture Fund for Software and Information Technology
NGO	Non-governmental Organisation
NIF	National Innovation Foundation
NIFT	National Institute of Fashion Technology
NIPO	National Intellectual Property Organization
NIS	National Innovation System
NMCC	National Manufacturing Competitiveness Council
NMCP	National Manufacturing Competitiveness Programme
NPAs	Non-performing assets
NPC	National Productivity Council
NRDC	National Research Development Corporation
NRF	National Research Foundation
NSI	National System of Innovation
OECD	Organisation for Economic Co-operation and Development
PAC	Program for the Acceleration of Growth
PAPPE	Brazilian Program for Research in Enterprise
PEIEx	Brazilian Extension Project for Industrial Exports
PETROS	Petrobras Social Security Foundation
PID	Program of Innovation Development
PINTEC	Industrial Survey of Technological Innovation
PITCE	Industrial, Technological and Foreign Trade Policy
PPA	Federal Government Pluri-annual Plan
PPP	Public-Private Partnership
PPP	Purchasing Power Parity
PRI	Public Research Institution
PROFARMA	Support Program for the Development of the Pharmaceutical Productive Chain
PROSOFT	Program for the Development of the National Software and Related Services Industry
R&D	Research and Development

RBI	Reserve Bank of India
RedeSist	Research Network on Local Productive and Innovative Systems
RF	Russian Federation
RFI	Retail Finance Intermediary
RFTR	Russian Foundation for Technological Development
Rosinfocominvest	Russian Investment Fund for Information & Communication Technologies
Rosnauka	Russian Federal Agency for Science and Innovations
Rosstat	Russian Federal State Statistics Service
RRA	Revealed R&D Advantage
RRB	Regional Rural Bank
Rusnano	Russian Corporation of Nanotechnologies
RVC	Russian Venture Company
S&T	Science and Technology
SCSBEs	Small Scale Service and Business Enterprises
SDI	Spatial Development Initiatives
SE	Small Enterprise
SEBRAE	Brazilian Micro and Small Business Support Service
SEDA	Small Enterprise Development Agency
SFC	State Financial Corporation
SGF	SME Growth Fund
SIDBI	Small Industries Development Bank of India
SIDC	India Small Industry Development Corporation
SIDO	Small Industries Development Organization
SISI	Small Industries Service Institute
SME	Small and Medium Enterprise
SMME	Small, Medium and Micro Enterprise
SOFTEX	Society for Promoting the Excellence of Brazilian Software
SRC	State Research Centres
ST&I	Science Technology & Innovation
SSSBE	Small Scale Service and Business Enterprise
SSI	Small-scale Industry
SVCL	SIDBI Venture Capital Limited
TBI	Technology Business Incubator
TBSE	Technology Bureau for Small Enterprises

TCO	Technical Consultancy Organization
TDB	Technology Development Board
TIC	Technology and Innovation Centre
TIFAC	Technology Information, Forecasting and Assessment Council
TNC	transnational corporation
TP	Technology Platform
TPUTV	Tomsk Polytechnic University Television
TUSUR	Tomsk State University of Control Systems and Radioelectronics
TWIB	Technology for Women in Business
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
UNIDO	United Nations Industrial Development Organization
USSR	Union of Soviet Socialist Republics
VAT	Value Added Tax
VCIF	Venture Capital Innovation Fund
VLMP	Visionary Leaders for Manufacturing Programme
VTB	Russian Bank for Development and Foreign Economic Affairs
WTO	World Trade Organization
WTO-IPR	World Trade Organization-Intellectual Property Rights

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# Foreword

It has become commonplace to relate Brazil, Russia, India, China, and South Africa (BRICS) to the rise of a new international order. Analysts suggest that BRICS have an important role to play in shaping the future of the world economic, social and political scenario on account of the opportunities and threats associated with their 'take-off'. The aggravation of the crisis that hit the world economy in 2008 has lent support to perspectives suggesting not only that a significant share of the growth potential of the world economy resides in these countries, but that they also have important institutional and policy lessons to transmit to the rest of the world. A possible new world order is viewed with some concern and also with great anticipation.

Optimistic expectations sit uncomfortably with the hard reality associated with the urgent need to confront the high levels of poverty and inequality in these countries. For scholars looking at these transformations from a national system of innovation (NSI) perspective, including the authors in this book, the economy is firmly embedded in society and there can be no meaningful political or economic change unless it is grounded in the improved well-being of the people and the micro and small firms that comprise a significant part of the economy in BRICS.

How to deal with heterogeneity and poverty, issues that are central to social and economic development? The book starts from the premise that there is no inevitable trend towards a passage from any given stage of progress to another supposedly superior. Development, like innovation, is not a linear process; each country proceeds according to its own unique and specific historical and cultural paths. This means that there are no 'best practice' or 'catching-up' exercises to be emulated. History, geography and geopolitics matter. Each country case is important and significant per se as a valuable and rich experience in policy learning, institutional capacity-building and the development of technological and other capabilities for change. Although relevant data are examined, providing the reader with a portrayal of distinct national and local dimensions and trajectories, the goal is not to use measurements to compare.

In line with the systems of innovation framework, the chapters in this book take into account the specific social, economic and political realities of each country, the contextual and tacit nature of knowledge and innovation, the power relations in the behaviour of agents and the role of policies. This enables focusing on the imprint of each country's innovation system and in particular, aids in drawing out the richness and variety of Small and Medium Enterprises (SMEs) and their surrounding milieu, as well as the distinct challenges to the survival and sustainable growth of these firms.

This book on the promise of SMEs in the NSIs of BRICS represents a significant contribution in three main dimensions. First, it provides an overview of the role of small firms in the Brazilian, Russian, Indian, Chinese, and South African (BRICS) NSIs. The themes and questions addressed in each of the five country chapters offer a richness of novel empirical data; information and analytical findings about SMEs; their economic, social (including gender) and political contribution; the role of different institutional formats for their birth and growth; as well as policies and financing mechanisms and experiences.

Second, it brings to the forefront crucial issues in the discussion of the evolution and future trends of industrial and innovation policies and instruments for small firms: their scope, applicability, coordination, and main results, as well as the influence of the macroeconomic, legal and regulatory environments. Fundamental questions guide the analyses. How can policies be best designed to enable SMEs to fulfil their role in development? What are the implications and lessons for BRICS and other developing countries? These firms are, in many cases, important users and depositories of traditional local knowledge. How then, can policies harness the potential of the localised nature of the generation, assimilation, use, and diffusion of innovations to strengthen and sustain development?

One main objective of the book is to draw out initiatives to promote production and innovation capabilities in SMEs that address common bottlenecks and that can contribute to a new policy design for BRICS and other countries. The aim is not to engage in country comparisons nor to provide policy or other 'benchmarks', but rather to identify and analyse key experiences and opportunities that may help to uncover development alternatives capable of enabling small firms to fulfil their potential. Policy recommendations are based on the experiences and conditions of these countries. The chapters show how specific contexts and historical evolution matter. Also a systemic

approach to innovation policy is considered as central to fostering economic, political and social development, avoiding the usual trap to dissociate these dimensions. The role of the state is emphasised as key, as well as the policies that are put into place to strengthen SMEs, ideally within the wider scope of a development strategy that comprises an integrated, inclusive and sustainable perspective.

The small size and heterogeneity of firms, coupled with high levels of informality in production and labour processes, have implications in the nature of the innovation activities performed by SMEs. A broader approach to innovation is required to avoid the danger of excluding these firms — both from the research and policy agenda — and of privileging policies that exclusively favour the usual ‘winners’. Partnerships have proven to be essential to thinking out collective solutions and development and implementation of locally articulated policies capable of bringing to light the dynamic networks between suppliers and consumers, and among these and other agents in charge of education and research, support, finance, and regulation. The chapters show that it is important that policies take into account and prioritise the specificities and requirements of firms and their contexts and not the other way around, that is, forcing them to adapt to policies and instruments predefined for entirely different actors and contexts. An additional important role in fostering capacity-building and technological development of SMEs is played by government procurement policies.

The importance of the collective and systemic treatment of small firms is a recurrent topic in all chapters in this book. This means going beyond the frontiers of individual enterprise as units of analysis and intervention. From this point of view, it is essential to focus on enterprises and other organisations as a body aiming to foster their interactions as a source of synergies and the generation and diffusion of knowledge and innovation. Uni-sectoral, mono-scale, individual, and isolated policies are marks of past policies, now replaced by the understanding of the advantages of implementing those capable of supporting local production and innovation systems and of mobilising and enrooting development around them. The book also shows that while there is space for SMEs to co-exist with global corporations, specific economic, industrial and technological policies can improve chances for their development. There is a need for policies that are not geared solely towards their integration into the global economy, but rather emphasise local or territorial potential for the emergence and

mobilisation of vibrant innovation and production systems. These can also provide more promising models to face the huge task of evening out regional, social and other imbalances in developing countries. The promise of SMEs, revealed by the authors in this book, is precisely about the central role played by these firms and their local production and innovation systems in cohesive and sustainable development. This may well call for a changed view on more traditional and orthodox approaches.

Therefore, the third contribution of this book relates to the development of new knowledge anchored in the reality of a particular group of less developed countries, taking into consideration the specificities and complexity of their production and innovation systems and their own forms of functioning and of interaction with nature, society and culture. This surely represents a fundamental ingredient to the advancement of research and policy agendas, influencing academics and all those concerned with policy design and implementation. To sum up, the book offers a major contribution by enlarging our knowledge about development, about the role of SMEs' production and innovation systems and about policies to promote their, as well as regional and national, development.

3 April 2013

**Helena M. M. Lastres**  
Rio de Janeiro

# Preface

This volume 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 co-ordinators 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 information technology (IT) support for the research network.

The core ideas analysed in this book 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.

None of this work would have been possible without financial support. The support given by the IDRC was essential for the completion of this project and we are very obliged to them and their staff for their support. We would especially like to thank Richards Isnor, Federico Buroni, Gustavo Crespi, Veena Ravichandran, and Clara Saavedra. We are also grateful to Bill Carman, IDRC Publisher, for the technical assistance provided in the preparatory work that led to this publication.

Supplementary grants were received from various agencies of the Brazilian Ministry of Science and Technology, especially the Studies and Projects Finance Organization (FINEP) and the National Council for Scientific and Technological Development (CNPq). In particular, we would like to thank the General Secretary of the Ministry of Science and Technology, Dr Luiz Antonio Elias, and the President of FINEP, Luis Fernandes, who have given enthusiastic support to the BRICS project since its inception.

# Introduction

## BRICS National Systems of Innovation

*José E. Cassiolato and Maria Clara Couto Soares*

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### Preamble

The world is experiencing significant transformations in its geo-political and economic constitution. The processes of transformation have accelerated over the last decades. A significant part of the growth potential of the world economy nowadays and for the coming decades resides in some fast-developing countries. Brazil, Russia, India, China, and South Africa (BRICS) have displayed such potential for dynamic change. In a historic rupture with past patterns of development, the BRICS countries are now playing a major role in alleviating the current global crisis whilst revealing new and alternative progressive paradigms.

Much beyond the emphasis given by international agencies to the identification of investment possibilities in the BRICS production structures or to the prospects presented by their consumer markets, our perspective in analysing the BRICS countries is inspired by their significant development opportunities, as well as their several common characteristics and challenges, and the learning potential they offer for other developing countries. Identifying and analysing these opportunities and challenges will help to uncover alternative pathways towards fulfilling their socio-political-economic development potential within the constraints of sustainability.

The central focus of this book series is the National System of Innovation (NSI) of the five BRICS countries. Each book deals with a key component of the innovation system, providing the reader with



access to analyses on the role played by the state, the financing, direct investment and the small and medium enterprises (SMEs), besides approaching a particularly relevant — though still not extensively studied — aspect of the BRICS economies: the challenge of inequality and its interrelations with the NSIs of these countries.

The research endeavour that generated the publication of this book series has gathered universities and research centres from all the BRICS countries, as well as policy makers invited to discuss the outcomes. The research development and the comparative analysis of its results are intended to bring to light the challenges and opportunities of the BRICS countries' national innovation systems from the points of view of these same countries. Part of the effort undertaken was addressed to the construction of a shared methodology aimed at advancing the comprehension of the specificities of innovation systems in each country. This was done in view of the need for improvements in the analytical framework used for the analysis of the national innovation systems located in countries outside the restricted sphere of developed countries. Special attention was paid to the political implications. However, instead of searching for generalisable policy recommendations, it was sought to identify and analyse bottlenecks that are common to the BRICS economies, their complementarities and competition areas, as well as other aspects of major importance for supporting decision makers and that are able to incite reflection about the subject of innovation and development in other less developed countries.

It is worth mentioning that the research consolidated in this publication is rooted in a larger research effort on BRICS national innovation systems being developed in the spheres of Globelics (<http://www.globelics.org>, accessed 3 December 2011) and the Research Network on Local Production and Innovation Systems (RedeSist) at the Economic Institute of the Federal University of Rio de Janeiro (<http://www.redesist.ie.ufrj.br>, accessed 3 December 2011). Globelics is an international academic network which uses the concept of innovation systems (IS) as an analytical tool aimed at the comprehension of the driving forces that push economic development. It aims to advance the use of the IS perspective on a world basis. Established in 2002 and inspired by renowned scholars from the field of economics of innovation such as Christopher Freeman (1987) and Bengt-Åke Lundvall (1992), the Globelics network has, among others, the purpose of encouraging knowledge exchange between less developed countries,

thus fostering mutual learning across innovation research groups in Latin America, Africa and Asia. With this, it is sought to strengthen an original and more autonomous approach to understanding the development processes in developing countries. On the other hand, the focus put by the Globelics network on the study of innovation systems of BRICS results from the recognition that understanding the particular dynamics which connects the knowledge base with innovation and economic performance in each of the five BRICS countries is, today, a precondition for better appreciating the direction that the world economy will be following (Lundvall 2009). It is within such analytical field that the contribution offered by this book series is inserted.

In the following sections we (*a*) present the broad conceptual approach of NSI used as the guiding analytical framework for the research gathered under this book series; (*b*) characterise the increasing importance of the BRICS countries in the global scenario; and (*c*) introduce the five-book collection on NSIs in the BRICS countries.

## NSI and Development — A Broad Perspective

One of the most fruitful ways of thinking developed in advanced countries in the last 30 years came from a resurrection and updating of earlier thinking that emphasised the role of innovation as an engine of economic growth and the long-run cyclical character of technical change. A seminal paper by Christopher Freeman (1982) pointed out the importance that Smith, Marx and Schumpeter attached to innovation (*ibid.*: 1) and accentuated its systemic and national character (*ibid.*: 18). Freeman also stressed the crucial role of government policies to cope with the uncertainties associated with the upsurge of a new techno-economic paradigm and the very limited circumstances under which free trade could promote economic development. Since it was formulated in the 1980s, the system of innovation (SI) approach has been increasingly used in different parts of the world to analyse processes of acquisition, use and diffusion of innovations, and to guide policy recommendations.<sup>1</sup>

Particularly relevant in the SI perspective is that since the beginning of the 1970s, the innovation concept has been widened to be

understood as a systemic, non-linear process rather than an isolated fact. Emphasis was given to its interactive character and to the importance of (and complementarities between) incremental and radical, technical and organisational innovations and their different and simultaneous sources. A corollary of this argument is the context-specific and localised character of innovation and knowledge. This understanding of innovation as a socially determined process is in opposition to the idea of a supposed techno-globalism and implies, for instance, that acquisition of technology abroad is not a substitute for local efforts. On the contrary, one needs a lot of knowledge to be able to interpret information, select, buy (or copy), transform, and internalise technology.

Systems of innovation, defined as a set of different institutions that contribute to the development of the innovation and learning capacity of a country, region, economic sector, or locality, comprise a series of elements and relations that relate production, assimilation, use, and diffusion of knowledge. In other words, innovative performance depends not only on firms and research and development (R&D) organisations' performance but also on how they interact, among themselves and with other agents, as well as all the other forms by which they acquire, use and diffuse knowledge. Innovation capacity derives, therefore, from the confluence of social, political, institutional, and culture-specific factors and from the environment in which economic agents operate. Different development trajectories contribute to shape systems of innovation with quite diverse characteristics requiring specific policy support.

It is this understanding of the systemic nature of innovation that allows for two crucial dimensions of the SI approach to be explicitly discussed: the emphasis on historical and national trajectories and the importance of taking into account the productive, financial, social, institutional, and political contexts, as well as micro, meso and macro spheres (Freeman 2003; Lastres et al. 2003). Although all of these contexts are relevant for a discussion about development, two in particular should be singled out that are pertinent to this study. One is the financial context, recognised by Schumpeter (1982 [1912]) in his *The Theory of Economic Development*. For him, entrepreneurs, to become the driving force in a process of innovation, must be able to convince banks to provide the credit to finance innovation. In this sense, any discussion about innovation systems has to include

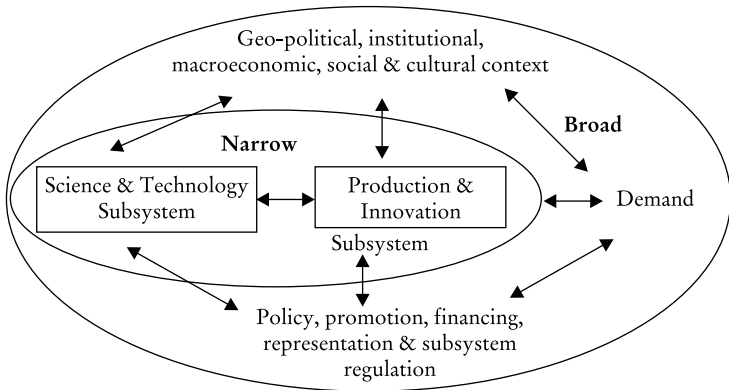
the financial dimension.<sup>2</sup> The other is the idea that space matters, that the analysis of systems of innovation should be done at the national (Freeman 1982; Lundvall 1988) and local levels (Cassiolato et al. 2003).

The national character of SI was introduced by Christopher Freeman (1982, 1987) and Bengt-Åke Lundvall (1988) and has been widely used as an analytical tool and as a framework for policy analysis in both developed and underdeveloped countries. As a result, research and policy activities explicitly focusing on SI can be found in most countries and a rapidly growing number of studies of specific NSIs have been produced. Although some authors tend to focus on the NSI in a narrow sense, with an emphasis on R&D efforts and science and technology organisations, a broader understanding of NSI (Freeman 1987; Lundvall 1988) is more appropriate. This approach takes into account not only the role of firms, education and research organisations and science and technology institution (STI) policies, but includes government policies as a whole, financing organisations, and other actors and elements that influence the acquisition, use and diffusion of innovations. In this case emphasis is also put on the role of historical processes — which account for differences in socio-economic capabilities and for different development trajectories and institutional evolution — creating SI with very specific local features and dynamics. As a result, a national character of SI is justified.

Figure 1 is an attempt to show both the narrow and the broad perspectives on NSI. The broad perspective includes different, connecting sub-systems that are influenced by various contexts: geopolitical, institutional, macroeconomic, social, cultural, and so on. First, there is a production and innovation sub-system which contemplates the structure of economic activities, their sectoral distribution, degree of informality and spatial and size distribution, the level and quality of employment, the type and quality of innovative effort. Second, there is a sub-system of science and technology which includes education (basic, technical, undergraduate, and postgraduate), research, training, and other elements of the scientific and technological infrastructure such as information, metrology, consulting, and intellectual property. Third, there is a policy, promotion, financing, representation, and regulation sub-system that encompasses the different forms of public and private policies both explicitly geared towards innovation or implicitly, that is, those that although not necessarily geared

towards it, affect strategies for innovation. Finally, there is the role of demand, which most of the time is surprisingly absent from most analyses of SI. This dimension includes patterns of income distribution, structure of consumption, social organisation and social demand (basic infrastructure, health, education).

**Figure 1:** *The Narrow and Broad Perspectives on NSI*



Source: Adapted from Cassiolato and Lastres (2008).

This portrayal of the national innovation system framework is a corollary of an understanding that

- innovation capacity derives from the confluence of economic, social, political, institutional, and culture-specific factors and from the environment in which they operate, implying the need for an analytical framework broader than that offered by traditional economics (Freeman 1982, 1987; Lundvall 1988);
- the number of firms or organisations such as teaching, training and research institutes is far less important than the habits and practices of such actors with respect to learning, linkage formation and investment. These shape the nature and extensiveness of their interactions and their propensity to innovate (Mytelka 2000; Johnson and Lundvall 2003);
- main elements of knowledge are embodied in minds and bodies of agents or embedded in routines of firms and in relationships between firms and organisations. Therefore, they are localised and not easily transferred from one place/context to another,

for knowledge is something more than information and includes tacit elements (Lundvall 1988);

- the focus on interactive learning and on the localised nature of the generation, assimilation and diffusion of innovation implies that the acquisition of foreign technology abroad is not a substitute for local efforts (Cassiolato and Lastres 1999);
- national framework matters, as development trajectories contribute to shape specific systems of innovation. The diversity of NSIs is a product of different combinations of their main features that characterise their micro, meso and macroeconomic levels, as well as the articulations among these levels (Freeman 1987; Lastres 1994).

From the specific point of view of less developed countries (LDCs) the usefulness of the SI approach resides precisely in the facts that (a) its central building blocks allow for their socio-economic and political specificities to be taken into account and (b) it does not ignore the power relations in discussing innovation and knowledge accumulation. As this book argues, these features are particularly relevant in the analysis of the BRICS countries' innovation systems. As the analysis of economic phenomena also takes into consideration their social, political and historical complexity, policy prescriptions are based on the assumption that the process of development is influenced by and reflects the particular environment of each country, rather than on recommendations derived from the reality of advanced countries. A number of development studies followed these ideas, arguing that technical change plays a central role in explaining the evolution of capitalism and in determining the historical process through which hierarchies of regions and countries are formed. Furtado (1961), for instance, established an express relation between economic development and technological change pointing out that the growth of an economy was based on the accumulation of knowledge, and understood development within a systemic, historically determined, view. Although original, these contributions have a close correspondence with Myrdal's (1968) proposition that: (a) contexts and institutions matter; (b) positive and negative feedbacks have cumulative causation; (c) cycles may be virtuous or vicious, and with Hirschman's (1958) point that interdependencies among different activities are important.

The need to address paradigmatic changes and the problems and options deriving from the upsurge of information technologies led to the outbreak in Latin America in the 1980s of a series of interconnected work from the innovation perspective. Building on Furtado's work on changes associated with the industrial revolution, authors like Herrera (1975) and Perez (1983) analysed the opportunities and challenges associated with the introduction of these radical changes in the region. It was only then that the innovation and development literature started to integrate the empirically validated knowledge about learning inside firms with the contributions stemming from the work of Freeman, Perez, Herrera, and others on new technologies, changes of techno-economic paradigms and systems of innovation. What gave special impetus to this direction was the empirical work focusing on technological capability building as part of a broader national innovation system. The role of government policies in orienting the speed and direction of technological changes was also highlighted (Freeman and Perez 1988).

Development processes are characterised by deep changes in the economic and social structure taking place from (technological and/or productive) discontinuities that cause and are caused by the productive, social, political, and institutional structure of each nation. Development is also seen as a systemic process, given the unequal capitalism development in the world. The recognition of national specificities of these processes is also fundamental. We found the same stress on the national character of development processes in List's work (1841), and on the NSI idea of Freeman (1982) and Lundvall (1988) in Furtado's (1961) discussion about the transformation of national economies where their structural complexity is manifested in a diversity of social and economic forms. For Furtado, it is in this transformation that the essence of development resides: structural changes 'in the internal relations of the economic and social system' (ibid.: 103) that are triggered by capital accumulation and technological innovations. The emphasis on diversity, and the recognition that: (a) both theory and policy recommendations are highly context dependent, (b) the economy is firmly embedded in society, and (c) knowledge and technology are context-specific, conform some general identities.

Furtado (1961) established a direct relation between economic development and technological innovation pointing out that the growth of an advanced economy was based on the accumulation

of new scientific knowledge and on the application of such knowledge to solve practical problems. The Industrial Revolution set into motion a process of radical changes based on technical progress that has lasted till now and that is at the root of how the world economy is conformed. In essence, those changes: (a) rendered endogenous the causal factors related to growth into the economic system; (b) made possible a closer articulation between capital formation and experimental science. Such articulation has become one of the most fundamental characteristics of modern civilisation. As pointed out by Furtado (*ibid.*), the beginning of such a process took place in the countries that were able to industrialise and create technical progress first, and the quick accumulation made possible in the development of this process became the basic engine of the capitalist system. For this reason, there is a close interdependency between the evolution of the technology in the industrialised countries and the historical conditions on the basis of which such development was made possible. As the behaviour of the economic variables relies on parameters that are defined and evolve into a specific historical context, it is quite difficult to isolate the study of economic phenomena from its historical frame of reference (Furtado 2002). This assertion is more significant when analysing economic, social and technological systems that are different from each other, as in the underdeveloped economies. In this context, underdevelopment may not, and should not, be considered as an anomaly or simply a backward state. Underdevelopment may be identified as a functioning pattern and specific evolution of some economies. Social and economical peripheral structure determines a specific manner under which structural change occurs (industrialisation during the 1950s and 1960s) and technical progress is introduced. Hence different outcomes from those in developed countries are to be expected (Furtado 1961; Rodríguez 2001).

The neo-Schumpeterian perspective also argues that economic development is considered a systemic phenomenon, generated and sustained not only by inter-firm relations, but most significantly by a complex inter-institutional network of relations. Innovation is eminently a social process. Therefore, development — resulting from the introduction and diffusion of new technologies — may be considered as the outcome of cumulative trajectories historically built up according to institutional specificities and specialisation patterns inherent to a determined country, region or sector. Each country follows its own development trajectory according to its specificities and possibilities,



depending fundamentally on their hierarchical and power position in the world capitalist system. The more distant underdeveloped countries are from the technological frontier, the larger will be the barriers to an innovative insertion in the new technological paradigm. More serious than technological asymmetries are knowledge and learning asymmetries, with the implication that access, understanding, absorption, domination, use and diffusion of knowledge become impossible. However, even when the access to new technologies becomes possible, most of the time they are not adequate for the reality of underdeveloped countries and/or these countries do not have a pool of sufficient knowledge to make an adequate use of them. This occurs because the learning process depends on the existence of innovative and productive capabilities that are not always available. On this aspect, Arocena and Sutz (2003) argue that there are clearly learning divides between North and South that are perhaps the main problem of underdevelopment nowadays.

## The Increasing Relevance of the BRICS Countries

The BRICS denomination was originally used to connect the dynamic emerging economies of Brazil, Russia, India, China, and South Africa as continental countries bearing a strategic position in the continents of the Americas, Europe, Asia, and Africa. The BRICS are also joined by their large geographical and demographic dimensions. Collectively, they were home to 42.2 per cent of the world population as of 2010 representing nothing less than 2.9 billion people. In addition, the five countries account for approximately 30 per cent of the earth's surface, holding significant reserves of natural resources such as energy and mineral resources, water and fertile lands. As well, BRICS countries have 24.3 per cent of world biodiversity; Brazil alone embracing 9.3 per cent of the total (GEF 2008).

Moreover, it is the recent performance of these economies and their macroeconomic indicators that make them more and more the focus of surveillance and analysis. In fact, the BRICS countries display a growing economic importance. In 2000, the five countries accounted for 17.1 per cent of the world Gross Domestic Product (GDP) in public-private partnership (PPP). Their share increased to 25.7 per

cent in 2010, with China and India accounting for 13.6 per cent and 5.5 per cent respectively, followed by Russia (3 per cent), Brazil (2.9 per cent) and South Africa (0.7 per cent) (IMF 2011).

The participation of the BRICS countries in world GDP is expected to rise sharply in the years to come. The impact of the financial crisis and global recession on developed world economy over the last three years has only lent support to this expectation, beyond attracting attention to the BRICS economies' capacity to remain immune or quickly recover from the crisis. Large domestic markets, pro-active investment policies, monetary and tax policies with anti-cyclic capacity, presence of major public banks, and high level of reserves are elements increasingly recognised as having helped at least some BRICS economies to be less affected by the crisis.

While growth slowed in all major regions, China and India continued to grow rapidly in 2009 and 2010 (Table 1). In other BRICS countries the crisis rebounded fast. In Brazil, the GDP fell 0.2 per cent in 2009, but the economy surpassed pre-crisis growth rates in 2010 (7.5 per cent). South Africa showed a GDP decrease by 1.8 per cent in 2009 and had a 2.8 per cent increase in 2010. In Russia, heavily dependent on commodities like oil and gas, the economy has been hit more severely by the global crisis. It experienced shrinking of almost 8 per cent in 2009 but the GDP growth recovered to 3.7 per cent in 2010, beating the developed economies' growth rates. Prospects for 2015 show the five economies representing 29.5 per cent of the world economy.

The economic performance of the BRICS countries has, however, varied widely during the last decades as shown in Table 1. China has maintained its position as the fastest growing economy worldwide. India has also grown significantly and regularly. Brazil has had an irregular performance, well below its potential, but showed an enhancement in the second half of the 2000s. Russia, after the severe 1990s crisis that resulted in a decline of 40 per cent in its real GDP, has recovered and South Africa has had a small improvement in its economic performance that remains below its potential.

These different performances were accompanied by significant changes in the productive structure of the five countries, which reflect dissimilar development strategies.

The competitiveness of China's industrial sector is the main source of the country's impressive economic growth. The share of industry

**Table 1: BRICS: Average Rates of Growth of Real GDP, 1980–2015 (percentage)**

	1980–1990	1990–2000	2001–2005	2006	2007	2008	2009	2010	2015*
Brazil	2.8	2.9	2.8	3.7	5.7	5.1	−0.2	7.5	4.1
Russia	–	−4.7	6.2	7.4	8.1	5.6	−7.9	3.7	5.0
India	5.8	6.0	6.9	9.8	9.3	7.3	6.5	9.7	8.1
China	10.3	10.4	9.6	11.6	13.0	9.0	8.7	10.3	9.5
South Africa	1.6	2.1	4.0	5.4	5.1	3.1	−1.8	2.8	2.8
Developed Countries	3.1	2.8	1.9	2.8	2.5	0.8	−3.2	3.0	2.3

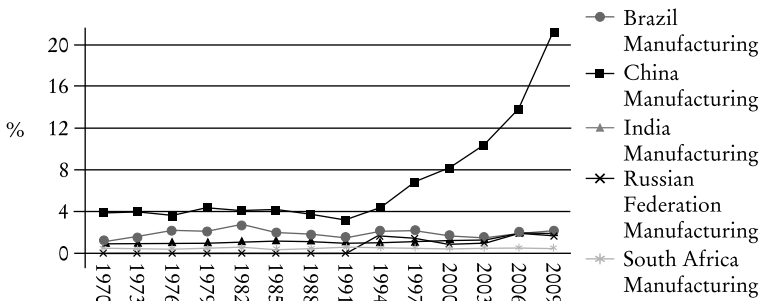
*Source:* UNCTAD (2010) for the period 1980–2008 and IMF (2011) for 2009–2015 data. See <http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx> (accessed 15 March 2011).

*Note:* \*Estimate.

in the composition of China's GDP is unusual and growing: it was around 40 per cent in 1990 and reached 48 per cent in 2009. In contrast, in 2008, 56.1 per cent of the Chinese labour force still remained in rural areas. The relative share of the agricultural sector, which accounted for 30.2 per cent in 1980, is constantly falling, to 11 per cent of GDP in 2009. The share of services grew from 21.6 per cent in 1980 to 41 per cent in 2009.

Really impressive is the mounting share of China's manufacturing sector in world manufacturing GDP (Figure 2). In 1990, it represented 3.1 per cent of global manufacturing GDP, achieving 21.2 per cent in 2009.

**Figure 2:** *Manufacturing Sector: BRICS' Share in World GDP, 1970–2009*



Source: UNCTAD (2009). See <http://unctadstat.unctad.org/ReportFolders/reportFolders.aspx> (accessed 15 March 2011).

China has diversified its industrial system to a significant degree during the last 25 years and the share of technologically intensive sectors in industrial output in 2009 reached 42 per cent of the total value added by the manufacturing sector. In the other four countries this share is around 15 per cent.<sup>3</sup> In addition, some major differences in the characteristics of the BRICS countries' manufacturing sectors should be noticed.

Brazil has gone through a structural transformation since the late 1980s, with a significant reduction of the share of industry in total GDP (declining from 41.7 per cent in 1980 to 25.4 per cent in 2009) and a high growth of services (from 50 per cent to 68.5 per cent in the same period). It is worth emphasising that agricultural goods that have had an important role in the country's trade surplus were responsible for only 6.1 per cent of GDP in 2009, showing a fall from 9.0 per cent

in 1980. In Brazil, as in Russia and South Africa, the products based on natural resources and commodities have a relatively greater share of national GDP than in China and India.

Russia's economic development is heavily dependent on energy and raw material resources. As in Brazil, the contribution of manufacturing sector to GDP in Russia has declined since the 1980s, decreasing from 44.6 per cent in 1983 to 32.9 per cent in 2009. The share of defence-related industrial complex in manufacturing is significant, together with the strong production base in non-electric machines and equipment. The oil and gas industry alone accounts for more than 10 per cent of the gross value added. The share of services in total GDP has grown in the last two decades achieving 62.4 per cent in 2009 while agriculture has decreased its participation accounting for only 4.7 per cent in 2009.

The Indian economy is essentially service-led. Skills in the manufacturing sector are relatively modest and concentrated in non-durable consumer goods and in the chemical-pharmaceutical complex. However, some manufacturing segments in the automobile complex and in certain basic industries have been developing rapidly in recent years. Since the mid-1980s, the contribution of industry to India's GDP has been almost constant and around 26 per cent, but from 2004 to 2009 it increased to 28.3 per cent. India's capacity in the area of services is significant, particularly those linked to information and communication technology (ICT). The share of services in GDP has grown from 39 per cent in 1980 to 54.6 per cent in 2009. Although the agricultural sector is declining in India's GDP, it still represented 17.1 per cent in 2009 (compared to 36.8 per cent in 1980) and constitutes an important determinant of the overall economic growth.

The services sector has also been playing a more important role in the South African economy. The share of this sector in GDP was 45.4 per cent in 1980 and increased to 65.8 per cent in 2009. The development of the financial sector and the growth of tourism have contributed to this growth. Finance, real estate and business services are expanding their share with regard to government services. South Africa's industrial sector is heavily based on natural resources, mainly steel and non-ferrous metals, with some increases in capacity occurring in non-durable consumer goods and the automobile sector. The share of industry-added value in total GDP value decreased from 48.4 per cent in 1980 to 31.4 per cent in 2009. The metal and engineering sectors dominate the manufacturing sector. Although agriculture

is responsible for a small share of South Africa's GDP (3 per cent in 2009), it still represents an important source of employment. The minerals and mining sector remains important also with respect to both employment and foreign trade.

The changes observed in the participation of BRICS countries in international trade were even more significant (Table 2). Their share in merchandise trade value more than doubled in the short period of 2000–2010, exports rising from 7.5 to 16.4 per cent and imports from 6.2 to 14.9 per cent. However, the contribution of the five countries varied significantly. The most notable fact is the well-known growth of China in the merchandise trade value: its exports mounted from 3.9 per cent to 10.4 per cent of world exports reaching US\$ 1.58 trillion in 2010, and imports increased from 3.4 per cent to 9.1 per cent in the same period.

**Table 2:** BRICS: Merchandise Trade Value (in billion of current US\$) and Share in World Total, 2000–10 (percentage)

<i>Exports</i>	2000		2005		2010	
	<i>Value</i>	%	<i>Value</i>	%	<i>Value</i>	%
World	6,448.57	100.00	10,495.70	100.00	15,174.44	100.00
Brazil	55.12	0.85	118.53	1.13	201.915	1.33
China	249.20	3.86	761.95	7.26	1,578.270	10.40
India	42.38	0.66	99.62	0.95	221.406	1.46
Russia	105.57	1.64	243.80	2.32	400.424	2.64
South Africa	31.95	0.50	56.26	0.54	85.700	0.56
<i>Imports</i>	2000		2005		2010	
	<i>Value</i>	%	<i>Value</i>	%	<i>Value</i>	%
World	6,662.89	100.00	10,800.15	100.00	15,353.26	100.00
Brazil	58.64	0.88	77.63	0.72	191.46	1.25
China	225.02	3.38	660.21	6.11	1,396.20	9.09
India	51.52	0.77	142.84	1.32	328.36	2.14
Russia	49.13	0.74	137.98	1.28	273.61	1.78
South Africa	30.22	0.45	64.19	0.59	96.25	0.63

Source: UNCTAD (2010).

India also experienced a sharp increase of exports, reaching 1.46 per cent of the world total in 2010. Fostered by Chinese growth and commodities boom, the share of Brazil and Russia in world exports grew rapidly from 2000 to 2010, increasing almost four times. South Africa is the only BRICS country that still shows less than

1 per cent of world exports. On the import side, India and Russia increased their share in world imports more than fivefold. Except India and South Africa, the other BRICS countries managed to keep a surplus in their merchandise trade in 2010. In India inflows on account of invisibles have been helpful in financing the growing deficit in merchandise trade.

The BRICS economies have significantly increased their openness to international trade in the last decades. They have raised their exports and imports both in volume terms as a share of GDP, but the level of trade openness has varied quite a lot (Table 3). The greater changes occurred in China and India, particularly since the 1990s when they speeded up their international trade flows. Currently, China, South Africa and Russia are the BRICS economies with the higher levels of openness. The Brazilian economy, despite the liberalisation process in the 1990s, remains the most closed amongst the BRICS countries.

**Table 3:** BRICS: Foreign Trade and Share of GDP

<i>Countries</i>	<i>Exports + Imports (in million of current US\$)</i>				
	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>
Brazil	8,719	25,412	61,212	113,762	393,379
China	4,833	38,919	11,471	474,227	2,972,960
India	4,792	28,839	51,144	93,941	540,489
Russia	–	–	349,249	136,973	627,323
South Africa	8,352	50,411	486	56,782	161,953
<i>Countries</i>	<i>Exports + Imports (GDP) (percentage)</i>				
	<i>1970</i>	<i>1980</i>	<i>1990</i>	<i>2000</i>	<i>2010</i>
Brazil	13.0	10.3	14.0	17.6	18.8
China	5.3	12.9	29.9	39.6	50.6
India	7.9	15.7	15.8	20.4	31.3
Russia	–	–	36.1	52.7	42.4
South Africa	45.7	61.2	43.4	42.7	44.5

*Source:* United Nations (2010); World Bank (2011).

The bilateral trade flows between BRICS countries have been relatively restricted. However, since the first half of the 2000s there was a widespread increase of exports and imports flows between the five economies, but particularly a stronger presence of China as an important trade pole for the other four countries (Baumann 2009). In 2009, China surpassed the United States (US) as the main

trade partner of Brazil and also emerged as the second main trade partner of India and Russia. The converse does not however hold, as these four economies don't match their respective rankings insofar as they are neither the top import suppliers nor export destinations for China. China exports to Brazil, India, Russia, and South Africa at a more intense pace than it imports from them. In addition, the latter are concentrated on a few primary goods intensive in natural resources while China's exports are much more diversified and led by manufactured goods. Therefore, despite the fact that intra-BRICS trade has increased in recent years, the flows are still restricted in size and unbalanced in terms of the different rhythms and compositions of the BRICS bilateral commercial transactions.

In the last decades, the BRICS countries have been the recipients of significant amounts of foreign direct investment (FDI). Brazil received the greatest share of FDI of all BRICS economies until the first half of the 1980s. Although China has surpassed Brazil since 1985, Brazil continued to be a major destination for FDI during the 1990s, most notably during the process of privatisation that took place during that decade. Since the 2000s Russia and India have been strengthening their relevance as FDI inflow destinations (Table 4). In 2010, the BRICS countries received 17.6 per cent of global FDI inflows. Especially since 2005, there was a sharp increase of BRICS' FDI outflows. With the exception of South Africa, BRICS countries more than tripled their FDI outflows from 2005 to 2010, raising their participation in the world total from 3.6 per cent to 11.1 per cent in the period.

BRICS countries also followed different development strategies regarding FDI. Particularly remarkable has been the Chinese policy to attract multinational companies since the beginning of the 1990s. Inserted in a broader strategy aiming to expand its technological knowledge and later to strengthen the domestic industries and enterprises, China imposed conditions — such as the establishment of joint ventures and that R&D be carried out locally — that had to be met before the subsidiaries were to operate in China or sell in its markets. Brazil, Russia and South Africa — countries that liberalised their economies with few restrictions — got more portfolio investment, but most of the investment received by the manufacturing sector was used to buy up local companies. In China and India, where the capital account was not liberalised, FDI seems to have been concentrated in new investments in production and innovation.



**Table 4: BRICS: Foreign Direct Investment, Inflows and Outflows Share in the World Totals**

	<i>Selected Years</i>									
	1970	1975	1980	1985	1990	1995	2000	2005	2010	
<i>FDI Inflows (%)</i>										
Brazil	2.94	4.53	3.53	2.54	0.48	1.29	2.34	1.53	3.90	
China	NA	NA	0.11	3.50	1.68	10.96	2.90	7.37	8.50	
India	0.34	0.32	0.15	0.19	0.11	0.63	0.26	0.78	1.98	
Russian Federation	NA	NA	NA	NA	NA	0.60	0.19	1.31	3.31	
South Africa	2.50	0.71	-0.02	-0.80	-0.04	0.36	0.06	0.68	0.13	
<i>FDI Outflows (%)</i>										
Brazil	0.01	0.38	0.71	0.13	0.26	0.30	0.19	0.29	0.87	
China	NA	NA	NA	1.01	0.34	0.55	0.07	1.39	5.14	
India	0.00	0.00	0.01	0.01	0.00	0.03	0.04	0.34	1.11	
Russian Federation	NA	NA	NA	NA	NA	0.17	0.26	1.45	3.91	
South Africa	0.12	0.44	1.46	0.08	0.01	0.69	0.02	0.11	0.03	

Source: UNCTAD (2010).

Other relevant macroeconomic indicators could be added — such as the impressive share of BRICS in international monetary reserves (about 40 per cent of the total) — but the interest in these five emerging economies goes beyond this area. Together with their expanding economic relevance, these countries are claiming a rising geopolitical influence. They have been important players in their geographic areas of influence. However, they are pushing to have an increasing voice in the international high-level decision-making institutions, particularly through reforms in the UN system and in the Bretton Woods organisations. New dialogue spaces bringing together BRICS countries, such as the IBSA (India, Brazil and South Africa), BRICS (Brazil, Russia, India, China, and South Africa), and BASIC (Brazil, South Africa, India, and China) signal concrete steps to move forward the co-operation and coordination within and amongst these countries, which intends to go further than the mere economic sphere.<sup>4</sup>

Their growing leverage in international relations together with other emerging countries is associated with a repositioning of the balance of power on the world stage, which was intensified by the recent world crisis. BRICS countries want to see these changes reflected in the institutions of global governance. Since their economies will probably continue to account for a sizeable portion of the increase in global GDP in the near future, it is expected over time that BRICS

will exert increasing financial and political influence, even if limited by their considerable differences and constraints to form a coherent political bloc anytime soon.<sup>5</sup>

The increased influence of these countries took place during a period marked by intense transformations in the global society. One of these remarkable changes is the integration in the economy of a significant portion of previously marginalised segments of the BRICS population. The highly populated China and India led this process in terms of world shares, but Brazil also had an important participation (Soares and Podcameni 2014). The present and potential dimension of BRICS domestic markets as well as the policies adopted by some BRICS countries aiming to reduce their dependence on developed countries' consumer markets has been drawing increasing attention in the last years. According to one estimate, two billion people from BRICS will join the global 'middle class' by 2030 (Wilson and Dragusanu 2008) representing a huge impact on the demand profile with expected reflexes on global investments as well as on innovation.

Simultaneously, several hurdles remain for the BRICS to overcome. One of them is the growing social gap caused by the unequal distribution of recent economic growth. While the percentage of the population below the poverty line has decreased over the past 30 years in most of the BRICS countries, inequality is still a major issue for these economies. In fact, the BRICS countries, except Brazil, show a trend of increasing income inequality that — particularly since the 1990s — has been following the rapid economic growth. Moreover, despite the improvements in recent years, Brazil is still among the countries with the worst distribution of income, together with South Africa that found itself in an even worse situation.<sup>6</sup> In addition, India and Russia are among those with the largest percentage of the population living below the poverty line.<sup>7</sup> Furthermore, beyond the income dimension, inequality has a multi-dimensional character in the BRICS countries. This challenge is exacerbated by race, gender, ethnic, and geographic dimensions and therefore demands more integrated solutions (Scerri et al. 2014).

One of the problems associated with the high poverty levels and the perverse distribution of income is the limited access to quality public services — education, health, housing and infrastructure, safety and security, etc. These problems are common to the five countries, where a significant portion of the population lacks access to essential goods

and services, and demand urgent redress. This situation is reflected in poor human development indices in the BRICS countries. Other undeniable challenges faced by BRICS are unemployment, poor quality employment and increasing informality.

Another evident challenge in all five countries is the huge regional disparity in human and economic development. There is also a large gap between the rural and urban population. In general, the wealthier regions are those that are more industrialised. Practically 60 per cent of the total GDP of Brazil originates in the states of the southeast. The Chinese economic development model favours the coastal provinces, while other provinces in the interior are much less developed. In South Africa, economic activity is concentrated in Gauteng province and in the western part of Cape Town. The industrial development of Russia occurred principally around cities such as Moscow, St Petersburg, Nizhny Novgorod, and Ekaterinburg. India also shows significant inequalities between the rich regions to the south and the northern regions of the country as well as between the rural and urban populations. Therefore, regional redistribution of income and access to essential goods and services is another significant challenge that these five countries have in common (Scerri et al. 2014).

The negative environmental impact of recent growth is another huge challenge to be faced by BRICS countries. According to Carbon Dioxide Information Analysis Center–United Nations (UN) data for 2008, the BRICS countries are responsible for emitting 35.3 per cent of the world's total CO<sub>2</sub>.<sup>8</sup> China is ranked as the world's largest emitter, accounting for 21.9 per cent followed by the United States (17.7 per cent), India (5.4 per cent) and Russia (5.3 per cent). South Africa and Brazil are responsible for 1.4 per cent and 1.2 per cent of global emissions respectively, and occupy the 13th and 17th positions internationally. If we take the example of China, we observe that fossil-fuel CO<sub>2</sub> emissions in the country have more than doubled in the 2000 decade alone. Energy efficiency is a big problem in China and energy consumption per product is about 40 per cent higher than in the developed world. Other environmental problems are also critical. For instance, 40 per cent of river and 75 per cent of lake water is polluted leaving 360 million rural people without clean water. As in China, the environmental impacts in other BRICS countries are also mounting.

Other than extending the existing problems in BRICS countries, one general and common issue should be emphasised. This relates

to the sustainability of its current growth trajectory. This is true in terms of growing inequality, increasing environmental impacts, as well as regional and other imbalances. However, there are some recent changes that may open better future prospects.

All the BRICS countries have an important role to play in shaping the future of the world economy, but China will probably have a more prominent role in this respect. The Chinese system of innovation has been undergoing some changes in order to address two new proclaimed goals: the building of a ‘harmonious growth’ and the development of ‘indigenous innovations’.<sup>9</sup> The harmonious growth aims at reducing the growing social and environmental imbalances. China’s emerging ‘high-growth with low-carbon’ strategy has been emphasised by recent policy decisions, together with measures directed to reduce rural–urban social gaps. The indigenous innovation goal refers to the efforts to make China less reliant on foreign technology through the building of a new kind of relationship between national and foreign players in the process of developing and using new technologies.<sup>10</sup> China is pursuing these goals especially by linking innovation to domestic needs and by giving increased priority to domestic consumption.<sup>11</sup>

For Brazil, India, Russia, and South Africa, Chinese success may lead to strategies towards strengthening domestic technological capabilities and fostering clean technologies. Nevertheless, the differentiated role of the BRICS countries in the configuration of global power and the global economy will in some way constrain the evolution of BRICS national systems for innovation. In addition, their NSIs are highly dependent on their historical development and on how the different domestic actors interpret global developments as well as how they position themselves in the national and international economies. Yet, more flexibility for setting up new industrial and technological policies may be expected.

## Introduction to Books 1–5

This book series attempts to cover five themes that are crucial to an understanding of the National System of Innovation of BRICS. The first book *The Role of the State*, edited by Mario Scerri (South Africa) and Helena M. M. Lastres (Brazil) aims at exploring the relationship between the state and the national systems of innovation in BRICS countries. An evolutionary approach has been adopted in order to

capture the nature of the state in the respective countries and thus understand the historical and ideological basis for its role in the evolution of the NSI in the five countries. As a background, it is argued that debates on the role of the state in the development process, especially since the 1980s, have often focused on the apparent dichotomy between market-driven and state-driven development. This is a rather wasteful diversion, since it should be accepted as a starting premise that the state is essential to the structural transformation that is required for development.

The second book addresses an aspect of the NSI that is normally absent from the discussion: the relation between innovation and inequality. The objectives of the book *Inequality and Development Challenges*, edited by Maria Clara Couto Soares (Brazil), Mario Scerri and Rasigan Maharajh (South Africa) were to trace the trends in interpersonal and inter-regional inequality within BRICS in an evolutionary perspective and to analyse the co-evolution of inequality and the innovation system to highlight how the various elements of innovation and the production system and inequality mutually reinforce.

The book is driven to improving our understanding of this issue. The inequality concept is considered in its multi-dimensional character, embracing a phenomenon that goes beyond the mere income dimension and is manifested through forms increasingly complex, including, among others, assets, access to basic services, infrastructure, knowledge, as well as race, gender, ethnic, and geographic dimensions. The book adopts the broad approach of the national system of innovation to analyse the relations between BRICS innovation systems and inequality, departing from a co-evolutionary view.

As shown in the book chapters, innovation can affect inequalities in different ways and through distinct trails that are influenced by national conditions, and shaped by public policy interventions. Although innovation does not constitute the main factor of influence on inequality, it is suggested that distinct strategies for technological change may lead to different outcomes in distributive terms, thus either aggravating or mitigating inequality. Based on this understanding, the book corroborates the hypothesis that inequalities need to be explicitly taken into account in development strategies since the benefits of science, technology and innovation are not automatically distributed equally. Therefore, advancing the comprehension of inter-relations

between innovation and inequality may be helpful to find ways to shape the national innovation systems so that they reduce rather than increase inequalities.

The third book aims at analysing the contribution of small and medium enterprises (SMEs) in the national system of innovation. The objective of the book *The Promise of Small and Medium Enterprises*, edited by Ana Arroio (Brazil) and Mario Scerri (South Africa) is to explore three main research goals. In the first place, to provide an overview of the main characteristics of micro, small and medium firms in the Brazilian, Russian, Indian, Chinese, and South African national systems of innovation as a basis to examine the contribution of SMEs to the economy of each country. A second goal is to bring to the forefront crucial issues in the discussion of industrial and technological policies for small firms, including the recent evolution and future trends of policies and instruments, their applicability and coordination, as well as a discussion of the macroeconomic, legal and regulatory environment. A final research objective is to draw out initiatives to promote innovation in SMEs that address common bottlenecks in BRICS countries and that can contribute to policy design and implementation by these and other countries.

The fourth book discusses the relationship between transnational corporations (TNCs) and the national system of innovation of BRICS countries. In the book *Transnational Corporations and Local Innovation*, edited by José E. Cassiolato (Brazil), Graziela Zucoloto (Brazil), Dinesh Abrol (India), and Liu Xielin (China) the thesis of technological globalisation is taken with some caution, refuting the idea that R&D activities would be inexorably internationalised. In fact, technological innovative activities in TNCs have been transformed, in relation with the financialisation of TNCs, as evidenced by the rise of their intangible assets (which includes R&D, patents, and trademarks) and a reorientation of R&D expenditures towards non-scientific activities and very downstream development.

The book chapters present a detailed presentation of the relation of the position and evolution of TNC in the country. Subsequently, there is a discussion on the local factors affecting innovation by TNCs and local firms in the country. Government policy towards TNCs has been important but as the Chinese experience shows, access to local buoyant markets has also been vital. Other issues discussed refer to how the government protects local companies from the competition

of TNCs. Spillovers of TNCs to local BRICS enterprises have also been analysed and the immediate conclusion is that there is hardly any convincing evidence regarding either the existence or non-existence of spillovers. An in-depth analysis of outward FDI has also been conducted.

Finally, the fifth book deals with finance and funding in the national system of innovation. The objective was to analyse institutional character and support instruments for the innovation financing process in BRICS, focusing on institutional structure and innovation policy. This book, *Financing Innovation*, edited by Michael Kahn (South Africa), Luiz Martins de Melo (Brazil) and Marcelo G. Pessoa de Matos (Brazil) contributes to understanding the varied approaches to the financing of innovation. It draws on the experience of five diverse countries each of which has undergone dramatic structural adjustment in the last two to three decades. The experience of the BRICS countries presents a unique set of case studies of the transition from largely closed centrally planned and state-driven economic and science policy to a more open and market-led situation. The contributing authors examine the varying approaches to the provision of support to the full range of activities that contribute to innovation ranging from scholarship support to doctoral students, to R&D tax incentives and the provision of seed capital.

The significance of financing investments in innovation has been pointed out as an important structural bottleneck that is yet to be solved by the private financial institutions. If, on the one hand, the internationalisation, deregulation and globalisation of financial markets signals the possibility of resources at lower costs, on the other, the characteristics of investments in innovation such as the length of time needed for development, the uncertainty and the risk, point to the need of setting national institutional arrangements.



## Notes

1. This is also true in Latin American countries, where it is being applied and understood in close connection with the basic conceptual ideas of the structuralism approach developed in the region since the 1950s under the influence of the Economic Commission for Latin America and the Caribbean. In fact, since the mid-1990s, the work of RedeSist — the

Research Network on Local Productive and Innovative Systems — based at the Economics Institute of Rio de Janeiro, Brazil, has been using such a dual frame of reference.

2. See, for instance, Mytelka and Farinelli (2003); Freeman (2003); Chesnais and Sauviat (2003).
3. The following data on BRICS countries' value added by sector (per cent of GDP), 1980–2009 is based on the UNCTAD *Handbook of Statistics* (2010).
4. The IBSA Dialogue Forum was established in June 2003 in Brasilia, Brazil.  
BRIC was formally constituted in June 2009 at a summit of the four countries in Yekaterinburg, Russia. In 2011, South Africa joined the group, which changed its denomination to BRICS.  
BASIC of the G4 was formed during the international climate change negotiations in December 2009 in Copenhagen, Denmark.
5. There are several economic and geopolitical factors that restrict a greater convergence of interests among BRICS countries in multilateral negotiations. The analysis of these constraints goes beyond the limited scope of this concept note, but we could cite the aforementioned relatively low degree of trade complementarities between BRICS as an important one.
6. In 2008, Gini indexes were respectively 0.54 and 0.67 according to Brazilian and South African national institutes of statistics.
7. According to World Bank statistics, the population below poverty line was 28.6 per cent in India and 30.9 per cent in Russia in the mid-2000s.
8. It is important to mention that CDIAC-UN data considers only global carbon dioxide emissions from the burning of fossil fuel, but not emissions from deforestation or other greenhouse gases, including methane.
9. See the AeA research team's 'China's Fifteen-year Science and Technology Plan', in Competitiveness Series, *American Electronics' Association*, Vol. 14, April 2007, p. 2.
10. The US Information Technology Office in Beijing refers to indigenous innovation as a term combining three distinct elements: *yuanshi* (original, or genuinely new); *jicheng* (integrated, or combining existing technologies in new ways); and *yinjin* (assimilated, or making improvements to imported technologies). See <http://www.usito.org/> (accessed 8 January 2013).
11. In November 2008, China launched a US\$ 584 billion anti-cyclical package. According to the HSBC report on climate change (Robins 2009) almost 40 per cent of the total package resources were allocated to 'green' themes. Among others, it combined the search for a lower carbon pattern with the offering of better transport conditions for lower income people placed in rural areas, fostering a niche for the development of innovations capable of attending to the specificities of this domestic market segment.



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# 1

## Small Fish in a Big Pond

### *SME and Innovation in BRICS Countries*

*Ana Arroio and Mario Scerri*

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It is not by a slip that an inverted popular quotation was permitted to intrude into the title of this section. The analogy is useful because it brings to mind an image of numerous, dispersed and heterogeneous ‘small fish’ swimming confusedly in an oversized, inadequate and dangerous ‘pond’ and this corresponds to the experience faced by millions of micro and small firms spread throughout the developing world. It illustrates an often confusing and challenging reality. Nonetheless, understanding and working with this reality is essential as small firms are central to capitalist development; they are thought to have the capacity to change the world both through the generation of critical income and also through their role in the Schumpeterian cyclical ‘waves’ that are the key drivers of innovation, thus furnishing the potential for great social and economic transformation.

This is a powerful proposition that lies at the heart of the rationale for this book. There is an important parallel in the development of new (usually small and medium) businesses and new forms of innovation, production and commercialisation of goods and services. These firms have the potential and flexibility required to capitalise on emerging technological and other opportunities for growth, as well as the fact that they do not offer the usual resistance to their incorporation, mainly because they are not tied down by patterns that are being superseded. Second, the challenge faced by most countries in achieving economic growth, difficulties that increased significantly in the transition to the millennium, intensified the search for the means to

strengthen the economic tissue and generate employment and income, particularly through the promotion of the creation and development of Small and Medium Enterprises (SMEs). Third, the increase in economic and social inequalities between countries and regions, both more and less developed, has shifted the policy focus towards the promotion of less-favoured regions, including the promotion of the small firms that in many cases comprise the basis of local economies (Lemos et al. 2003).

Buffeted by strong currents, these firms struggle to survive in a highly challenging, mostly adverse, global scenario. ‘Globalisation’ heralds the promise that the pond will get bigger; however, in many cases this apparently larger potential is an illusion, or available to the very few, and in other instances, the fish are becoming noticeably smaller. The analogy highlights the urgency of a new approach to understanding the opportunities and challenges to the sustainable development of small and medium firms, an urgency that is heightened by the crisis and conflicts that characterise the globally competitive accumulation regime. The aim of this volume is to address some of the challenges to the sustained growth of small firms looking at the development alternatives that are evolving in Brazil, Russia, India, China, and South Africa (BRICS).

The authors use a broad national system of innovation (NSI) approach as a theoretical framework. According to this perspective, the effectiveness of policies for the promotion of SMEs depends on a wide-range set of factors that include the historic specificity of each country and the existing macroeconomic and social contexts, business and institutional environment and related policies. Besides drawing out the importance of the NSI concept for an analysis of SME policies, this introductory chapter offers an analysis of the varieties of the NSI concept that have been adopted by BRICS to deal with the policy challenges of strengthening small and medium firms. The next section provides a general picture of the environment for SMEs, pointing out their relative importance and strength in BRICS, and this is followed by a discussion that highlights relevant dimensions of the individual realities of the five country cases that are dealt with in more detail in Chapters 2–6. This chapter concludes with policy implications and foundations for future research in this area.

## The Importance of the System of Innovation Framework for SME Policy and Varieties of the Concept in BRICS

Systems of innovation, understood as a set of differing institutions that contribute to the development of the learning and innovation capacity of a country, region, economic sector, or locality, and which comprise a series of elements and relations that link together the production, assimilation, use, and diffusion of knowledge, have been defined, studied and adopted as an important analytical tool and framework to guide analysis in both developed and underdeveloped countries (Cassiolato and Lastres 2009; Freeman 1982; Lundvall 1988). The framework takes into account the specific social, economic and political realities of each country, the local or tacit nature of knowledge and innovation, and also the power relations in discussing innovation and knowledge accumulation. The relevance of the NSI framework for BRICS has been extensively discussed in J. E. Cassiolato and H. M. M. Lastres (2009).

It is argued here that the NSI concept can be usefully employed to focus on the processes of interaction, co-operation, learning, and development of capabilities in small and medium firms. The concept enables taking into account the micro-, meso- and macroeconomic dimensions that are central to innovation efforts and allows focusing on issues and dimensions that are not usually considered including the productive, financial, social, institutional, and political spheres. Most importantly, for the innovation system of BRICS countries and SMEs, the NSI approach provides lenses that can be used to examine learning processes; historical and cultural trajectories; and social, regional, gender, and other inequalities.

While NSI researchers concur that national and local conditions may lead to completely different paths and that there is not only one solution and policy prescription but rather a myriad of alternatives, it is nonetheless possible to draw several lessons from the experiences presented in this book. Importantly, the adoption of a common theoretical framework allows research to draw back, analyse the bigger picture and draw lessons which can be of value to the broader discussion on the role of innovation in socioeconomic development.



## *Varieties of the NSI concept in BRICS*

Reflecting an international move towards recognising the need to develop a systemic approach to the promotion of innovation and competitiveness of firms and individual agents, policies have focused more clearly on clusters of firms (Freeman 1987; Piore and Sabel 1984; Storper 1997). In particular, policies to promote technological and industrial development increasingly recognise that the agglomeration of enterprises and the best use of the collective advantages generated by their interactions, and also by their exchanges with the surrounding environment, can effectively contribute to the strengthening of their chances of survival and growth, and represent an effective source for sustainable competitive advantages (Cassiolato et al. 2003). This approach suggests that collective learning processes, co-operation and dynamics of groups of firms are fundamental to meeting the challenges of economic, social, technological, and knowledge asymmetries. Gradually, existing programmes have begun to provide support to groups of small firms, employing varying conceptual definitions and terminologies, such as firm networks; technological parks; incubators; co-operative projects; clusters; productive, regional, sectoral, or export zones, among others (Piore and Sabel 1984; Porter 1998; Storper 1997).

A unique experience in public policy to foster collective regional entrepreneurship and SME innovation is the Local Productive Systems (LPS) approach examined by Ana Arroio in the chapter on Brazil. This concept is grounded in the NSI perspective to guide economic, industrial and social policies that seek to strengthen the interactions among SMEs and to promote learning and innovative capabilities. LPS represent a practical unit of analysis and investigation that goes well beyond traditional views based on individual organisations (enterprise) or economic sectors, comprising both the territorial dimension and economic activities. This approach expands the sectoral system of innovation perspective not only because it brings to the fore the heterogeneous agents (enterprise and research and development [R&D] organisations, education, training, financial agents, etc.) and related activities that are necessarily comprised in any productive system but it also highlights the conditions under which local learning, the accumulation of productive and innovation capabilities and effective use of these capacities occur. For developing countries this is absolutely vital.

Although other BRICS countries have not articulated SME policy making in terms of such a conceptually structured NSI approach, the need to bridge the gap between the challenges of globalisation, development and innovation-based competitiveness has meant that all countries have to some extent found a response in the systems of innovation approach. In South Africa, the systems of innovation framework has been used to organise public resources in research, development science and technology since 1996 when the publication of the White Paper on Science and Technology established the parameters and orientation of the reframed NSI. The South African policy framework is particularly relevant for analysis of strategies to strengthen SMEs considering that in the post-apartheid policy framework, these firms are perceived to occupy a central role in the achievement of social (poverty alleviation), economic (employment creation, growth) and political (black economic empowerment) objectives.

China also adopts an explicit NSI approach, and the evolution of its approach to scientific and technological policy making described by Yuan Cheng and Jian Gao illustrates key milestones in the development stages associated with strengthening the innovation system. In the current phase, beginning from 1998, the country has focused on enhancing the innovation capabilities of domestic enterprises, including the technological capabilities of SMEs.

Both the India and Russia country studies provide a detailed description and analysis of legislation and policy instruments to support SMEs, giving a comprehensive overview of the role of SMEs in the country's system of innovation. In the chapter on India the focus is on the huge policy challenges inherent in an innovation system torn between highly competitive SMEs that display technological capacity and vibrancy on one hand, and the profusion of tiny, small sector firms, often grouped in what has been termed 'poverty clusters', on the other hand. They show that increased competition from the world market has led to increasing concentration of SMEs in more advanced regions, thus aggravating rather than mitigating regional inequities. The chapter on Russia examines the consequences of immersion in the global economy without an adequate legal and institutional framework to shield the development of SME. In both these countries, policy making in general, and for SMEs in particular, is not couched explicitly in an NSI perspective.

Almost all of the chapters highlight the need for more detailed analysis using both regional and sectoral innovation systems perspectives. The authors in this book make it clear that it is important to tailor the NSI concept to study in more focused detail the regional and sectoral specificities that may lead to improved policy making for a broader spectrum of SMEs. This is because regional-level-specific mechanisms for supporting small- and medium-size entrepreneurship are considered crucial to their sustainable development. The Brazilian experience that looks at LPS can bring important insights for such studies, and these are drawn out in the final section in this chapter.

## Setting the Stage: The Role of SMEs in BRICS

This section brings to the fore central aspects of the social and economic context, in addition to the business environment, that are essential to analyse SME development and that are summarised in Tables 1.1 and 1.2. The data reveal that SMEs play an important role in BRICS economies, representing in most cases over 90 per cent of total firms. Although studies show that these firms are less important in terms of wage generation, as salaries are significantly larger in bigger firms, SMEs provide a much needed cushion to absorb the labour force contingent, particularly in China and India. They also provide a buffer to high unemployment rates, such as those registered in South Africa, reaching 23 per cent or even higher when capturing those who have given up registering for work.

These firms must deal with a highly challenging financial and business environment. Although all BRICS have managed to achieve positive Gross Domestic Product (GDP) growth in the new millennium despite an adverse international economic scenario, short-term interest rates are high in most countries, and very high in Brazil and India; this is compounded by the fact that official credit-lines for SMEs are in most cases practically non-existent, and even when formally in place, very difficult to access. In terms of inflation, the scenario in most countries has improved significantly from the late 1980s and early 1990s when extremely high inflation rates were feeding the financial economy rather than the 'real economy'. Nonetheless, existing rates of over 5 per cent in most cases may prove too steep for the survival of many SMEs.

**Table 1.1: SME in BRICS Countries: Social and Economic Context, 2012**

	<i>SME</i> (million units %)	<i>Labour Force</i> (million)	<i>Unemployment</i> (% of labour force)	<i>GDP Growth</i> (2008–12)	<i>Interest Rate</i> (short-term)	<i>Inflation*</i>
Brazil	5.37/99	103.2	5.5	0.9	7.25	5.4
Russia	4/97	76.4	6.6	3.4	5.50	5.1
India	26	476.1	...	3.2	9.00	9.3
China	42/99.6	816.6	4.1	7.8	3.25	2.7
South Africa	2.5	18.6	25.1	2.5	5.40	5.1

*Source:* SME data compiled from information in individual country chapters in this book. Other sources are the International Monetary Fund (IMF), the Inter-Agency Group on Economics and Financial Statistics, the World Bank Development Economics Data Group and the Investment Climate Department of the Financial and Private Sector Development Vice Presidency.

*Note:* \*annual per cent change in Consumer Price Index (CPI).

... indicates data not available.

**Table 1.2:** *SME in BRICS Countries: Business Environment, 2012*

	<i>Time to Start a Business (days)</i>	<i>Procedures to Start Business (number)</i>	<i>Total Tax Rate (% of profit)</i>	<i>New Business Density*</i>	<i>Firms Using Banks to Finance Investments (% firms)</i>
Brazil	119	13	69.3	2.4	48.4
Russia	18	8	54.1	2.6	30.6
India	27	12	61.8	0.1	46.7
China	33	13	63.7	...	28.8
South Africa	19	5	33.3	0.8	34.8

*Source:* World Bank, Development Economics Data Group and Investment Climate Department of the Financial and Private Sector Development Vice Presidency.

*Note:* \*new registration per working age population.  
... indicates data not available

The business environment is equally challenging. Opening a formal business enterprise in Brazil is not for those that are in a hurry, as this could take as long as 120 business days (see Table 1.2). The tax rate is high in all countries and absorbs a significant percentage of profits, reaching 69 per cent in Brazil. Russia is the champion in terms of new business density and, together with South Africa, is one of the countries that require the smallest number of procedures to start a business, and likewise these two countries can boast of the smallest interval to start a business. The last column in Table 1.2 — ‘Firms Using Banks to Finance Investments’ — shows that a significant proportion of formal SME business enterprises benefit from investment financing, reaching almost 50 per cent in Brazil and India. It is important to keep in mind that these figures do not comprise informal business indicators.

However, a comparison of World Bank Business Environment indicators between 2007 and 2009 reveals dramatic changes in the data. The main point is that it has become much easier to start a business in almost all BRICS countries, both in terms of the time to start a business and the number of procedures that are required. This holds true for all countries except Russia, where both indicators have increased in the two-year period. Most importantly, the percentage of ‘firms using banks to finance investments’ has gone up dramatically: it has more than doubled in Brazil (from 22.9 per cent to 48.4 per cent, an

increase of 110 per cent) and India (from 19.4 per cent to 46.7 per cent, a growth of 141 per cent), almost tripled in China (from 9.8 per cent to 28.8 per cent, a 194 per cent increase) and over three-fold in Russia (from 10.2 per cent to 30.6 per cent, up by 200 per cent). Taken together, changes in these indicators confirm that public policies can have an important impact on business practices and must be carefully conceived and tailored to the environment faced by SMEs.

These countries have several aspects in common that may have a profound impact on how policies for SME are conceived, developed and implemented. These include demographic and social aspects, such as the high degrees of inequality in the distribution of income; their large, or extremely large, population densities; and associated challenges in the provision of essential goods and services, including water, food, energy, sanitation, education, and health. Additional development challenges such as relatively large unemployment figures, the significant gap between the rural and urban populations, the immense regional disparities in human and economic development, and perverse regional income distribution patterns are common themes that justify focused attention on policies for SMEs.

As regards economic and productive structures, BRICS have the importance of agricultural and extractive activities as well as the transformation of mineral and energy resources in common. The magnitude of their agro-industry and the rich biodiversity are noteworthy and may offer important windows of opportunities for SME policies.

The trends and directions of SME policies will also be to a large extent dictated by the different strategies for development that have been adopted in BRICS and their various degrees and forms of integration into the world economy. Thus in Russia, specialisation in petroleum, the gas complex and other natural resources associated with the strength and impact of the 4,000 research institutes inherited from the Soviet era has led to strong policies within specific industrial clusters, as discussed in Alexander Sokolov and Pavel Rudnik's chapter (Chapter 3). The opportunities and challenges associated with the various development strategies are drawn out in individual country chapters.

BRICS have faced intense political and economic transformation processes in the last decades. They have dealt in diverse manners with the impacts of liberalisation, deregulation and financial instability. The significant increase in their participation in international trade,

fostered by the Chinese and commodity booms, has led to specific vulnerabilities in SMEs dedicated to the export sector or that are attempting a more nuanced insertion in global production chains, as addressed particularly in the analysis of the role of SMEs in national innovation systems in the chapters on China and India.

Russia and South Africa have also faced great political changes and the strategic role assigned to SMEs in bringing about radical political and economic change is exceptionally highlighted in the case of South Africa. Likewise, the Brazilian chapter brings to the fore the importance of national policies to orient, regulate and support SME growth. As mentioned previously, this chapter provides an important conceptual contribution: it presents the LPS approach that provides a policy framework which seeks to foster sustainable and coordinated development at national, regional and local levels. Because it is not geared solely towards integration into the global economy, it is a promising policy model to face the huge task of evening out regional imbalances in countries of continental dimensions.

## Comparative Treatment of the Five Country Cases

### *Definitions and basic statistics*

There are various challenges to carrying out cross-country empirical comparisons of BRICS. The paucity of existing data on SME and the varying definitions used for small and medium firm categorisation is one of the first difficulties.<sup>1</sup> The term ‘SME’ is used to describe a diverse range of highly heterogeneous business activities that differ in size, sector, ownership structure, the market that is served, and the technology that is used. Most importantly, variations occur considering the nature of the productive and institutional relationships they are embedded in and their legal status.

Although definitions of SME vary from country to country, some of the commonly used criteria include the number of employees, total net assets, sales, and investment levels. Brazil and China’s national survey systems, for example, consider employee figures for specific industrial sectors, including manufacturing, construction and other categories such as commerce or services, while other countries’ indicators comprise broad criteria based on employee numbers, rather

than associated with specific industrial sectors. All five countries also categorise SMEs according to revenues from sales of goods but here again, the limits vary considerably.

Keshab Das and K. J. Joseph in Chapter 4 provide an interesting discussion on the evolution of the definition of SME in India, showing that the adoption of criteria for the definition and classification of firm size allows policy makers to draw out particularities that are considered relevant; in the Indian case, employment and the usage of power until the 1960s, when the criteria was dropped and firms were defined in terms of investment in plant and machinery. In India these businesses are categorised as 'small scale industry' highlighting the fact that varying terminologies are used in different contexts. The definitions and criteria that are adopted allow policy makers to highlight specific themes according to local interests, and also enable firms within the established limits to enjoy the benefits and incentives offered in legislation providing differential treatment to SME.

Because countries use different criteria for defining SMEs it is impossible to generate valid direct comparisons. Nonetheless, it is possible to draw some broad comparative insights. Not surprisingly, most authors represented here stressed the role of SMEs as the backbone of their national economies. In Brazil and China, for example, 99 per cent of total firms are SMEs and they contribute heavily to employment generation and to GDP growth, reaching almost 60 per cent in China. As pointed out by Yuan Cheng and Jian Gao in the chapter on China, these firms make a tremendous contribution to national economic development.

In Chapter 3, Sokolov and Rudnik observe that although the country has yet to complete the process of downsizing conglomerates inherited from the Union of Soviet Socialist Republics (USSR) era, small and medium businesses have steadily increased production volumes and employment and are becoming mainstays of the national economy. In India, although Micro Small and Medium Enterprises (MSMEs) have achieved relatively high growth in terms of number of units, investment, output, employment, and exports, production growth has not kept pace with employment or number of units. The strategy for enhancing the competitiveness of Indian small firms has linked output growth to increased capital intensity of production, and it is highly likely that a few relatively larger units have emerged as competitive by being able to invest in expensive plant and machinery. This strategy



has not been able to enhance either employment or number of units, a pressing issue for large developing countries.

It is in the chapter on South Africa that the relevance of policies to promote these businesses as a vehicle for economic growth, wealth distribution and social transformation comes sharply into focus. Lindile L. Ndabeni's study (Chapter 6) shows that in over 300 years of colonialism and over 40 years of apartheid capitalism, there was little scope for any policy framework to promote MSMEs. Industrial and business policies were in line with racial discrimination; the black population was simply seen as providing cheap labour for the white business establishments. This led to the creation of two disconnected and parallel economies, what is termed in South Africa as the 'first economy and second economy'. Although disconnected, they are highly symbiotic since the structure of the primary and secondary sectors in the country is shaped by the characteristics of the labour market, thus the 'second economy' constitutes an important internal market for South African industry.

As in other countries, a vast majority of the firms in the second economy are informal and 'survivalist'; they exist at the barest levels of survival. In Brazil it is estimated that the number of informal businesses is at least four times larger than the number of MSMEs that have been legalised, involving around 60 million individuals. In India, 99.5 per cent of over 4.4 million small enterprises belong to the micro category and these are largely part of the ubiquitous informal sector. As Ana Arroio observes, these firms face limited availability of financial, human, technical, technological, and management resources and have very weak capability and bargaining power when it comes to dealing with actors in their external environment.

The authors in this book highlight the many difficulties faced by businesses in the 'second economy' in their external environment, in addition to the internal organisational challenges detailed previously. Ndabeni, for example, points out that they have to compete with more sophisticated and well-organised counterparts in the formal sector. Sokolov and Rudnik discuss one of the most perverse aspects of the informal or 'shadow economy', as it is known in Russia, where 'shadow' firms push legal companies out of the market since the former can sell their products and services at more competitive prices. SMEs have to either accept the 'shadowy' rules of the game or quit the market. This is an important challenge that requires creative policies, such as the introduction in Moscow of registries of 'honest small

businesses' that receive breaks and preferences, including reduced rent. Taking steps to ensure that the rights and lawful interests of small- and medium-size businesses are not breached and to deal with private and public corruption and criminalisation of activities, thus reducing the substantial uncertainties and risks faced by small businesses, are critical policy challenges.

The small size and heterogeneity of firms, coupled with high levels of informality in the production and labour processes, has implications for the nature of innovative activity in this sector. A different approach is required to help these 'small fish' survive, grow and contribute to more dynamic regional and NSIs.

### *SME policies and innovation policies*

A surprising factor to emerge from the analysis is how fast and far policies to strengthen SME, and also policies to promote small business innovation, have advanced in BRICS. Until the 1970s, policies had traditionally focused almost exclusively on the promotion of large domestic state-owned enterprises or in creating an environment that was favourable to the productive structure of large firms, both national and foreign, through monetary, fiscal and labour policies, among others. With the notable exception of India, where the National Planning Committee of 1938–41 had already accorded significance to small-scale firms in India's industrial development, the formulation and implementation of policies for the promotion of SMEs is very recent, beginning from the 1970s in Brazil and China, from the 1980s in the case of Russia, and as late as the 1990s in South Africa. In most cases, initiatives in support of the universe of small businesses were a small item on the government agenda and the focus was mainly on social welfare, i.e., redressing unemployment.

Early policy making sought to establish the institutional structure and legal framework for the treatment of small enterprise. As can be expected from countries this diverse, institutional design and the legal framework vary considerably. Brazil, India and South Africa, for example, implemented relatively centralised institutional structures to address SME-related topics. India created the Ministry of MSME as early as 1954, while Brazil developed a sophisticated and extensive system to provide business assistance to SMEs — the Brazilian Micro and Small Business Support Service (SEBRAE). Although in most BRICS there is one institution responsible for overall policy

coordination, SME promotion is a shared competency cutting across a range of policy areas and government departments.

As regards legislation, common themes focusing on the differentiated treatment of SMEs that emerge in the BRICS countries include administrative, taxation, social security and welfare, labour, credit, and entrepreneurial development strategies. Legislation to create an enabling framework focuses on tax exemptions, simplified accounting rules for tax calculations, differential taxation, and other financial incentives, facilitating access to finance and specific credit lines. Regulation also seeks to reduce constraints and simplify bureaucratic procedures in addition to creating structures that facilitate or provide access to information, advice and access to affordable physical infrastructure, including training for entrepreneurship skills, management and export-oriented services.

The importance of improving SME business skills is noted by all authors in this book. These entrepreneurs generally lack business skills which in turn constrain their ability to take advantage of business opportunities; the lack of relevant skills also limits creativity and innovations and leads to entrapment in low-quality, unsustainable product and service offerings. Cheng and Gao observe that the shortage of talent is one of the biggest problems faced by SMEs and highlight the fact that these firms must deal with the simultaneous occurrence of the phenomena of shortage of talent and brain drain. Many SMEs are family business and these tend to have weak management abilities that are not usually grounded in modern scientific management ideas. Even the more competitive SMEs may find it difficult to attract and retain talent, because they cannot implement effective incentives or mobilise the enthusiasm and creative talent needed to remain competitive. SMEs thus become trapped in a vicious cycle where it is extremely difficult to upgrade management and technological innovation capacities, making it impossible to achieve economies of scale and compete with larger companies with more access to capital, technologies and information.

The other side of the coin is the lack of relevant professional skills in the institutions designed to support SME entrepreneurs. This is a serious issue that tends to become more acute with insufficient resources and weak management and technical skills. Thus, although there exists in most countries an extensive arsenal of tools to support small enterprises, the absence of skilled, modern-thinking professionals means that conditions are less than favourable. Policy initiatives

are often poorly integrated and badly tuned to the needs of small innovative companies. In addition, the lack of clarity about the roles and responsibilities of staff at different levels of the public sector makes their efforts uncoordinated and less effective. There is thus a double challenge in improving staff qualifications for dealing with SME and also improving the integration of the surrounding network of actors that are relevant in SME promotion and innovation efforts. This is where the NSI perspective can have a deep impact, because according to this perspective technological innovation is not an isolated phenomenon and the surrounding environment and network of actors and institutions must be taken into account in the development of innovation policy.

From 2000, legislation in most countries has focused more sharply on facilitating SME access to technologies and the development of technological capabilities. A case in point is China's Science Technology & Innovation (ST&I) system, which, although undergoing a series of stages since the reform and opening up in 1977, only succeeded in implementing an SME Promotion Law in 2003. Although late relative to the other BRIC countries, this legislation has a clear-cut focus on technological innovation, in addition to measures for financial support, entrepreneurial support, market development, social services, and building an appropriate legal environment.

This finds echo in the Russian Federation, where it was only in 2007 that more sophisticated legislation for the treatment of SMEs was implemented. Tracing the historical roots of SME development in Russia, Sokolov and Rudnik provide a picture of a country undergoing profound economic and social transformation with a deleterious impact of political upheavals on SMEs. In spite of the body of legislation which is in place and significant institution-building, the turbulence of the past two decades means that there is still a long way to go in the promotion of the SME sector.

### *Fostering demand and the role of government procurement*

Creating demand for small-enterprise products and services in addition to legislation that lays down special conditions for their increased participation as suppliers (contractors) of products and services in government acquisitions are key themes that have recently begun to

be explored in country-specific legislation and that may include the design of specific procurement policies. Government procurement can be successfully tied into technological development and capacity-building strategies and this is an important theme for SME promotion that has only recently begun to achieve recognition through specific legislation.

For Ndabeni, the crucial problem is that a majority of SME entrepreneurs depend entirely on local markets which are often overtraded, suggesting that isolation of the business enterprise from large markets is at the core of the lack of the problem of demand. In addition to improving regional inequalities, policies should seek to provide efficient programmes to promote marketing and export of small enterprises so that entrepreneurs can diversify products, identify niche markets for high-value products and expand.

Some authors suggest that the lack of demand for SME products could be addressed through policies that seek to promote integration into relevant value chains, particularly through increasing the demand of large enterprises for innovative products supplied by SMEs. However, bearing in mind Das and Joseph's warnings regarding the pitfalls of 'global integration' and that there is nothing inevitable about small firms being connected with global commodity chains, any such policy should be carried out carefully.

Most interestingly for developing countries, Sokolov and Rudnik point out that there is significant room for improvement in procedures for placing government orders as a tool to promote the demand for SME products. Procurement could also be part of a broader strategy to promote co-operation and networking between small, medium and large businesses. In particular, promoting linkages between SMEs, including strengthening inter-enterprise co-operation among SMEs and fostering networks of sectoral associations that represent collective interests could be very beneficial. The role of business associations in the promotion of SMEs and innovation should not be underestimated. In Russia, there has been an interesting participation of businesses' representatives and non-profit organisations in the development and implementation of the national policy to support SMEs; they provide expert assessment of draft federal, regional and local legislation regulating this sphere. In India there have been efforts by industry associations to associate with commercial banks and financial institutions to provide collateral security to entrepreneurs and in China, Productivity Promotion Centers — scientific and technical service organisations

that support SMEs — have grown significantly. In Brazil, in addition to SEBRAE, the National Confederation of Industries provides a forum for discussion of industrial interests and various services for micro and small businesses. These bridging institutions are crucial in the system of innovation that supports SMEs, they represent important loci for the discussion of public policies and could provide connecting channels to discuss and implement mechanisms to facilitate public procurement of SME products and services.

### *Gender in SME development*

Ndabeni's observation that 'the marginalisation of women's enterprises in the general economy tends to mirror the marginalisation of women in society' (see Chapter 6) says it all; in BRICS, as in many other developing countries, women are a majority of the population and they tend to dominate the micro enterprises of the SME economy. However, their production is concentrated in a relatively narrow range of activities, characterised by low technological density and few fixed assets, with intense use of unqualified labour, developing activities in traditional industries, such as livestock, food and beverage production, clothing and footwear manufacture. These enterprises operate on the fringes of the major economic sectors and enjoy very low profits and rent.

Gender inclusive policy designs in BRICS countries are timid and fall short of meeting the pressing requirements and specific obstacles faced by business women. Given their social and economic relevance, it is essential to create alternative forms of incentive and to ensure that public policy be purposefully designed to promote an enabling environment for women entrepreneurs. Placing the gender issue within a broader development policy that includes not only access to credit, markets, information, the development of business, and other capabilities, but most importantly also seeks to enable their engagement in policy dialogue and political empowerment, may have a significant impact on their status, transforming power relations and positions within society.

Likewise, the almost complete absence of information and lack of policy instruments for family businesses in BRICS suggests a very important gap in research, analysis and policy making that requires urgent attention. A significant proportion of SMEs are family busi-

nesses and more knowledge is needed to design policy instruments tuned to the specific vulnerabilities and challenges of this type of business.

The studies show that since the 1950s BRICS countries have focused, with varying degrees of success, on the policies and the institutional build-up to strengthen domestic industries. During the 1990s and into the new millennium, there have been major efforts at institution building, legislation and regulation for SMEs. BRICS have designed and to varying extents successfully implemented policies to promote SMEs, and more recently policies have begun to tune into a systems of innovation approach.

The chapters in this book show that, in addition to social and economic constraints, the major challenge to successful policy implementation is linked to the weak articulation among the diverse initiatives and agencies in charge of policy execution, leading to fragmentation and dispersal of policy initiatives. Another serious challenge is that funds allocated from federal budgets to programmes for small business support may in reality be almost insignificant and that many programmes are not as fully financed as initially planned. In some cases, funds that were small to begin with get dispersed among myriad competing initiatives. The authors argue that use of the policy framework provided by the NSI perspective — particularly focused on the regional or local level of production — although requiring unprecedented efforts to develop a collective and systemic approach could redress many of the challenges associated with the large geographic spread and sectors of SMEs, women and family enterprises.

### *Innovation data*

It is essential to point out that existing concepts and methodologies for studying innovation in the SMEs in developing countries are inadequate, leaving out and thus rendering invisible a wide array of factors, indicators and processes that are crucial to broad-based innovation in SMEs; importantly, these gaps may lead to skewed policy making. The use of narrow concepts to focus on innovation, including the emphasis on R&D, for example, has meant that those other highly relevant aspects of the innovation process, such as design and computer programming; management; business, administrative and production activities; teaching; and other activities needed to innovate are left out.

Especially worrying is the inability of mainstream innovation surveys to incorporate, comprehend and deal with the high levels of informality in the SME sector. In BRICS countries, where informality prevails and informal cooperative practices and agreements are a part of the historically established socio-cultural context, this limitation is particularly important. The ‘invisibility’ of actors, regions and activities has prevented their inclusion in policy agendas, thus reinforcing inequalities. It is apparent that a methodology and accompanying indicators that seek to illuminate contributions of the SME sector to broad innovation in BRICS would provide more robust data and innovation indicators, greatly contributing to policy making. In addition, research that enables highlighting and analysis of informal cooperative practices in the SME sector might bring to light truly dynamic networks between ‘invisible’ suppliers, clients or consumers in addition to links with educational, financial and other institutions.

The discussion of innovation data in the country reports suggests that it is important to develop and use concepts and parameters that enable analysis of ‘invisible’ local innovation in order to foster their inclusion in policy agendas. There is ample room to improve policies and financing to enhance the innovation efforts of SMEs; however, it is important that policy initiatives be based on innovation indicators that are developed taking into account and that prioritise the realities and requirements of the firms and contexts they are targeting.

## *Financing*

Improving access to financing and innovation financing for SMEs is the holy grail of economic policy for these firms. The studies in this book show that since the mid-1990s many credit lines traditionally available in most countries in the portfolio of public banks and development agencies for financing production, floating capital, equipment, exports, and technological capability-building, have been available, at least in theory, for use by small firms. However, several obstacles have contributed to the overwhelming failure of financing programmes directed towards small enterprises. First, the traditional and immense difficulties felt by small firms in adapting to existing rules, considering that the structure of credit instruments was conceived to meet the requirements of large firms. A second obstacle refers to the conflict between the commercial and political logics inherent in the activities



developed by banks. Even though it is increasingly being demanded that development banks invest public resources to finance SME, these banks, due to specific traits and because of the context in which they are embedded, have many difficulties in dealing with small firms.

In South Africa, the Khula Enterprise Finance scheme has the mandate to improve the access of Small, Medium and Micro Enterprises (SMMEs) to finance through the provision of wholesale finance or guarantees to retail financial intermediaries which in turn finance SMMEs. Both micro credit and larger loans are available and Khula provides a Credit Guarantee Scheme that offers alternative security to entrepreneurs wishing to acquire or expand their business through a bank loan but who are not in a position to provide the necessary security or collateral. However, many problems have been faced in the implementation and these are similar to the obstacles found in other BRICS, including the commercial banks' lack of technical skills and knowledge to lend to the SMME sector, the lengthy and cumbersome loan procedures that discourage small borrowers and new start-ups, the inexperience of Retail Finance Intermediaries, inadequate capacity-building before and after loan implementation and disbursement, the failure to scrutinise lending methodologies, and importantly, an emphasis on 'international best practice' rather than developing a focus that would enable improved results tailored to local conditions.

As far as small firms are concerned, many SMMEs lack the skills and the business experience required to develop and submit business plans, and they may also lack awareness of financial institutions' services and products, including competing finance charges. As Ndabeni correctly observes, there is a need for increased transparency in the banking sector, including banks reporting on their SMME lending. Most significantly, he also suggests that effective SMME promotion requires a supportive human resource base fostering business and economic literacy and the importance of bringing in non-financial institutions in the broader provision of finance. These institutions can strengthen business efforts through entrepreneurship skills improvement and they may also have knowledge of local economic conditions which can impact on the success of individual projects.

In South Africa, barely two-thirds of projects submitted by SMEs are approved; in India the proportion of credit to the sector as a percentage of net bank credit has been on the decline since 1997 and

reached a low of 8 per cent in 2007. Financial agents show a clear preference in dealing with credit lines that favour larger businesses. In China and Russia access to funding for small businesses is also very limited and the government support system is poorly tuned for bridging the gap small companies face when they try to get bank loans. There is a strong bias against small loan portfolios and it is deeply ironic that in countries where SMEs comprise over 90 per cent of the total number of firms, they receive such a tiny slice of the financing pie.

In Chapter 4, Cheng and Gao go further into the discussion of the complexity of financing SME. Despite strong GDP and industrial production growth (8.6 per cent and 16.1 per cent respectively as of February 2010), insufficient funds and difficulties in accessing credit — or ‘the financing channel problem’, as aptly named — also besiege Chinese SMEs. These firms lack adequate capital accumulation and have poor access to venture capital and more traditional financing channels. In the financial system, small- and medium-sized commercial banks possess significantly smaller sources of funds when compared to the four major state-owned banks, and their network and settlement system is also far less sophisticated, and so they have great difficulties in supporting SMEs. The development of regional small capital markets and services specifically for small- and medium-sized enterprises lags far behind as does the development of entrepreneur and venture capital.

Sokolov and Rudnik agree that it is important to take into account specific features of micro-finance activities, paying particular attention to the development of private micro-financial organisations, credit cooperatives and cooperative banks that could provide services to start-up entrepreneurs and clients that are traditionally unattractive to banks, particularly in regions where regular banks are poorly represented. They also focus on the many problems surrounding tax legislation, including the fact that tax laws and regulations are imprecise and that small enterprises have limited access to preferential taxation regimes. Of course, while this is important, simplification of tax laws will only benefit SMEs that operate in the formal economy.

In Brazil, the policy approach prioritising the collective treatment of SMEs from 2003 has led to the development of an interesting array of instruments to improve access to credit. The main public and private banking institutions participate in the Working Group on Local Productive Systems and have implemented specific credit

lines to finance LPS. These institutions have increasingly recognised that the focus on the financing of small firms in LPS represents better opportunities and less risk. This experience, although by no means sufficient to meet all demands for financing, has interesting lessons for other developing countries seeking to promote these firms and particularly the collective treatment of firms.

As Ndabeni concludes, the institutional environment of traditional financial institutions is unfriendly to many SMEs and the majority of these entrepreneurs rely on their personal savings and other informal lending outlets. This persistent financial vulnerability poses insurmountable problems for the landless, the poor, and women and is a serious obstacle to socio-economic development and sustained competitiveness. As highlighted by various authors, the creation of cluster banks, or other financial arrangements, embedded within local systems of innovation and that target collective agents is a promising way forward.

### *Innovation financing*

Interesting advances regarding SME innovation financing were reported. Innovation funds, equity financing and venture capital are most commonly used to promote technological development and these are fully explored in the country reports.

Venture capital has become the panacea of SME innovation financing and its role in promoting the innovation economy has been much extolled. Studies have shown, however, that there are specific socioeconomic and institutional aspects that must be satisfied for a successful venture capital industry to flourish. These include high mobility and regular flow of talented people, a very large supply of investment funds and highly liquid public equity markets to permit exit in good conditions (Chesnaï and Sauviat 2003). In most developing countries these conditions do not exist and governments have been busy attempting to create an environment that is propitious to the take-off of a venture capital sector. As can be seen in the country reports in this book, all of the attempts are government-led and have been successful only in a narrow sense.

The authors in this book highlight challenges to the establishment of a venture capital market, including lack of projects in the regions where funds operate; the small size of some of the first-order funds; problems with attracting private capital; and the inadequate skills,

qualifications and experience of the personnel of managing companies. As in China and Russia, in Brazil, South Africa and India the venture capital market is also the result of state-supported operations rather than a spin-off of the private sector's wealth and risk-taking. Various initiatives for venture capital promotion have been implemented, but so far the results have been relatively meagre. It does not appear that the existing venture capital system takes into account the specific requirements of SMEs and the socioeconomic contexts in developing countries. Rather, there are clear attempts at forcing reality to adapt to this financing mechanism. Most importantly, not all fields of economic and industrial activity are consistent with venture capital practices, making it an instrument with rather limited reach; it has the potential to benefit only a very small segment of the SME sector in developing countries.

## Innovation Systems: Key Actors and their Interactions

### *Local productive systems*

As regards the collective treatment of SMEs, perhaps the most innovative conceptual and policy making approach is provided by the LPS perspective adopted in Brazil since 2004. LPS refers to any productive agglomeration involving economic, political and social agents localised in the same area, performing related economic activities and presenting consistent articulation, interaction, co-operation, and learning processes. The advantages of focusing on groups of agents that interact to produce goods or services and of implementing policies that stimulate these agents and their surrounding social and economic environment go beyond economies of scale and include the potential to benefit from other important synergies. As discussed in Chapter 2, this approach has provided the framework to ground new forms of support and specific legislation to promote innovation in LPS.

Important lessons have been gained from the Brazilian experience in implementing policies based on this collective approach. First, that it is essential to adopt a broad conception of innovation, starting from the point of view of the economic, social or political agent, or of the collective actors in the LPS that are implementing the innovation. A related observation is that LPS do not comprise an end per se in the

sense, for example, of counting them and attempting to increase their total number. Indeed, the use of narrow concepts and mapping of innovation and LPS in Brazil has tended to reveal only cases in the most advanced parts of the country; the less structured cases with intense participation of SMEs and with high levels of informality — that may also require both research attention and policy support — have been left aside.

Second, the focus on the collectivity means going beyond the frontiers of individual enterprise as units of analysis and intervention. From this point of view, it is essential to focus on agents, enterprises and other organisations as a body. The advantage of adopting this approach, and perhaps also the largest challenge to successful policy implementation, resides precisely in the collective treatment of agents, that is, the design and implementation of policies geared to a body of agents rather than individual firms. Research in this vein argues that the very success of development policies hinges on the focus on the collectivity. This task requires additional and unprecedented efforts, as well as a systemic view for the construction of new frameworks, that also comprise interrelated issues including access to credit, taxation, regulation, and legislation.

It is essential to develop partnerships to design collective solutions to specific problems and devise the means to exploit growth potential of the SME sector. This involves institutional learning and the design of new frameworks and policy instruments. It is not enough to augment and make available financial, technological and management resources. Rather it is essential to enable institutional learning to deal with (a) groups of enterprise and, more precisely, groups of actors that are frequently at odds and resistant to articulation and co-operation amongst themselves; (b) micro and small enterprises that may have difficulty in identifying and expressing their needs; and (c) segments that are not usually considered by such policies, particularly those that are excluded from formal economic activities.

Of the work presented in this book, the greatest emphasis on territorial and regional imbalances is that of Arroio, Ndabeni, Das and Joseph. They are particularly concerned with the deep structural and regional inequalities that must be faced to overcome constraints to social-economic development. They argue that access to support services must be comparable in urban and rural areas and detail specific mechanisms for supporting small- and medium-size entrepreneurship, including the dissemination of regional experience in supporting

SMEs, improving their access to financial and credit resources and extending the network of regional business-incubators. They stress the potential contribution of analysis which adopts a local, sectoral and regional systems of innovation approach to SME analysis, as this could provide helpful insights and enable sub-sectoral policy making and interventions with a greater leverage than would otherwise be possible.

South Africa's policy regarding clustering is also pertinent, focusing as it does on two levels, the sectoral and the spatial to overcome the various inequality legacies of apartheid through the redistribution of economic activities and infrastructure. At the spatial level initiatives are linked to regional systems of innovation, while the sectoral focus deals with improving the performance and competitiveness of specific sectors. However, here SMMEs are seen as beneficiaries of multiple effects of clustering rather than primary beneficiaries of the clustering policy. This is in contrast to the LPS perspective that places SMEs at the heart of policy initiatives.

Keshab Das and K. J. Joseph also highlight the role of small firms in regional long-term competitiveness and as important agents to help build locally rooted and diversified industrial capabilities. In India, as in other BRICS countries, the distribution of industries is highly skewed regionally and this imbalance has been accentuated with globalisation. In their words: 'as investment decisions got governed by the market test of profitability rather than social objectives even in the small-scale sector, their operations got confined to the developed regions' (Chapter 4, this volume). As a result, most of the poorer states in India have fared badly since the opening up of the economy. Their analysis emphasises the importance of strengthening regional innovation systems and the interaction between various agents to facilitate the growth of industries.

In India, policy initiatives to strengthen clusters are being implemented by a diverse set of agencies, including central government ministries, state governments, international agencies, and other specialised institutions with diverse agenda and support instruments. The authors of the chapter on India draw attention to the fact that diverse sets of actors are involved in policy making and that the limited interaction and coordination between them may lead to duplication of efforts and other inefficiencies. In addition, there appears to be limited understanding of the need for a conceptual framework to consider

policies that link innovation, the regional or spatial dimension and SME development.

The chapters on Brazil, South Africa and India strongly emphasise the importance of policies that focus on the local or territorial dimension for the emergence of a vibrant system of innovation and production. They draw attention to the dangers of 'invisible exclusion' and of policies that favour the 'winners' or the more structured SMEs, and suggest that partnerships are essential to work out collective solutions and develop policies that are articulated with local realities.

### *Technological and science parks, and business incubators*

The promotion of technology and science parks gained momentum in the 1990s and there is a shared understanding of the importance of industrial, technological and science parks, and business incubators to enhance the innovation capability of SMEs as they provide critical technical, logistical and operational support for these businesses. Cheng and Gao summarise the main contributions of incubators to SMEs, observing that they promote overall learning and network effects through system of innovation synergies; help to reduce start-ups costs and provide assistance to obtain financial resources, particularly helping to reduce investment risk as investors can use incubator-generated information to make more accurate investment decisions; and finally, they enable cultivation of the innovation and entrepreneurial spirit, particularly how to take risks and overcome difficulties.

As Ndabeni points out, the more advanced parks and incubators will provide a critical platform for the implementation of new business ideas. Ideally industrial and science parks will bring together the firms producing final goods and their suppliers and contractors, and it is important that they possess adequate infrastructure, real estate, trained managers, and preferably trained staff to support start-up entrepreneurs.

Russian policy making has a particularly strong and positive focus on the linkages between universities, higher-education institutes and support to SMEs, with a relatively broad system of industrial parks (about 85 throughout the country), business incubators and Technological Innovation Centres (around 40 nationwide). It is

interesting that many of these industrial parks were created on the basis of state research centres, in academic towns, science towns and formerly ‘closed’ settlements. There has been consistent and evolving legislation to support these initiatives.

China’s policies for ‘high-tech zones’ emphasise innovation, enterprises and institutions. Their achievements in the promotion of high-tech industrialisation, institutional innovation, transformation of production and optimisation of the economic structure, attraction of the talents and provision of entrepreneurial environment best illustrate what Cheng and Gao mean when discussing ‘the road of high-tech industrialisation with Chinese characteristics’ (see Chapter 5).

However, not all is rosy in the ‘road to hi-tech industrialisation’ as shown by Das and Joseph in their discussion of the impacts of market liberalisation and the ‘small-scale led growth’ strategy adopted in India (see Chapter 4). The strategy — which was in tune with the objectives of regional dispersal of economic activities, utilisation of local skills, materials and capital, broadening of entrepreneurial base — reserved production for SMEs in a number of high-tech industries. However, since the opening of the economy in 1991, policies have favoured those few units in certain sub-sectors that have a global market presence and have left out massive numbers of smaller units where the average capital investment is less and also face low global market demand for their products.

Even for those SME that have ‘successfully’ integrated into global value chains or global production networks, there are serious issues regarding their participation that must be faced. All too frequently anchor or leading firms engage in what has been termed ‘rent-poor’ activities, whereby, typically, labour-intensive and low value-adding tasks are subcontracted to SMEs in poorer countries, particularly in modern, labour-intensive sub-sectors. Opportunities to participate in non-labour or high-tech stages are practically non-existent in highly asymmetrical business ‘partnerships’. These are essentially exploitative business relationships, where the participating enterprises mostly do not have complete information regarding production processes and where it is almost impossible to achieve functional upgrading. The authors argue that in terms of knowledge spillover, technological capacity-building and moving up in value chains, SMEs have gained precious little.

Most of the chapters in this book suggest that the collaborative efforts between the government, research institutions, universities,



and firms are encouraging overall. The proliferation of Science and Technology (S&T) parks and business incubators in BRICS is witness to the relatively successful policy efforts aimed at small, high-tech firms and the recognised importance of knowledge sharing and technology transfer between universities and SMMEs.

There remains a major lesson to learn from the Chinese strategy of the state playing a vital role in creating a dynamic business environment (including building physical and economic infrastructure) for networking between manufacturers and traders who are otherwise disadvantaged by distance and limited local market. Likewise, there are important policy lessons to be gained from collective approaches that seek to incorporate the many 'invisible' small firms as an integral component of national development strategies.

### *Manufacturing growth poles*

The chapters on China and Russia are the ones that best explore the various dimensions of their manufacturing clusters as they impact on SME innovation and strategies for sustainable economic growth. The chapter on China provides robust data on the economic and development characteristics of the Pearl River Delta and Yangtze River Delta, the 'double triangle' or 'the world's factory', as the two most dynamic production bases in the world are called. The analysis highlights the pattern of interaction between industrialisation, urbanisation, information, and internationalisation, stressing the important aggregation effects and the industrial chains between major cities in the regions.

This glossy picture is only one side of the coin. The other side, touched upon by Cheng and Gao and also highlighted by Das and Joseph in their analysis of the performance of the Indian small-scale sector in the electronic industry, is the potential trap for small firms caught in the operational, strategic and economic reality of global production value chains. Cheng and Gao observe that in China, although the proportion of technology and capital-intensive industries has increased, they are trapped at the low-end of the value chain because the design and production of high value-added segments, including core technologies, marketing, design, and management is centralised at headquarters and local firms can only engage in processing, assembly and other low-tech segments. Local independent innovation capability is consequently weak, profits are relatively thin and there is limited production driven by the local economy.

Small firms and their employees suffer many difficulties due to this production pattern, and difficulties that have been exacerbated with the 2009 financial crisis. From 2008, the price of electricity, water and coal have risen, but increases in production cost cannot be compensated for by raising product prices because most of these enterprises are extremely price sensitive, a large increase may lead to the loss of many customers. Insufficiency of funds has become an urgent problem. As in most BRICS nations, the cost of borrowing is unbearable to SMEs. Finally, with the increased educational levels being achieved by young rural workers, labour rights are becoming an important issue. The low-cost 'rural workers economy' that has fed the dynamism of the 'double triangle' area is not expected to subsist for long.

The authors conclude that the competitiveness of the 'world factory' region has been mainly built on the basis of low cost, reflected in price advantages and that the lack of innovation ability and technological innovation in the leading industrial clusters is the crucial bottleneck that China faces during its current development phase.

Sokolov and Rudnik provide an in-depth analysis of the major Russian industrial clusters, the wood-processing cluster in the Archangelsk timber products region, the agrifood cluster in Krasnodar District, the chemical cluster in Perm District, and clusters in the Tatarstan Republic and Tomsk Region (Chapter 3). In all of these, there is a relatively high participation of SMEs, and the analysis draws out the role and challenges to SMEs. The strategic role of government support and active industrial policies to promote SMEs is also mapped out in the study of Russian clusters.

The industrial clusters face difficulties that are peculiar to their own productive structures and the specific sectors and activities in which they are embedded, such as the environmental problems faced by the Archangelsk timber products cluster, including depletion of forests, lack of clear federal and regional forest and environment policy, and the growing costs of transporting timber from forests to consumers. However, they also share common challenges, not only with other clusters in Russia, but also broadening the base to consider other BRICS clusters. The most pressing shared challenges include lack of funding or difficulties in accessing existing credit lines, obsolete infrastructure, lack of skilled labour, inefficient tax administration, high administrative barriers, competition from manufacturers who use low-quality raw materials, and from 'shadow firms'. In addition,

many of the clusters suffer from insufficiently developed engineering components and machinery manufacture; they typically have a comparatively low share of processing industries, making half-finished products for export and using low-potential technologies. Perhaps the most important weakness pointed out by the authors is the ‘distinct separation of the enterprises from each other; there is a lack of interaction and links between them. Companies of the Tomsk ICT [Information and Communication Technologies] cluster practically don’t compete with each other, but they don’t have any motivation for networking and cooperation either’ (Chapter 3, this volume).

The analysis of the role of SMEs in the manufacturing growth poles or industrial clusters of China and Russia points to the importance of policies that seek to enhance innovative density and diversity. The role of a systems of innovation perspective, particularly one that seeks to strengthen cooperative practices among the network of local and other relevant actors, is particularly significant. This understanding is crucial to address the challenges of upgrading these clusters from labour-intensive manufacturing clusters to innovative industrial clusters, thus improving both the competitiveness of SMEs located in the clusters and their domestic and international competitive advantages.

## Policy Recommendations and Foundations for Future Research in the Area

The five case studies in this book showcase important advances in our understanding of the role of SMEs in the National Systems of Innovation of BRICS. As summarised in Table 1.3 and discussed in the previous sections, these countries have pursued specific strategies to enhance the growth of SMEs, their chances of survival and the support institutions that provide business, technological and other development services. Innovation policies have targeted the promotion of agglomerations of firms, incubators and science and technology parks.

There appears, however, to be a sharp distinction between policies that target high-tech innovative SMEs and those that aim to support the ‘survivalist SME economy’. As shown in the second column — ‘SME Innovation Policy’ — the focus of these policies is on innovative firms, and these are usually not articulated with broader SME development policies, including those related to finance, family businesses

**Table 1.3: SME Policies in BRICS**

	<i>SME Policies</i>	<i>SME Innovation Policy</i>	<i>Main Support Institution*</i>	<i>Innovation Finance</i>	<i>SME Gender Policies</i>
Brazil	✓	Local Productive Arrangements	SEBRAE	Innovation Funds	✓
Russia	✓	University and Industrial Parks, Innovation Centres, Industrial Growth Poles	Rosnauka	Innovation Funds	—
India	✓	Micro, Small and Medium Enterprises Development (MSMED) Act, 2006; Clusters	Ministry of MSME	—	—
China	✓	High-tech Zones, Incubators, S&T Parks, Industrial Growth Poles	Productivity Promotion Center	Innovation Funds	—
South Africa	✓	Spatial Development Initiatives (SDI), Clusters, Technology Stations	South Africa Small Enterprise Development Agency (SEDA)	Khula Enterprise Finance	✓

*Source:* Data compiled from information in individual country chapters in this book.

*Note:* \*In BRICS, SMEs are supported by a myriad of federal, state and local institutions. This column draws out the main institution responsible for technical, training and other non-financial support services.  
— no explicit policies in place.

and gender. With the exception of Brazil, which has sought to implement policies using an LPS approach, most SME policies and support mechanisms remain focused on single, high-tech firms.

Many public initiatives to promote micro, small and medium enterprises have been justified based on arguments considering the reduction of economic, regional and social disparities. However, despite significant investment in the institutional framework to foster SMEs, initiatives focusing on single firms have been in many cases inadequate, indiscriminate and uncoordinated and have suffered from superposition and lack of continuity. Most importantly, small firm promotion objectives have frequently collided with macroeconomic policy goals, budget constraints and, as illustrated in the case of India, with policy goals that seek primarily to enhance growth of SME output, capital intensity and their chances of participation in global production chains.

The heart of policies for SME and industrial development lies in the financial dimension, specifically as it relates to SME access to credit and the mechanisms for financing SME innovation. The overwhelming failure of the current funding paradigm, structured to meet the demands of larger firms, is discussed in each one of the country chapters, but a few strategies are presented in this section to deal with this challenge. There is a belief that innovation funds and venture capital may provide the 'magic bullet' to boost the innovation system. However, as argued convincingly in the NSI literature, these mechanisms depend on socioeconomic specificities that are not usually present in BRICS and reproducing them may have limited impacts and uncertain costs.

A more systemic and localised approach is needed. Particularly, the weak results so far in improving the participation of SMEs in the finance pie suggest that the design of new instruments requires a systematic effort to invert the logic of traditional resource offerings, created and offered in the belief that there exists a corresponding demand for these resources. A policy that prioritises small firms requires, in contrast, initiatives that strengthen the interaction between firms, financial and technological agents in order to strengthen various capabilities simultaneously.

An obvious point here is that policies have to be developed taking into account the specific requirement of the firms and contexts they are targeting, and not the other way round, that is, forcing reality to adapt to them. It is therefore necessary to modify the prevailing culture in

the environment where policies are formulated and implemented with a view to effectively changing the promotion and funding paradigm in order to tailor it to the SME profile. It is important to bear in mind that the attempt to transform small enterprises into one collective agent, capable of filling in the mould designed for large firms, is only one of the factors that justify the support given to local systems, clusters and other agglomerations. The advantages go well beyond so-called economies of scale considering the opportunity to promote other important synergies, including processes of interaction, co-operation, learning, and development of capabilities.

The largest challenge to successful policy implementation resides precisely in the collective treatment of agents. As shown in the Brazilian experience, creating and making available the capabilities required to understand and translate the demands of SME and local agents is essential to developing partnerships that are prepared to consider collective solutions to specific problems and the means to best exploit growth potential. These themes and issues make it necessary to establish governance systems that include the multiple social actors that are most strongly affected and that are usually excluded from such systems. New intervention mechanisms should be found and traditional ones improved, particularly through the improvement of the articulation between local, state-level and federal institutions. This task requires additional and unprecedented efforts, as well as a systemic view for the construction of new frameworks, which also comprise interrelated issues including taxation, regulation and legislation.

A better understanding of the role of SMEs in the NSI is critical to the overall transformation of the sector as well as an improved innovation policy environment. Because it works with the opportunities, diversity and specificities of different territories the LPS approach represents a powerful analytic and normative instrument to study and tackle regional imbalances and foster development of local SMEs.

The approach could also be usefully employed to study empirical and analytical issues that are not addressed in this book. Questions regarding innovation, development and strategies for environmental sustainability as well as implications of environmental policies adopted by other countries on SME competitiveness, for example, are hardly mentioned in the chapters of this book. International and domestic environmental legislation can represent a significant burden for SMEs and government support mechanisms may provide

essential information on technological solutions, funding possibilities and others. Considering the impact of the SME sectors in the BRICS economies on the environment and the pressing international demands for compliance to ever-increasing environmental standards, this is an area that merits greater research attention.

Studies will also need to explore to a much larger extent the co-operative practices between small firms and other actors that are important in their environment. This relates not only to conspicuous, formalised co-operation mechanisms that are usually traced in formal innovation studies but also the more hidden and subtle links that are ‘invisible’. Thus, it is important to use a broad definition of innovation to encompass the less structured cases with intense participation of SMEs and with high levels of informality. This approach may render visible a wider array of actors, regions and activities, thus justifying their inclusion in policy agendas.

The discussion offered by the different authors in this book represents an important contribution to studies of innovation, SME and development. We hope that the discussion can stimulate further development of conceptual frameworks and analytical perspectives capable of dealing with the realities, challenges and opportunities of BRICS development and enable the design of increasingly socially inclusive policy approaches.



## Note

1. The main focus of the study is on SME. However, given their significance, most country reports also include analysis on micro firms. In this Introduction the terms ‘SME’, ‘Micro Small and Medium Enterprises (MSMEs)’, ‘Small Medium and Micro Enterprises (SMMEs)’, and ‘Small Scale Industry’ or ‘Small Sector Businesses’ in the Indian case, are used.

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## 2

# Local Productive Systems and SME Development in Brazil

*Ana Arroio*

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The aim of this research is three-fold. First, to provide an overview of the main characteristics of micro, small and medium firms in the Brazilian national system of innovation as a basis to examine the Brazilian experience in the formulation and implementation of policies for these enterprises. A second goal is to bring to the forefront crucial issues in the discussion of industrial and technological policies for small firms, including the recent evolution and future trends of policies and instruments, their applicability and coordination, as well as a discussion of the macroeconomic, legal and regulatory environment. A final research objective is to draw out initiatives to promote innovation in Small and Medium Enterprises (SMEs) that address common bottlenecks in Brazil, Russia, India, China, and South Africa (BRICS) and that can contribute to policy design and implementation by these and other countries.

The study uses the national system of innovation concept in order to focus on the processes of interaction, co-operation, learning, and development of capabilities in micro and small firms. This approach highlights the importance of local and national specificities and the role of policies in general, and government policies in particular, to promote social and economic development. Innovation is characterised as an interactive learning process with multiple origins and the firm is considered as an organisation that is inserted in social, economic and political environments that reflect specific cultural and historical

trajectories. This approach stresses the localised nature of the generation, assimilation and diffusion of innovations. This is particularly relevant for micro and small enterprises that are, in many cases, important depositories of traditional local-based knowledge. The very nature of these firms enables them to have immediate and continuous linkages with local actors, knowledge, habits, and traditional practices.

One of the most promising tendencies of new policies for SME in Brazil from 2000 onwards is the collective treatment of small and medium firms in Local Productive Systems (LPS). This involves the design of policies that support joint activities, foster knowledge flows and mobilise local productive and innovative systems.

This research on the role of SME in the National Innovation System of Brazil is presented in six sections. The study begins with an overview of micro, small and medium firms in Brazil, establishing indicators concerning firm distribution by size, employment generation, amongst others, which highlight the social and economic contribution of SME. The third section provides an in-depth analysis of the role of SMEs in the high-tech sector. The results for Brazil confirm the findings of international comparative studies showing that the profile by enterprise size and the structure by sector are the main factors influencing the rate and the pattern of innovation. Most importantly, the data confirms that SMEs are different and that specific policies that take account of these differences must be put in place. The third section also further contextualises the role of SME in the National Innovation System of Brazil by examining science parks and incubators, venture capital in the country, and the spirit of entrepreneurship and culture for innovative SME.

Public policies based on the LPS approach are discussed in the fourth section. An overview of policies is provided and the analysis focuses on the opportunities that may be harnessed for the mobilisation of SMEs. It also provides important reminders concerning the relevance of understanding and adequately treating the challenges posed both to the development of these enterprises and the policies for their promotion. The fifth section draws out the discussion begun in the previous section, identifying and describing the main policy instruments and mechanisms implemented in Brazil, particularly from 2003.<sup>1</sup> The lessons from the Brazilian experience are drawn out in the concluding section.

## The Role of SME in the Brazilian Economy

### *Defining SME*

The adoption of criteria for the definition and classification of firm size is an important factor in the support to micro, small and medium firms. It enables firms that are classified within established limits to enjoy the benefits and incentives offered in legislation providing differential treatment to SME to meet specific policy goals such as employment and income generation, increasing innovation, reducing small business informality, increasing exports, and others.

The criteria adopted by the Brazilian Micro and Small Business Support Service (SEBRAE) — the main bridging organism to promote micro and small enterprise in the country — is number of employees, while the SME Statute (Law 9.841/1999) considers annual gross income. Current values used in Brazil are shown in Table 2.1.

**Table 2.1:** *Firm Size Classification*

<i>Firm Size</i>	<i>Annual Gross Income (US\$)</i>	<i>People Employed</i>
Micro	up to US\$ 188,000	Industry and Construction: 19 Commerce and Services: 9
Small	from US\$ 188,000 to US\$ 1,000,000	Industry and Construction: 20 to 99 Commerce or Services: 10 to 49
Medium	from US\$ 1,000,000 to US\$ 30,000,000	Industry and Construction: 100 to 499 Commerce or Services: 50 to 99

*Source:* BNDES (2009); SEBRAE (2005).

### *Basic statistics on SME in Brazil*

The number of micro and small firms in the country is significant. Official statistics suggest that in 2010 there were 3,319,742 formal establishments in Brazil and that they generated 20 per cent of Gross Domestic Product (GDP) (MTE 2010). As shown in Table 2.2, micro, small and medium businesses taken together represent 99 per cent of the total firms, contributing to 52.2 per cent of total formal employment in the country and to almost half (43 per cent) of total wages in the Brazilian economy.

Of the 5 million formal businesses in the country, 56 per cent are engaged in commerce-related activities, representing approximately

**Table 2.2:** *Distribution of Firms, Occupied Personnel, Wages and Other Remuneration According to Number of Personnel Employed, Brazil, 2010*

<i>Type of Firm</i>	<i>Number of Firms (%)</i>	<i>Personnel Employed (%)</i>	<i>Wages and other Remuneration (%)</i>
Micro	85.4	18.8	10
Small	12.1	21.6	12
Medium	1.4	12.2	21
Large	1.0	47.4	57

Source: IBGE (2010).

1.4 million units and employing 7 million people. Another 30 per cent businesses are in the service sector, with 1.9 million establishments employing 8 million. Industry comprises only 14 per cent of total small firms, including civil construction, with 630,000 units that employ 3.7 million people.

Between the years 1997 and 2000, the annual average firm birth and mortality rates were 19 per cent and 13 per cent respectively, and these rates increase inversely to the size of the firm. The turnover rate is particularly significant in firms with four or fewer personnel employed. It is also likely that the mortality rate has been underestimated. SEBRAE (2005) indicated that almost half of SME end operations close down within two years of their establishment and 60 per cent within four years. Financial difficulties are the main reason given for firm closure, accounting for almost 60 per cent of closures. Foremost is lack of capital (24 per cent), high taxes and other tributes (16 per cent). After firm closure, individuals remain autonomous in 29 per cent of the cases while 24 per cent find employment (*ibid.*).

The activities developed by a large majority of micro and small firms in the country are characterised by low technological complexity, with intense use of unqualified labour, developing activities in traditional industries — such as food and beverages, clothing and footwear — in which barriers to entry are low. As a result of the difficulties faced, many small firms limit their activities to local or regional markets where requirements regarding service and product quality and the levels of competition are considered to be smaller.

In the year 2009, a total of 19,272 firms exported products and services, arriving at a total value of US\$ 152.7 billion. Although micro and small firms represent a large proportion of exporting firms (12,230 in 2009, that is, 63.5 per cent), the total value exported is very

small — US\$ 1.9 billion in 2009, corresponding to 1.26 per cent of the total value of Brazilian exports (de Matos and Arroio 2011).

The most dynamic states in terms of exports are not concentrated in the wealthier south and south-east of the country, as might be expected, but rather in the rich forest land of the northern states. Thus, in the period 1998–2003 Roraima had a 475 per cent increase in exports, followed by Mato Grosso (383 per cent), the Federal District (328 per cent), and Rondônia (187 per cent). Exploitation of natural resources is the main source of advantage for these enterprises, leading to issues concerning sustainable economic development and potential environmental impacts.

For micro and small firms in developing countries this brings to the fore added challenges for their survival and growth. As observed by Johnson and Lundvall:

it is assumed that growth trajectories are only economically viable if they are at the same time, socially and environmentally sustainable . . . developing countries are thus faced with the challenge of designing ways to increase international competitiveness that are socially and ecologically sustainable (2000: 27).

The importance of SME in sustainable economic growth is emphasised by the fact that micro, small and medium firms are consistently the main contributors to the economy considering the number of firms and employment as shown in Table 2.2.

The other side of the coin is the large and increasing level of informality that characterises the Brazilian economy. Going beyond official statistics, which point to the existence of over 5 million firms officially established, there are an estimated 20 million small informal business units, involving around 60 million individuals, operating in Brazil (SEBRAE 2005). Half of these are informal urban business units with almost 14 million individuals involved.<sup>2</sup> These have proliferated mainly as a result of economic recession and the high unemployment rate in the country in the last decades.<sup>3</sup>

The main economic activities developed by informal urban businesses are commerce and repairs (33 per cent), civil construction (17 per cent), industrial transformation and extraction (16 per cent), followed by transports, warehousing and communications (8 per cent), collective, social and personal services (8 per cent), lodging and alimentary (7 per cent), and activities associated with real estate, rentals and services rendered to firms (6 per cent). As can be expected, almost 50 per cent of these enterprises are concentrated in the more industrially

developed south and south-east of the country, with São Paulo taking the lead (25 per cent), followed by Minas Gerais (10 per cent), Rio de Janeiro (8 per cent), and Rio Grande do Sul (7 per cent).

The economic crisis and outsourcing led to the increase of a wide array of urban micro businesses and was favourable to the incorporation of women, mainly as employers, from 19 per cent in 1993, to 26 per cent in 2001. Growth occurred particularly in the commerce and service sectors, and in activities traditionally associated with female roles (health, education, etc.).

The evidence confirms that the survival of a large part of the Brazilian population is dictated by the performance of small — formal and informal — businesses and that the survival and maintenance of their activities is one of the main difficulties faced by these firms. The limited availability of financial, human, technical, technological, and management resources and the weaker capability and bargaining power of small businesses when it comes to dealing with actors in their external environment, including suppliers, clients, labour market, development agencies and banks, are among the many obstacles that must be overcome. As a corollary to this tableau, it was only in the last decades of the 20th century that specific initiatives and policies to support small firms began to be implemented in Brazil, as discussed in the next section.

### *History of SME in Brazil*

The formulation and implementation of policies for the promotion of SME is a relatively recent experience in the context of Brazil's industrialisation process. During the 20th century, industrialisation was strongly based on state support for the development of the productive structure of large firms, both national and foreign. Initiatives in support of the universe of small businesses were a very small item on the government agenda. Consequently, despite the existence of a large number of SMEs, it was only in the last decades of the century that specific policies for their development were formulated.

Two important institutional and legal milestones stand out in the official process of recognising SME in the country. The first is the creation, in the beginning of the 1970s, of a centre to provide business assistance to SME, which was transformed in the beginning of the 1990s into the SEBRAE. This is the main organism for direct initiatives with micro and small producers and for the intermediation between these producers and the government instruments designed to

support them. The SEBRAE has 750 service ‘points of entry’ in the 27 units of the Brazilian Federation, a network of 4,433 employees and 9,223 external consultants and, in 2008, developed around 2,500 projects in over 2,000 municipalities that benefited 65,000 micro and small enterprises, including 170 clusters and 377 business incubators. The SEBRAE provides assistance to businesses, including access to technology services, and finance and training services. In São Paulo, SEBRAE provides specialised training for bank managers to improve their interactions with small and medium enterprise. Since 2004, 7,500 account managers have been trained. Support services are carried out through business centres, call centres, internet, television programmes, radio training programmes, workshops, the *Desafio SEBRAE* programme, entrepreneurship fairs and exhibitions, publications, videos, CDs and DVDs.

The second landmark refers to the establishment of specific legislation, in the 1990s, for the legal treatment of small businesses — the first was the ‘SIMPLES Law’ (Law 9.317, December 1996), followed by the SME Statute (Law 9.841, October 1999). This legislation confers deferential treatment to small enterprises in various fields, including administrative, taxation, social security and welfare, labour, credit, and entrepreneurial development, and enables tax exemptions, simplification of bureaucratic procedures, specific credit lines, participation in governmental acquisitions, foreign trade, public research and development (R&D) investments, and development of technological capabilities.

A revision of the SIMPLES Law was carried out by the federal government in 2008. The aim was to further simplify taxation, integration and co-operation between the various federal, state and municipal taxation offices and update the annual income limits that were established in 1996. Preferential treatment in government purchases, labour regulation and inspection, and improved access to the judiciary system were also contemplated. In addition, a judicial figure called the ‘SIMPLES consortium’ was created according to which small businesses can legally associate to gain economies of scale, competitiveness and access to markets without the risk of double taxation or incurring the mistrust of financial institutions (SEBRAE and CNI 2005). These changes in legislation correspond to official recognition of the relevance of SME as important agents in the development of the Brazilian economy, pointing to more adequate forms for their treatment and promotion. In 2009, around 400,000 firms

subscribed to the SIMPLES system, a significant increase from 2008 (200,000 firms), but still well below the number of formal SMEs in the country (5.37 million).

Although important legislation and the institutional structure to support SMEs was introduced in the 1990s, government activity in this period was mainly focused on macroeconomic structural adjustment policies, to the detriment of industrial and technological policies, and this strongly contributed to increase the difficulties in the implementation of initiatives to promote small firms. This is illustrated, for example, in the interest rates established in the last decade of the 20th century — one of the highest in the world, that is, around 20 per cent monthly interest. In such a scenario, entrepreneurs had difficulties in financing their businesses and many chose to close down their firms and invest (speculate) in the financial market. In addition to macroeconomic constraints there was weak articulation among the diverse initiatives and agencies in charge of policy execution, leading to fragmentation and dispersal (Lemos and Lastres 1999).

### *Gender and SME*

One of the most striking social and economic phenomena of the last 20 years is the increase in the economically active female population. In addition to their importance in labour markets, research confirms that a majority of women's businesses are micro or small enterprises. They are heavily involved in clothing manufacture, retail sales, spinning and weaving of textiles, livestock and food production. The increasing recognition of the role of gender equality, not only as a fundamental human right but also as essential to poverty reduction, improved living standards, and sustainable economic growth has led to the development of policies that seek to promote an enabling environment for entrepreneurship in SME. Gender inclusive designs increasingly target barriers to the growth of women's businesses such as the negative socio-cultural perception of 'women in business': their limited access to credit, the weak voice of women representatives in policy dialogue and the weak role of women entrepreneurs' in decision-making positions, among others (ADB 2009; UN 2005).

Women entrepreneurs play an increasingly important role in Brazilian SMEs. The growth of the service sector in the economy is due in part to the expansion of the rate of participation of women in the labour force. These concentrate almost 50 per cent of their



activities in the service sector and women control 30 per cent of service enterprises in the country. These activities are the privileged loci of female occupation, both as employees and employers (Melo and Sabbato 2003).

Despite the social and economic significance of women-led businesses, it is only very recently that public policy in Brazil has begun to be more attuned with this segment. The Special Secretariat of Policies for Women was established in 2003 to develop joint actions with ministries and in 2008 elaborated the Second National Policy Plan for Women, targeting economic autonomy and equal working conditions with social inclusion. The Plan does not have a specific remit as regards micro and small businesses and female entrepreneurs, but it does highlight the importance of households as a focal point of economic development, including the proliferation of households as repair shops, sales shops, health service providers, child-care service providers, and sewing/tailor shops, among other modes of production in the domestic sphere. The Plan includes specific actions to improve conditions for micro businesses in urban areas, particularly sanitation, electricity and security.

Other initiatives have been developed in association with SEBRAE to stimulate the creation of environments that are favourable to new businesses and the development of women's entrepreneurial capacity. The Business Woman Award, for example, is open to owners of micro and small businesses and members of small business cooperatives and associations. In 2004, the first year of the award, 700 success stories were sent into the competition; four years later, there were 2,000 inscriptions countrywide (SEBRAE 2008).

These initiatives are timid and fall short of meeting the pressing requirements and specific obstacles faced by business women. Women have more limited choices regarding the type of business they may operate, less access to financial and productive resources, work three times more than men in domestic activities, and have less opportunity to obtain the necessary qualifications and experience for the efficient development of micro business activities. It has been observed that they are less knowledgeable about hiring labour and are more dependent on family connections that often undertake non-remunerated work.<sup>4</sup> Other characteristics of micro business managed by women include their smaller size and added challenges of economic sustainability such as the fact that they are often constrained by non-remunerated family-based work schemes. These firms enjoy

very low profits and rent, possess low technological density and few fixed assets. These characteristics make it difficult to increase levels of accumulation based on traditional business plans. It is essential to create alternative forms of incentive, that is, to deliberately design public policy to help women face the obstacles encountered in the implementation and development of their businesses.

In this sense, it is important that microcredit programmes targeted at women borrowers be part of a broader development policy that includes the development of business and other capabilities, access to markets, information, and, whenever possible, insertion within production chains. For women, access to microcredit may contribute not only to the strengthening of economic but also social positions. Greater responsibility and decision-making capacity within their micro or small firm may enable them to establish stronger, improved relations with family members and the community. Effective control over credit may have a significant impact on women's status, transforming power relations and positions within society.

The access of women to credit programmes and support services requires specialised structures and specific conditions that take into account the particularities of small businesses owned by women. There is thus a double challenge in the adaptation of promotion instruments that must contemplate not only the stimulation of small businesses but also the insertion of excluded social and regional segments. Brazil has begun to take some steps in this sense and these are discussed in the following section.

### *Family businesses in SME*

Family businesses comprise a substantial part of Brazilian companies and have a significant role to play in the strength and dynamism of the economy. A study by SEBRAE (2005) concluded that almost half of the service and commerce SMEs in the country are family-owned, that is, firms where the work-force comprises only owners, partners or family members. For many people, family-owned SMEs represent the sole possibility of participating in productive processes and are essential for their very subsistence.

Keeping these firms open is a hard task. Out of 100 family businesses in Brazil, only 30 per cent reach the second generation and only 5 per cent are carried on to the third generation. It has been estimated

that around 70 per cent of these firms go out of business with the death of the founder and that their average life cycle is 24 years (SEBRAE 2005).

Courses offered by the SEBRAE to train managers and executives of family businesses, advisors for family businesses and to facilitate family business start-ups, transmission or take-over is the main instrument to support family-owned SME. These courses focus on issues such as management, professionalism, corporate governance, and dealing with succession in family businesses. Target audiences are business owners, heirs and consultants engaged in the administration and the provision of consultancy services to family businesses.

Family-owned firms have peculiarities that have only recently begun to be studied. The European Commission (EU) (2008), for example, has found that family businesses tend to focus on the firm's long-term sustainability rather than on realising short-term profits and generational changes in ownership and management and that in line with this, family businesses are on average older than non-family businesses. The EU report goes on to argue that when a firm is transferred to the next generation, it is not only financial assets that are passed on, but also social and cultural capital (value system and beliefs). This has led to particular emphasis being placed on the personal commitment and engagement of family members within the enterprise and, on the other hand, the firm's engagement in (local) social responsibility activities.

The overview of European countries also found that the capitalisation of family firms stems from family funds and bank loans, and that profits are often reinvested in the company and the owners are more willing to wait for a return on their investment (the so-called 'patient capital'). Finally, the report shows that growth trajectories of family businesses are quite stable and continuous in comparison to non-family ones (*ibid.*).

More knowledge about the characteristics and situation of family businesses in Brazil is needed to understand not only their specific contributions to social and economic development, but also in order to design policy instruments that are more effective in dealing with the specific challenges inherent in family businesses.

## SME and the Innovation System

This section looks at innovation statistics and SMEs, the role of university and government research institutes in creating spin-offs,

Brazilian science parks and incubators, and finally, the role of venture capital in the creation of innovative SME.

### *Role of SME in the high-tech sector*

The Industrial Survey of Technological Innovation (PINTEC), carried out by the Brazilian Institute of Geography and Statistics (IBGE) with the support of the Studies and Projects Finance Organization (FINEP), is the soundest statistical basis for the analysis of SME innovation efforts in Brazil.<sup>5</sup> Since 2000, four waves of the PINTEC have been carried out and the analysis that in the next section presents findings from all data-gathering cycles, focusing particularly on results for small and medium enterprises.

### *Overview*

The relative differences in the macroeconomic context, considering the periods in which the PINTEC was carried out, had a strong impact on the innovation capacity of firms. The influence of different economic contexts on the decision of adopting innovative policies is understood particularly when the first and the second PINTEC are compared. The first data-gathering cycle presented a much more favourable scenario: in 2000 Brazilian GDP grew by 4.4 per cent and industry by 4.8 per cent. These were the highest annual growth rates since the period 1993–94. In contrast, in 2003, industry remained practically stable, with 0.1 per cent growth while GDP increased only by 0.5 per cent.

In the period 1998–2000 a relatively favourable economic environment stimulated the development of more expensive technological innovation projects and the establishment of partnerships to develop new products. This is in sharp contrast to the period 2001–03 when in order to deal with a comparatively adverse scenario firms were more cautious in their strategy choices. Overall, they invested in cheaper and less risky projects and used their own resources to develop product innovations within the company. From 2003, Brazil experienced almost continued economic growth with a robust expansion of industrial activity. The results of innovation efforts shown in Table 2.3 confirm this relatively stable growth and are closely related to a more positive economic scenario and also to the innovation and industrial policies established by the federal government from 2004.

**Table 2.3: Firms that Implemented Innovations by Size in Brazil, 1998–2003 — Innovation Rate (per cent)<sup>6</sup>**

<i>Employees</i>	<i>1998–2000</i>	<i>2001–03</i>	<i>2003–05</i>	<i>2006–08</i>				
	<i>Innovation Rate (%)</i>	<i>Innovation Rate (%)</i>	<i>Innovation Rate (%)</i>	<i>Innovation Rate (%)</i>	<i>Product – New to Firm (%)</i>	<i>Product – New to Market (%)</i>	<i>Process – New to Firm (%)</i>	<i>Process – New to Market (%)</i>
Total	31.5	33.3	34.4	38.6	20.6	4.4	30.8	2.4
10 to 29	25.3	30.4	29.8	37.4	20.2	3.6	29.6	2.0
30 to 99	37.6	34.5	35.8	37.6	19.6	4.1	30.7	1.9
100 to 499	51.4	44.9	58.3	45.1	23.1	7.5	35.2	3.7
500 and more	75.6	72.6	79.6	71.7	40.6	27.1	56.0	18.8

*Source:* PINTEC, 2000, 2003, 2005, 2008 in de Matos and Arroio (2011).

Considering the full decade since the first PINTEC study, the change that stands out the most is the almost continuous expansion in the percentage of micro and small firms that innovate, particularly those employing 10 to 29 people. These firms developed mainly process (29.6 per cent) and product (20.2 per cent) innovations for the firm, involving less risk and costs. Considering that SME comprise 79.9 per cent of the firms represented in PINTEC, their innovation efforts can have a significant impact on aggregate innovation indicators. That is, the expansion in the aggregate innovation rate of the Brazilian economy can be largely explained by SME innovation efforts.

However, regardless of the positive evolution of SME innovation activities, size-class effects remain important: firms with 500 or more employees register much higher product and process innovation rates than smaller firms. Comparative studies of innovative performance of firms from various countries show that the size of the firm and the industrial sector are the main factors that condition innovation rates, and, more precisely, the existing industrial innovation patterns in each country (EU 2004).

### *Innovation activities and expenditure*

Considering the expenditure on innovative activities by micro and small firms (10 to 99 employees), a majority was on the acquisition of machinery and equipments, over 60 per cent in all PINTEC cycles, followed by industrial projects and other technical preparations and internal R&D activities, with very slight variations across time periods. The introduction of technological innovations in the market, and the acquisition of other external knowledge, R&D and training were also considered in PINTEC, but spending on these activities is small and indicates that access to technological knowledge is mainly through the incorporation of machinery and equipment. This investment is directly related to process innovations that are new to the firm and that often represent a pre-condition for the development of product innovations.

In a comparison of periods covered by PINTEC, the data shows that expenditure on in-company R&D activities decreased for all firm irrespective of size. This retraction occurred mainly in in-company R&D activities of an occasional nature, that is, non-continuous activities; these allow greater flexibility for cost cutting. However, size-class

effects do matter: in 2000, 72 per cent firms with 30 to 49 employees invested in occasional in-company R&D activities, which decreased to 66 per cent in 2003. As the size of the firm increases expenditure on internal occasional R&D activities decreases; only 20 per cent of large firms invested in occasional in-company R&D activities in 2000, and this proportion fell to 15 per cent in 2003. This does not hold for continuous in-company R&D activities. Expenditure increases as firm size increases: 85 per cent of firms with 500 or more employees invested in continuous in-company R&D activities, while the figure was only 35 per cent for firms with 30 to 49 employees.

As can be expected, this data suggests that resources to develop in-house R&D activities in small firms are scarce, and this points to the importance of linkages and articulation with external sources for the development of innovation activities therein.

### *Public support for innovation*

The main beneficiaries of public financial support for innovation in Brazil are large firms. However, a comparison of PINTEC results shows a small, gradual overall increase in the number of firms that received support, from 17 per cent in the period 1998–2000 to 19 per cent in 2001–03 and 22.3 per cent in 2008, corresponding to 9,200 firms that received some form of incentive to innovate. However, in the period 2006–08, only 22 per cent of firms with 10 to 99 employees received support in the form of financing, fiscal incentives, endowments, scholarships, etc. There is ample room to improve policies and increase financing in this area.

The programme most used by innovative companies was the financing of machinery and equipment offered by the major official banks. However, 24 per cent of large firms used these resources while the figure was only 13 per cent for small firms. As regards R&D financing, only 0.7 per cent of small innovators benefited from public resources, whereas 6 per cent of large firms received support. Similarly, financing for research projects has benefited mainly large firms which received almost six times more public financing than small ones.

### *Innovation protection methods*

Trademarks were the most frequently used formal method of protection by Brazilian firms, used by 21 per cent of small firms and

42 per cent of larger enterprises. The next most common method used both by small and large firms was a strategic protection method — industrial secrecy, which may include agreements between suppliers and clients, proprietary control of innovation procedures, and other forms. Patent applications were used by 6 per cent of small and 31 per cent of larger firms. The low proportion of SMEs applying for patents is due to cost factors; these firms may not be prepared to invest the time and the resources required. In addition, small firms predominate in traditional sectors where patents do not confer effective protection to new products.

### *Barriers to innovation*

The main obstacles pointed out by firms were high innovation costs, excessive perceived economic risks associated with innovation, and scarcity of financing sources. These results are similar to those found in the Community Innovation Survey, 2004–2006 (Forfás 2008) — that is, both the European study and the Brazilian survey showed that economic factors were perceived as the main barrier to innovation, regardless of the size of the firm.

However, there are major differences between the findings of these surveys. In Brazil, various other barriers to innovation were considered very high, presenting a double-digit response rate, including lack of qualified personnel (47 per cent), lack of information on technology (36 per cent) and markets (30 per cent), and inability to adjust to regulations or standards (33 per cent). Lack of interaction with other firms or institutions (30 per cent) and inadequacy of external technical services (26 per cent) are other weak spots in the existing system that supports innovation efforts. The failure of an innovation project may jeopardise the very survival of a small enterprise; thus, the development and implementation of adequate support to innovation efforts is a crucial issue that may represent a case of life or death for a small firm.

### *Science parks and incubators*

Brazil's first experience with science parks dates from 1984 when the National Council for Scientific and Technological Development (CNPq) established 12 such parks in co-operation with state and municipal governments and universities. However, a continuing



economic crisis led to the demise of the programme, although some parks continued with local support. The university incubator movement continued to grow even without strong government support and by 2007 there were 65 science parks in the country, including 13 initiatives during implementation and another 11 in preliminary planning stages. Over 520 technology-based enterprises are installed in these parks generating 26,233 jobs, positions that are held mostly by professionals with undergraduate- and graduate-level qualifications. These parks generate a total revenue of approximately US\$ 74 million and in 2007 they received public funds of US\$ 22 million, half of which is from the federal government. All science parks in Brazil have an incubation programme and have established clear goals to attract new firms and investments, and to promote the creation and consolidation of SMEs, technology licensing and the development of technology-related areas and products (Anprotec 2008).

The main technologies developed are information and communication ones; this is the leading sector with over 50 per cent of projects. Other sectors include energy, biotechnologies, electronics and instrumentation, services, environment, and agribusiness. State-owned enterprises, particularly Petrobras, play an important role in the promotion and consolidation of science parks in the country.

In addition to the science parks, there were 237 incubators in Brazil in 2003, of which 107 are incubators of technology-based companies, 56 for companies from traditional economic sectors, 40 mixed — for both technology-based and traditional businesses — 29 for cooperatives, and five that are managed by private companies. Although mostly concentrated in the south and south-east they are present in all regions of Brazil. More recent data suggests that by 2007 there were 400 incubators comprising over 6,000 innovative small firms (*ibid.*).

### *The role of venture capital*

As in many countries, the venture capital market in Brazil is the result of state-supported operations rather than a spin-off of the private sector's wealth and risk-taking. However, the country has a very sophisticated financial system and has built solid capital markets, strongly regulated by independent entities. Private equity and venture capital funds are regulated by the Brazilian Securities and Exchange Commission. Two institutions are at the forefront of venture capital promotion: the Brazilian Development Bank (BNDES) and the FINEP.

The BNDES was the precursor to the formation of funds, having developed support programmes to structure investment funds since 1995. Its Investment Funds Programme, BNDESPAR, selects funds in private equity shares and venture capital shares, with the purpose of expanding the support to capitalisation of business corporations of different sizes, disseminating good governance practices and the culture of risk capital in Brazil, and also leveraging private investors' support to projects in the sectors prioritised by the BNDES System. The BNDESPAR has approved over 17 funds through its venture capital arm.

As regards SME, the CRIATEC Programme was created in 2007 with a budget of US\$ 40 million for participation in investment funds with the aim of capitalising micro and small innovative companies with seed capital and providing them with adequate management support. Eligible for support are companies with net invoicing of up to US\$ 3 million in the year immediately before the fund capitalisation. CRIATEC's focus is on investment in innovative companies operating in the Information Technology (IT), biotechnology, new materials, nanotechnology, agribusiness, and other sectors. The fund has a legal requirement that a minimum of 25 per cent of the equity be invested in companies with invoicing of up to US\$ 7 million and that a maximum of 25 per cent be invested in companies with invoicing between US\$ 2 million and US\$ 3 million. It is expected that 60 companies will be supported over the next four years (Coutinho 2009).

At FINEP, the INOVAR Project was launched in 2000 to promote the creation of a venture capital system for the development of small- and medium-size technology based companies and to mitigate the uncertainty and risks of investing in new businesses. Working in partnership with various institutions including the Inter-American Development Bank (IDB), the SEBRAE, Petrobras Social Security Foundation (PETROS), CNPq, the Society for Promotion of Brazilian Software Excellence (SOFTEX) and the São Paulo stock exchange (BOVESPA), the FINEP seeks to strengthen the venture capital investment culture in incipient and emerging technology-based companies. By 2008, the FINEP had launched seven public invitations for venture capital fund capitalisation, with an investment focus on incipient and emerging technology-based companies. From 2010 to 2012, it has approved 26 venture capital funds, leveraging approximately US\$ 45 million, with investment in over 80 innovative firms (FINEP n.d.).

Although venture capital financing may offer opportunities for small firms to avoid the collateral or high interest rates that prevail in the regular financial trade, not all fields of activity are consistent with venture capital practices. Most importantly it is essential to keep in mind Chesnais and Sauviat's observations (2003) that the venture capital industry requires a specific combination of socioeconomic mechanisms and institutions before it can experience a significant growth. These include both a very particular configuration of labour relations and large quantities of money seeking to invest. Furthermore, the venture capital market is so largely dependent on a set of systemic relationships that are deeply imbedded in US economy and society that international diffusion will at best be slow and difficult. For developing countries like Brazil, other instruments to finance innovation in SME are required and these are examined in the fifth section.

## Public Policy to Promote SME Innovation

Reflecting an international move towards recognising the need to develop a systemic approach to the promotion of innovation and competitiveness of firms and individual agents policies in Brazil have focused more clearly on clusters of firms. In particular, policies to promote technological and industrial development increasingly recognise that the agglomeration of enterprises and the best use of the collective advantages generated by their interactions, and also by their interactions with the surrounding environment, can effectively contribute to the strengthening of their chances of survival and growth and represent an effective source for sustainable competitive advantages.

In line with this perspective, an interdisciplinary research network called Research Network on Local Productive and Innovative Systems (RedeSist) was set up at the Economics Institute of the Federal University of Rio de Janeiro in 1997. The establishment of RedeSist was an important milestone in the development of the conceptual basis and methodology for the analysis of policies to promote innovation in SME. This approach, developed by RedeSist and known as the Local Productive and Innovative System framework, has been successfully used in more than 120 empirical studies in different parts of Brazil in the areas of manufacturing, agriculture, services, and creative and cultural industries.<sup>7</sup> 'LPS' refers to any productive agglomeration involving economic, political and social agents localised in the same area, performing related economic activities and presenting consistent

articulation, interaction, co-operation, and learning processes. It includes not only firms (producers of final goods and services, suppliers of inputs and equipment, service providers, etc.) and their different forms of representation and association, but also other public and private institutions and organisations specialised in educating and training human resources, R&D, engineering, promotion, financing, etc. The basic premise is that wherever there is production of any given good or service there will be a surrounding system, with the involvement of agents and activities related to the commercialisation of products and services. These arrangements will vary from the most rudimentary to more complex and articulated systems (Lastres, Arroio et al. 2003).

The LPS approach is particularly useful for understanding local processes of learning and capability accumulation. It represents a practical unit of analysis and investigation that goes well beyond traditional views based on individual organisations (enterprise) or economic sectors, comprising both the territorial dimension and economic activities. This perspective brings to the fore the heterogeneous agents (enterprise and R&D organisations, education, training, financial agents, etc.) and related activities that are necessarily comprised in any productive system. As a result, it enables understanding of the conditions under which local learning, the accumulation of productive and innovation capabilities, and effective use of these capacities occur. For developing countries this is absolutely vital.

The successful implementation of policies to promote effective learning and innovation in LPS is a complex policy objective. Analysts point to the lack of adequate statistical information and to the crystallisation of policy frameworks comprising inadequate initiatives, in addition to the superposition and lack of co-ordination and continuity of initiatives, as important contributing factors to the difficulties of policy implementation (Lastres, Arroio et al. 2003; OECD 2004; SEBRAE 2005). In many cases, mechanisms and instruments to promote innovation, particularly financing, were structured to meet the demands of larger firms, which obviously do not produce the required effect when dealing with small firms (Mytelka and Farinelli 2003).

An obvious point here is that policies have to be developed taking into account the specific requirement of the firms and contexts they are targeting and not the other way round, that is, forcing reality to adapt to them. It is therefore necessary to modify the prevailing culture in the environment where policies are formulated and operationalised, with a view to effectively changing the promotion and funding paradigm

in order to tailor it to the LPS profile. This will probably bring about important transformations: on the one hand, by revealing and making it possible to evaluate potential mismatches between the new policies designed specifically for small firms and their demands, an analysis that is essential for the improvement of such policies. On the other hand, it will create conditions to end all arguments that seek to blame (and punish) SMEs for not presenting conditions that are propitious for the use of promotion policies and instruments designed for other businesses. After all, it is not the particularities of these firms that are inadequate, but rather the initiatives and instruments that are unable to meet their development requirements.

In sum, the main conclusions to be drawn from this analysis point to the opportunities that may be harnessed by policies for the mobilisation of LPS, and the relevance of understanding and adequately treating the challenges posed both to the development of these enterprises and to the policies for their promotion. The main challenges include problems arising from the fact that LPS are too numerous, heterogeneous, dispersed, and small and also the inadequacies, superposition, lack of co-ordination, and discontinuity of policy initiatives.

This brings the argument back to the discussion about the advantages of focusing on the group of agents that interact to produce any good or service; and of implementing policies that stimulate these agents and their surrounding social and economic environment. The advantages of turning small firms into one large collective actor go beyond economies of scale and include the development of robust opportunities to benefit from other important synergies. Studies carried out by RedeSist have inspired government initiatives focused on LPS, and this has led to new forms of support and specific legislation to promote innovation in LPS.

From 2003 there was a strengthening of initiatives guided by the conceptual framework and methodology focusing on the collective treatment of groups of businesses. The LPS concept was embedded in the Federal Government Pluri-annual Plans (PPAs) for the periods 2004–07 and 2008–11. The PPA defines, by regions, the directives, objectives and goals of the federal public administration for capital expenses; it is the central directive governing the actions of federal ministries, agencies and development banks, as well as many non-governmental and other bridging organisations.

An Inter-Ministerial Group on LPS was established in 2004 comprising 33 organisations including 12 ministries; government

agencies; five federal development banks, with national and regional scopes; one private banking institution; and bridging organisations, such as SEBRAE and the National Confederation of Industries. The main guideline is to articulate, integrate and co-ordinate government actions, contributing to the establishment of discussions and agreements between the federal government, the local states and municipalities, improving their efficiency and maintaining the autonomy of actions carried out by each organisation.

### *Barriers and opportunities for SME in Brazil*

This section examines policies for financing SMEs and also innovation financing for technology-based SME. It draws out the challenges of designing policies that take into account the specific requirement of small businesses and highlights funding instruments that have been designed to address this demand.

The section concludes with an examination of SME capability-building that focuses particularly on lessons gained from the experience in the implementation of the LPS approach rather than on policies tailored to individual firms or on instruments for the promotion of innovation in determined sectors.

### **SME Financing**

This section discusses four topics: (a) the Brazilian experience of financing small firms in the 1990s, (b) a brief discussion of the BNDES experience, (c) an examination of microcredit operators in the country, and (d) innovation financing for SME.

This overview of policies and instruments for SME financing is important as the Brazilian banking system has developed an interesting array of instruments to support SME. This experience, although by no means sufficient to meet all demand for financing, has interesting lessons for other developing countries seeking to promote these firms and particularly the collective treatment of firms.

### **Financing Small Firms: The Brazilian Experience in the 1990s**

In the 1990s many credit lines traditionally accessible in the portfolio of public banks and development agencies for financing production, floating capital, equipment, exports and technological capability-building, were available, at least in thesis, for use by small firms.

However, two important obstacles contributed to the relative failure of the financing programmes directed towards small enterprise. The first is the traditional and immense difficulties felt by small firms in adapting to existing rules, considering that the structure of credit instruments was conceived to meet the requirements of large firms.

A second obstacle was the clear conflict between the commercial and political logic inherent in the activities developed by public banks. Even though it is increasingly being demanded that development banks invest public resources to finance SME, these banks, due to specific traits and the context in which they are embedded, have many difficulties in dealing with small firms (for details, see Mytelka and Farinelli 2003).

An important example is the BNDES that has traditionally invested in the financing of projects with major economic impacts. Although the bank has not traditionally prioritised the development of credit lines for small firms, since the 1960s it has made available specific programmes for these businesses and accredited a network of financial agents that are enabled to invest BNDES resources in small firms. In the 1990s new credit lines were implemented to meet SME demand in a more customised manner. However, the results were not significant (Lastres, Arroio et al. 2003). The availability of more resources and new credit lines was not enough to ensure expanded use by small firms, mainly due to the model for the operationalisation of credits and a clear preference for larger businesses expressed by financial agents when dealing with credit lines.

Other federal banks were also dealing in credit lines for SME, focusing on regional and local development and the intensification of the promotion of small firms, particularly in less favoured regions. In addition to the traditional credit lines oriented towards small, formal and informal producers, microcredit and income generation programmes were implemented and these were specifically oriented towards small, informal producers operating within a family structure. Nonetheless, SMEs still had immense difficulties in complying with the diverse pre-requisites for their access to credit schemes, including the many bureaucratic phases that were necessary to process the applications, the guarantees required and the very high interest rates. Furthermore, the development banks faced many difficulties in adapting operational processes to meet the particularities of SMEs as the main operational logic had traditionally focused on loans for the financing of large individual enterprise.

This could be illustrated by difficulties arising from the criteria used for the conformity of businesses for official credit guideline purposes. For instance, the criteria used by some development banks for determining credit limit were often based on an evaluation of firm invoices. As there were insufficient mechanisms and instruments for dealing satisfactorily with SMEs, the value of firm billings was frequently artificially increased. This allowed the banks to comply with annual pre-established targets, and extend the universe of beneficiaries, and therefore disbursement of resources for SME.

To sum up, amongst the many reasons for the inadequacy of initiatives implemented in Brazil in the 1990s, were the following: (a) difficulties in the convergence of macro- and microeconomic governmental policies; (b) the inadequacy of the instruments used to promote small firms, as these were mainly based on large firm requirements; and (c) the financial agents' lack of practice in dealing with small firms and collective activities.

From 2003 the collective treatment of SME and improved access to credit for micro and small firms became a policy priority, established in the PPA 2004–07. The main public and private banking institutions — BNDES, Banco do Brasil, Banco do Nordeste (BNB), Bradesco, and Caixa Econômica Federal — participate in the Working Group on LPS and have implemented specific credit lines to finance LPS. These institutions have increasingly recognised that the focus on the financing of small firms in LPS represents better opportunities and less risk.

### **Brazilian Development Bank (BNDES)**

The BNDES is Brazil's largest bank with a disbursement volume exceeding those of many multilateral bodies. The BNDES achieved a record performance in 2010, with disbursements amounting to US\$ 100.8 billion (BNDES 2011). From 2003, it has gradually widened the scope of its operations, adopting a more consistent and inclusive approach to the financing of SME development efforts. Consistent with this new focus, at the end of 2007 the BNDES created the Local Productive System Secretariat that responds directly to the Bank's Presidency with the mandate of developing initiatives focused on innovation and the reduction of regional disparities.

Disbursements to micro, small and medium enterprises reached approximately US\$ 9 billion in 2008, a 45 per cent growth as compared



to 2007. Micro and small companies alone accounted for a 51 per cent rise in disbursements and the number of operations reached 99,300, with a 43 per cent increase from that in 2007. SME operations are financed through accredited financial agents, who are responsible for the analysis of credit approval and guarantees. Small firms usually turn to institutions where they are already registered and/or have some type of banking relationship with.

The BNDES Card is an innovative instrument that is being increasingly adopted by SMEs. The card enables pre-approved, automatic credit to finance companies' productive investments, with a monthly interest rate of 1 per cent. Over 120,000 items can be purchased using the BNDES Card and these are supplied by the 18,000 suppliers certified by the BNDES. Items include machinery, transportation vehicles and components, computer products and software, industrial components, and construction equipment and materials. From 2009, an interesting innovation is that technological services, including design, product modelling, packaging, prototyping and scale-up, technological transfer and others, can be acquired using the BNDES card. In the first year of operation, 79 innovation service suppliers were certified and 62 innovation service financing operations carried out (BNDES 2009).

The spending limit per BNDES Card is around US\$ 500,000. All operations are carried out through the BNDES portal, from card request, simulated calculation of instalment values, to the acquisition of products, which can be financed in 12, 18, 24, or 36 monthly, fixed and equal instalments. Despite the 2009 financial crisis, by the end of the year, BNDES had disbursed US\$ 1.5 billion to card holders, an increase of 200 per cent from 2008. A total of 230,000 firms hold a BNDES card, out of which 97 per cent belong to small firms and 3 per cent are medium-size entrepreneurs.

### **Microcredit Operators**

In 1999 the Brazilian government established a microcredit policy in an attempt to expand access to financing for formal and informal micro entrepreneurs in the country. According to Law 9790/1999, non-profit institutions that can offer microcredit include non-governmental organisations (NGOs), civil society public interest organisations and micro entrepreneurship credit societies, all of which are regulated by the Central Bank. These institutions are not allowed to capitalise

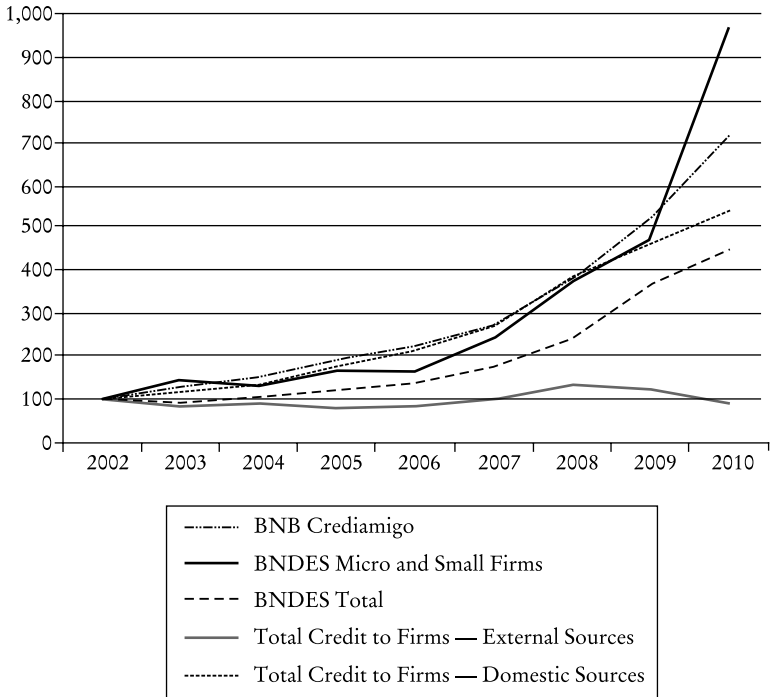
in the market but rather must depend on BNDES and municipal or state-level disbursements. Credit access measures were intensified in 2003 through Decree 3104/2003 which sought to stimulate the offer of banking services to lower income populations through banking inclusion (simplified bank accounts) and the stimulation of microcredit agencies and credit co-operatives. The principal attraction of microcredit for micro and small businesses is not only the lower interest rates that apply but also the very low amounts that can be borrowed, sometimes as low as US\$ 50, a sum that is impractical for commercial bank loans.

A study by the Central Bank (Soares and Sobrinho 2007) estimated that in 2006 there were around 220 microcredit operators working in the country, around 192 NGOs and civil society public interest organisations, 23 micro entrepreneurship credit societies (for-profit organisations) and five operators distributed among private banks, state banks and government promotion agencies. Around 71 per cent are in the south-east region of the country, 5 per cent in the north-east, 18 per cent in the south, and 6 per cent in the north and central regions. Important experiences include the BNB Crediamigo Program and Portosol established in the south (Porto Alegre) in 1995. Delinquency is low with repayment rates at around 4 per cent while the country average for commercial loans is around 20 per cent.

Figure 2.1, drawn from de Matos and Arroio (2011), presents the evolution of overall personal and firm credit, considering both internal and external financing sources, as well as specific data from the BNDES and the BNB. It shows that the global volume of credit from domestic sources as well as overall BNDES disbursements has followed a strong growth trajectory throughout the international crises from 2007, counterbalancing the significant decrease in the availability of resources in the international market. The data for the main microcredit programme (BNB Crediamigo) and BNDES disbursements to SMEs show an even more significant growth compared to increase in personal credit financing. This suggests that public policies discussed in this chapter, particularly the increase in available credit, the establishment of guarantee funds, the dissemination of the BNDES card, and tax reductions for SMEs have had a positive impact.

However, significant challenges to the expansion of microcredit remain, including the fact that communities are dispersed and that in these communities there is a lack of leadership with knowledge of

**Figure 2.1:** Available Credit in Brazil According to Financing Source – Current Values (2002 = 100)



Source: Adapted from de Matos and Arroio (2011).

microcredit access; paucity of resources, mainly in institutions that are in their early stages; low private capital participation; not enough qualified personnel in management activities; technical and institutional restrictions in existing organisations; difficulties in determining market size and accessing technical assistance and counselling (Soares and Sobrinho 2007).

### Innovation Financing for SME

The promotion of SME and LPS was established as a policy priority in the Industrial, Technological and Foreign Trade Policy (PITCE) announced officially in November 2003. The PITCE is aimed at raising the competitiveness of Brazilian industry, particularly through innovation. In addition to the more general propositions involving

all industrial sectors, the PITCE also targets the so-called strategic options for four selected sectors: software, semiconductors, pharmaceuticals and medicines, and capital goods.

In December 2004 important measures were announced including the approval of the Innovation Law that regulates and seeks to promote greater interaction between industry and research institutes. The new regulatory framework also provided for the creation of new institutions to coordinate and strengthen the link between government policies and business strategies, that is, the National Council of Industrial Development (CNDI) and the Brazilian Agency of Industrial Development (ABDI). The restructuring of the National Institute of Industrial Property (INPI) and the regulation of the Bio Safety Law further contribute to an environment that is more propitious for technology development by firms.

The PITCE was complemented with the Program for the Acceleration of Growth (PAC), launched by President Luiz Inácio Lula da Silva in 2008. The PAC calls for a total of US\$ 235 billion through 2010 to be invested in building and repairing highways, airports and ports nationwide; boosting energy development in the north; and providing housing, water and sewage systems. The programme also consists of measures to boost low interest rate credit, improve the investment environment and cut down taxes to stimulate some sectors.

The BNDES has also implemented new financing lines that focus on innovation, in line with the PITCE. Up to 2005, BNDES R&D lines were restricted to specific programmes, including the Support Program for the Development of the Pharmaceutical Productive Chain (PROFARMA) and the Program for the Development of the National Software and Related Services Industry (PROSOFT). In 2006, two new innovation credit lines were implemented — ‘Innovation RD&I’ and ‘Innovation Production’. These provided additional support to finance investments for the development of innovative products. These credit lines are not primarily focused on SMEs.

An important instrument tailored to strengthen financing for innovation in small firms, using the LPS approach, was the new policy focus given to the technological sector funds. These special funds, created at the end of the 1990s to finance Science and Technology (S&T) in the context of privatisation of infrastructure activities in Brazil, have their origin in incidental contributions based on revenues and/or

royalties from the exploitation of natural resources, goods, services, and other financial sources.<sup>8</sup> The Lula administration introduced an integrated management model of the sector funds to promote ‘Transversal Actions’, that is, strategic projects that use 50 per cent of the resources from the funds to promote LPS, incubators, science parks, industrial conformity assessment, and to finance other initiatives that promote innovation in industry. In 2006, a total of US\$ 20 million was made available for non-reimbursable financing for R&D in micro and small enterprises.

Finally, in terms of financial support for industrial innovation it is important to mention the ‘Law of Good’ — Law 11.196 — announced in June 2005, which established tax deductions for R&D spending, and import taxes for the acquisition of machines and equipment to be used in R&D, and also public subvention of up to 60 per cent of the wages of researchers directly employed in innovation activities in firms. Importantly, for innovation in small firms, large firms may, according to the ‘Law of Good’, deduct investments in small companies geared towards technological development from their own tax contribution. It is expected that this will strengthen technological collaborative efforts between companies of all sizes. But the results shown in PINTEC, 2008 are inconclusive: only 1 per cent of innovative firms have used tax deductions for innovation, that is, around 500 firms.

### *SME capability-building*

The main lessons that have been gained from the Brazilian experience with SME since the late 1990s are drawn out in this last section. The insights summarised below are based on Lemos et al. (2004) and focus particularly on lessons gained from the experience in the implementation of the LPS approach, rather than on policies tailored to individual firms or on instruments for the promotion of innovation in specific sectors.

### **Territorial Focus and Diversity**

The territory and its various dimensions, including macro-regional, sub-regional and local, in addition to the national dimension, are increasingly considered as a central reference points for any national development project.

The territorial focus is useful to tailor products and services according to diverse local realities and actors, facilitating not only access to credit and other forms of support, but also the concession of these resources and services by financial and other support agents, given local knowledge of potential clients. It also contributes to the diminution of risk, particularly breaches of contract in the case of access to credit, and propitiates governance systems based on the articulation of different actors, as well as of the various initiatives and policies. In order for credit and service offerings; and investment in equipment, technological and innovative capabilities, human resources, commercialisation, marketing, etc. to be truly effective, it is essential to obtain detailed knowledge of local needs, as well as about the environment in which the groups of firms are located, not only to identify the best means of serving them, but also to generate positive results for the social body of which they are a part.

Another relevant issue is territorial proximity among agents. In addition to the externalities that may be generated, interactions may strengthen important elements for sustained competitiveness and socioeconomic development, including the generation and dissemination of knowledge and innovations.

### **Local Productive Systems: Policy Mode versus Policy Fad**

In Brazil the term ‘LPS’ has diffused rapidly, substituting practically all analogous terminology used by policy makers. This standardisation of terminologies is perceived by policy agents as a significant contribution to co-ordination efforts and the articulation of initiatives, contributing to greater efficiency in policy implementation.

However, it is important to be attentive to the question of whether the adoption of the term ‘LPS’ effectively corresponds to a new policy mode. In order to effectively gain the benefits of this new form of policy intervention, it is essential that this adoption corresponds to a new conceptual approach and not to a mere change in terminology, or a passing fad.

It is also important to note that LPS do not comprise an end *per se* — in the sense, for example, of counting them and attempting to increase their total number — but rather represent a means to augment the effectiveness of policy initiatives. It is about re-orienting policy actions so that they may include collective agents and the promotion of learning processes, with a view to fostering innovation and the

sustainable competitiveness of national firms, particularly smaller firms, and local development.

On the other hand, it is encouraging to observe that in many of the initiatives examined, a new policy mode that includes elements which are considered essential for an effective LPS approach is clearly present, particularly a focus on the role of interaction, articulation and co-operation among different agents, and not only firms.

### **Integration and Co-ordination of Initiatives**

The integration and co-ordination of initiatives focusing on micro and small enterprises and LPS is a recurrent policy recommendation worldwide (Lastres, Arroio et al. 2003). The risks associated with the pulverisation and duplication of initiatives are significant, particularly considering the millions of SMEs that are geographically dispersed throughout the country.

Co-ordination is even more important at the local level, in order to avoid the overlapping of actions and also the generation of conflicts that may lead to the loss of interest by local actors, and even to the loss of credibility of government policy, initiatives and of the organisations that are responsible for their implementation. The successful co-ordination of actions at the local level depends on the diffusion and transparency of information among various agents, as well as their willingness to work together and overcome differences.

A related issue is the importance of local leadership for the aggregation of agents and policy initiatives. It has been observed that conflicts frequently arise within LPS making it more difficult, but at the same time essential, to establish leadership and local representation. These agents play an essential role, contributing to the cohesion, integration and co-ordination of initiatives within LPS.

### **Incorporating New Actors and New Issues**

The interest and participation of new institutional actors in initiatives to promote LPS has contributed to a broadening of the focus on Local Systems to comprise issues beyond competitiveness, innovation and sustainable economic development. New contributions have brought to the forefront the interconnection between issues such as social inclusion, employment and wage generation, diminution of social and economic disparities, and respect for regional differences, agrarian reform, local development, national integration and occupation of territorial frontiers.

These themes and issues make it necessary to establish LPS governance systems that include the multiple social actors that are most strongly affected and that are usually excluded from such systems, as is the case of informal segments, women entrepreneurs, peasants that do not have access to land, and labourers in general.

As expressed by Paulo Freire (1970), the solutions and answers must arise from discussions, differences of opinions, daily experiences, and general consensus. 'Subjects meet in cooperation in order to transform the world. Dialogue as essential communication must underlie any cooperation. This implies communion, or a deep capacity for understanding and communication. This is the basis for cooperation' (ibid.: 171). Policies based on the LPS approach may significantly contribute to strengthen local initiatives by helping micro and small enterprises to identify and express their needs. There are, however, immense difficulties in the inclusion of these segments within the scope of policy objectives and local governance systems.

### **Social Justice and Innovation: Is There a Contradiction?**

In the formulation and implementation of policies, the goal of promoting innovation is often stated as being opposed to the goals of local development and social inclusion. However, these objectives are not mutually exclusive, and, in addition the simultaneous consideration of these aspects tends to generate results that are more robust and have a longer-lasting effect.

This misconception often results from a very rigid definition of innovation, that is, that innovation must be an absolutely new product or service, originating from R&D efforts geared towards technologically complex or highly advanced processes. For developing countries such as Brazil, it is essential to clarify this issue. To consider innovation from the point of view of the economic, social or political agent that is implementing the innovation, focusing, for example, on the production or commercialisation of a product or service that is new to the agent implementing it, whether or not it is new to competitors, may contribute to the implementation of robust policies and the bypassing of the conflict between the promotion of innovation or local development. Any LPS, as well as the various actors that interact within the System, can be a locus of innovation and, therefore, represent appropriate subjects for policy initiatives that seek to promote innovation, from the most rudimentary to more complex ones (Lastres et al. 2005; Lemos et al. 2004).



The concept of LPS is based on the observation that innovation is not only a central element for the dynamics of economic growth, but also plays a crucial role in development policy. The adoption of policies that do not incorporate the systemic character of innovation may result in solutions that merely mitigate the effects of economic recession.

### **Focus on the Collectivity**

Analyses based on traditional economic theory do not go beyond the individual firm. The main academic argument for the adoption of an approach based on LPS resides exactly in the fact that these go beyond the frontiers of individual enterprise as units of analysis and intervention. From this point of view, it is essential to focus on agents, enterprise and other organisations as a body. The advantage of adopting this approach, and perhaps also the largest challenge to successful policy implementation, resides precisely in the collective treatment of agents, particularly when considering SME.

The risk, as mentioned previously, is to rhetorically incorporate the term 'LPS', that is, to work with Local Systems, but in reality keep to the traditional form of attention to individual firms and non-articulation with other agents. This risk is particularly relevant in the case of traditional financial intermediaries that work within LPS. In this case, other instruments could be used more effectively, such as cluster banks.

The success of development promotion policies for LPS hinges on the focus on the collectivity. No doubt it is more difficult to design and implement policies geared to a body of agents rather than individual firms. This task requires additional and unprecedented efforts, as well as a systemic view for the construction of new frameworks that also comprise inter-related issues including taxation, regulation and legislation.

To create and make available the capabilities required to listen to, understand and translate the demands of SME and local agents is essential to developing partnerships that are prepared to think out collective solutions to specific problems and the means to best exploit growth potential. This can make a world of difference to the promotion of LPS, generating truly significant results.

## Institutional Learning

The design of new frameworks and policy instruments is central to the adoption of the LPS approach; it is not enough to make available financial, technological and management resources. The lessons from policies implemented in Brazil in the 1990s and early 2000 show the inefficiency of initiatives aimed merely at the augmentation and facilitation of credit for micro and small entrepreneurs. Although significant resources were made available, bank rules to access these resources were mainly designed for large enterprises and these represented an effective barrier to their use by small firms.

Institutional learning aimed at the development of new policy modes is important in order to deal with (a) groups of enterprise and, more precisely, groups of actors that are frequently at odds and resistant to articulation and co-operation amongst themselves; (b) micro and small enterprises that often have great difficulty in identifying and expressing their needs; and (c) segments that are not usually considered by such policies, particularly those that are excluded from formal economic activities.

## National Strategy and Local Development

The Brazilian experience highlights the importance of the participation and intervention of local actors to provide bridges between federal public policies and specific territorial dynamics. The emphasis on local development is not about fragmenting the territory but rather making it a part of a national development project. In this sense, federal policies offer strategic signposts for the actions carried out by local actors. It is important to establish clear signals by means of a national development project agreed upon with society, and also through the establishment of closely articulated sector-focused policies, particularly an industrial policy that is congruent with macroeconomic and other policies.

In addition, the incorporation of this approach as an integral component of long-term development strategies is essential as a means to avoiding discontinuities that may lead to the loss of interest by local agents and to the invalidation of local initiatives.

It is important to reiterate that LPS do not comprise policy objectives *per se*, but rather are an instrument for social and economic development, providing the means to offer greater economic dynamism

to small enterprises, an environment that is favourable to innovation and the development of sustainable social and political governance systems (Lastres, Arroio et al. 2003).

## Policy Suggestions

Research on national systems of innovation draws out the localised and national nature of the generation, assimilation and diffusion of innovations and suggests that national and local conditions may lead to completely different paths, pointing to not only one solution and policy prescription but rather a myriad of alternatives. Nonetheless it is possible to draw several lessons from the Brazilian experience presented in this study that may contribute to policy design in Russia, India, China, and South Africa. One of the most important is the advantage of adopting an LPS approach to guide policy design that seeks to strengthen interactions among firms, promoting learning, innovative capabilities so as to increase SME competitiveness and their chances of economic survival in ways that are socially and ecologically sustainable. Results of the PINTEC innovation reports show that industrial and innovation policies implemented in the last decade in Brazil have contributed to more robust innovation rates in SMEs.

However, the largest challenge to successful policy implementation resides precisely in the collective treatment of agents. As shown in the Brazilian experience, to create and make available the capabilities required to listen to, understand and translate the demands of SMEs and local agents is essential to developing partnerships that are prepared to think out collective solutions to specific problems and the means to best exploit growth potential. This can make a world of difference to the promotion of LPS, generating truly significant results. These themes and issues make it necessary to establish governance systems that include the multiple social actors that are most strongly affected and usually excluded from such systems. New intervention mechanisms should be found and traditional mechanism improved, particularly through the improvement of the articulation between local, state-level and federal institutions. This task requires additional and unprecedented efforts, as well as requiring a systemic view for the construction of new frameworks, which also comprise interrelated issues including taxation, regulation and legislation.

It is important to improve policy evaluations enabling the proposition of more sophisticated and encompassing instruments. In this

sense, it is urgent to devise new and more powerful instruments to meet the pressing requirements and specific obstacles faced by businesswomen. It is only very recently that Brazilian policy making has begun to even consider the specificities of micro business managed by women and there are few studies looking specifically at the challenges to economic sustainability faced by this universe of SMEs. Likewise, the peculiarities of family businesses and of the role of these within LPS have not been addressed. Studies suggest that these firms provide strong social and economic contributions. However, they are fragile: 70 per cent go out of business with the death of the founder. A larger effort should be undertaken to understand the specific challenges inherent to family businesses and to design policy instruments that address these more effectively.

There is a need for more case studies of LPS to draw out the specificities that are crucial to guide policy making. For example, it is only recently that research by RedeSist has begun to look at arrangements centred on creativity and culture, such as tourism, festivals, arts, and entertainment (Cassiolato et al. 2008). According to Cassiolato et al. (*ibid.*: 45), these arrangements suffer from what has been termed a triple invisibility, related to their intangible and informal nature in addition to their novel character. There is an absence of theoretical, empirical and analytical instruments for the study of the contribution of these arrangements in national innovation systems.

As regards innovation policies, and particularly financing of SME innovation activities, this study has discussed various instruments and programmes, including the BNDES card and the new focus of commercial banks targeting LPSs. These are important instruments towards increasing access to credit for SMEs and may help to cushion the impacts of international financial fluctuations. Nonetheless, much remains to be done not only to increase the number of firms that have access to credit but also to enhance the innovation efforts of these firms. A policy that prioritises small firms requires initiatives that strengthen the interaction between firms, financial and technological agents, in order to simultaneously strengthen various capabilities. The central lesson for policy design is that policies have to be developed taking into account the specific requirement of the firms and contexts they are targeting, and not the other way round, that is forcing reality to adapt to them.

## Notes

1. A more detailed analysis can be found in Arroio (2009).
2. The definition of 'informal activity' is the same adopted by the International Labour Organization, that is: informal enterprises in urban areas, with up to five employees and self-employed workers, with or without legal establishment.
3. According to IBGE (2010), unemployment figures remained relatively stable and high throughout the 1990s and in the early years of 2000. The lowest unemployment rate since 2002 was observed in 2008 (6.8 per cent). In December 2003 unemployment was at 10.9 per cent.
4. A study by IPEA (2008) concluded that in 2007 women over 16 years of age dedicated 27.2 hours per week on domestic activities while men dedicated 10.6 hours, almost three times less.
5. The methodology used corresponds to the harmonised model suggested by EUROSTAT, particularly the third version of the Community Innovation Survey 2004–2006 (Forfás 2008). These statistics, while essential for the analysis of firm-based innovation, have important limitations. These include the unavailability of data for the service and agriculture sectors, a relevant gap considering the growth of the service sector in the economy pointed out in the previous section. In addition, information regarding co-operation is limited to formal partnership agreements. In developing countries like Brazil, where informality prevails and informal co-operative practices are a part of the historically established socio-cultural context, this limitation is particularly important for micro and small enterprises (see Cassiolato et al. 2005).
6. The innovation rate is defined as the proportion of firms that developed or introduced new or significantly improved goods or services (products) and/or operational processes.
7. RedeSist comprises about 27 universities and research centres in different parts of Brazil and includes more than 100 senior researchers, PhD and MSc Students. RedeSist has also established connections with over 20 research centres and six international agencies abroad and is an integral part of Globelics, the international research network on the Economics of Learning, Innovation and Capacity Building Systems. Since 1997, projects have been supported by CNPq, BNDES, FINEP, SEBRAE, and Banco do Nordeste. For details, see <http://www.redesist.ie.ufrj.br/> (accessed 25 February 2013).
8. Since 1999, 16 sector funds have been created, with tripartite management by the academic community, government and industry in the following areas: aeronautics, agriculture, biotechnology, energy, health, hydrology, informatics, infrastructure, minerals, petroleum, space sciences, telecommunications, transportation, and university-industry research. Three new funds were announced in 2011 and these would draw resources from the following sectors: construction, financial and automotive.

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# Innovation in Russian SMEs

## *Growth under Transition*

*Alexander Sokolov and Pavel Rudnik*

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### Small and Medium Business in Russia

During the last 10 years Russian small and medium enterprises (SMEs) have been showing a significant growth, not least due to energetic support provided by federal and regional authorities. Legal initiatives aimed at supporting SMEs include the Federal Law No. 209-FZ — ‘On Development of Small and Medium-size Entrepreneurship in the Russian Federation’ (GRF 2007) — which is the cornerstone legal document in the SME sphere.

The state pays particular attention to developing SMEs in the Science and Technology (S&T) sector. The framework for providing financial support to entrepreneurs at all stages of high-tech businesses’ life cycle is generally in place. Its major components include: (a) Russian Foundation for Technological Development (RFTR), which has been recently revived after years of being frozen; (b) Foundation for Assistance to Small Innovative Enterprises; (c) Russian Venture Company (RVC); (d) Russian Corporation of Nanotechnologies (Rusnano); (e) regional venture funds; and (f) the National ‘Program of Support and Development of Small and Medium Enterprises’.

These policy tools envisage direct financial support. But two initiatives by the Government Commission on High Technology and Innovation, launched in 2010, envisage indirect measures with respect to innovation at SMEs. The first of them enforces 47 largest Russian state-owned companies to develop their own Programs of

Innovation Development (PIDs), which — due to the issues stated in government recommendations — should include building linkages with innovative SMEs as one of their key components. The second one is creation of a number of national technology platforms (TPs) that should be aimed at bringing together stakeholders (including SMEs) in most promising technological areas in order to bridge the gap between science and industry.

Leading Russian higher education institutions also provide support to SMEs via, for example, a system of industrial parks (about 85 throughout the country) and business incubators and technological innovation centres (about 40 nationwide). Development of these forms of higher education institutions' participation in creation of SME enterprises is encouraged by the Russian government. In particular, in 1998, an interdepartmental programme to speed up technological innovation in Russia for 1998–2000 was approved (subsequently extended), and in 2006 the Russian Federation (RF) government approved a national programme called 'Creation of High-Technology Industrial Parks in the Russian Federation'. The latest initiative in this respect is a federal law that allows creation of small enterprises by public research institutes and universities in order to implement in practice the intellectual properties resulting from S&T activities (Federal Law no. 217-FZ).

The co-ordinated support provided by the government to SMEs has brought significant results. In 2009, the number of SMEs in Russia exceeded 4 million — about 97 per cent of the total number of enterprises in the country. However, despite the significant increase in the number of SMEs, the role they play in the economy is still rather limited. In particular, between 2005 and 2007, SMEs' turnover remained around half of the total of all Russian enterprises and organisations. Russia is yet to complete the process of downsizing huge conglomerates inherited from the Union of Soviet Socialist Republics (USSR) era, including de-monopolisation of the so called 'natural monopolies' and privatisation of large state-owned enterprises.

## SMEs and Innovation System

### *Definition of small and medium business*

The small and medium business sector is defined in accordance with international statistical practices; it includes companies (legal entities)

and individuals (private entrepreneurs who didn't register a company). The sector's legal entities are subdivided into small enterprises (SEs) and medium-size enterprises (MEs); classification criteria are defined in the Federal Law of 24 July 2007 (GRF 2007). Article 4 of this law defines the categories of small and medium businesses. These cover consumer co-operatives and commercial organisations (except state-owned and municipal unitary enterprises) included in the unified national register of legal entities; physical persons included in the unified national register of individual entrepreneurs conducting their business without creating companies (hereafter referred to as individual entrepreneurs); and farms.

SMEs should meet the following criteria:

- (a) for legal entities: total share in their chartered capital owned by the RF, Russian regions, municipalities, foreign legal entities, foreign citizens, public and religious organisations (associations), charity and other foundations must not exceed 25 per cent; shares owned by legal entity(s), which is not a small or medium company, must not exceed 25 per cent.
- (b) average work-force in the previous calendar year must be no higher than the following limits for each category of SMEs:
  - (i) 101–250 employees for MEs, inclusive;
  - (ii) up to 100 employees for SEs, inclusive; among them micro-enterprises (up to 15 employees) constitute a separate group.
- (c) revenues from sales of goods (services) excluding Value Added Tax (VAT), or the book value of assets (depreciated values of capital and intangible assets) for the previous calendar year must not exceed limits set by the government for each category of SMEs (as stated in the government regulation of 22 July 2008 (No. 556, 'On Threshold Amounts of Revenues from Sales of Goods [Services] for Each Category of Small and Medium Businesses'). The following threshold values for revenues received during the previous year have been set, excluding VAT: for SEs 400 million roubles (about US\$ 27.8 million);<sup>1</sup> for MEs: 1,000 million roubles (about US\$ 70 million).

Each small- or medium-size company is placed in the relevant category according to the larger value of the criteria defined in (b) and (c) previously. For the purposes of this study, enterprises employing between 250 and 500 people will be classified as MEs.

### *The role of SMEs in the Russian economy*

SMEs are making a significant contribution to the Russian economy. Since its conception in Russia in the mid-1980s, SMEs have been steadily increasing production volume and employment, and by now have become the backbone of the national economy. In the last 20 years the institutional framework for development of SMEs was put together in the country; it includes the following components: (a) basic legislation, most notably the Federal Law No. 209-FZ (GRF 2007), and the RF Tax Code which establishes simplified taxation procedures for individual entrepreneurs and SEs; (b) an elaborate system for providing financial support to SMEs at all stages of their operations; (c) the higher education system now has a component specialising in training staff specifically for SMEs; (d) a mechanism for regulating the intellectual property issues including its creation, distribution and use is in place, and being further developed. Despite important limitations — including an immature system for providing loans to SMEs, which has become even less available in the face of the global financial crisis and inefficient mechanisms for promotion and support of horizontal links — SMEs are enthusiastic about their prospects in Russia.

### **Statistics Characterising SMEs' Role in the Economy**

The total number of SMEs in Russia is over 4 million, which comprises 93.5 per cent of all enterprises and organisations in the country (if we consider all enterprises and organisations with work-force under 250 as SME), and about 97 per cent if also count the companies employing up to 500 people.<sup>2</sup> In 2007, particularly, there were about 1.1374 million SEs, about 3.0762 million MEs employing up to 250 people, about 157,700 MEs employing between 250 and 500 people, and only 135,100 enterprises employing more than 500 people (OPORA 2008; Rosstat 2010). Between 2005 and 2007, the total number of Russian SEs

was growing, but at the rate of no higher than 10.2 per cent a year. On the other hand, the number of MEs in 2007 decreased as compared to 2005.

As mentioned here, between 2005 and 2007 the share of SMEs in the total turnover of all Russian enterprises and organisations was steadily about 50 per cent. The share for SEs reached 26.4 per cent, for MEs employing up to 250 people 17.2 per cent, and 7.5 per cent for MEs employing between 250 and 500 people. In absolute terms, in 2007, SEs received about US\$ 1,316 billion, MEs employing up to 250 people about US\$ 871 billion, MEs employing between 250 and 500 people about US\$ 381 billion, and enterprises employing more than 500 people about US\$ 2,519 billion (OPORA 2008; Rosstat 2010).

The average SME work-force has also grown during recent years. Growth was achieved through increased number of staff at SMEs employing between 250 and 500, while the number of workers at MEs employing up to 250 had decreased between 2005 and 2007. In absolute terms, the average work-force of SEs numbered about 8.045 million people in 2005, about 8.582 million in 2006, about 9.239 million in 2007; average work-force of MEs employing up to 250 people numbered about 23.347 million people in 2005, about 22.988 million in 2006, and about 22.729 million in 2007; average work-force of MEs employing between 250 and 500 people numbered about 8.349 million people in 2005, about 8.396 million in 2006, and about 8.502 million in 2007. The average work-force of the enterprises employing more than 500 people numbered about 27.050 million people in 2005, about 27.205 million in 2006, and about 27.547 million in 2007. The total national employment during that period had increased, and since the number of people working at large enterprises remained practically unchanged the overall growth was achieved through increased work-force at SMEs employing between 250 and 500 people (*ibid.*).

### **History and Prospects of Russian SMEs**

Modern Russian businesses have grown out of the co-operative movement of 1985–91 that flourished in the USSR. On 2 April 1991, the law ‘On General Principles of Entrepreneurial Activities of the USSR Citizens’ was adopted, which established basic provisions for entrepreneurship in the USSR and rights and responsibilities of economic actors, guaranteed government support to entrepreneurs, and regulated their relationship with public authorities.

Development of small businesses in Russia was closely related with the overall economic and political trends. The first years (1985–87)

were characterised by the emergence of S&T development centres, 'temporary creative workgroups' founded by public associations, teams of contractors. Participants of entrepreneurial activities were few; the whole thing was seen as an experiment. The social and psychological basis for private business and entrepreneurship was gradually emerging.

Later on, in 1987–88, the scale of entrepreneurship was rapidly growing; many people felt free to work for their own prosperity and created a lot of new co-operatives and companies, although many of the companies were liquidated within a short time. The declared objective of providing government support to small business was to meet the internal market's demand for consumer goods. However, that did not occur — mostly due to insufficient financial resources and immature infrastructure.

In 1989–90, the first legislation was passed to encourage development of SEs. This has been achieved to an extent: people's business interests became much more diverse, new organisational forms of entrepreneurship emerged, leasing and renting became increasingly popular. Preparation for the so-called 'small-scale privatisation' was underway. That was when private entrepreneurship was legitimised.

One of the more important phenomena of that period was the emergence of leasing and renting, encouraged by switching all state-owned enterprises and production associations to self-financing and profit-and-loss mode of operations. Privatisation had turned public property into privately-owned assets, de-monopolising them in the process. It created the necessary basis for real transition to a market economy, and a prospect to increase efficiency of the Russian economy.

In 1991–92, the key trends in the Russian economy were commercialisation and emergence of medium and large business. Many laws have been passed, opening opportunities for major development of entrepreneurship. During these years a market infrastructure emerged; business skills and solutions became more elaborate; commercial structures, agents and all kinds of sellers started to merge, grow and get stronger; the oligarchy appeared, along with more advanced financial institutions such as banks and exchanges. Unfortunately, the state was unable to support competition by creating a favourable environment and offering preferential terms to SMEs — which in its turn displayed a weakness for 'parasitism', i.e., inclination towards pure brokerage, buying-and-selling activities. Everything was left to

the natural flow of things: survival of the fittest. It looked like implicit encouragement of centralisation and strengthening of entrepreneurs' positions, which on the one hand contributed to the deterioration of the market's psychological climate due to negative public perception of entrepreneurs (as people busily 'lining their own pockets'), while on the other making the whole situation much more criminalised.

The years 1993–94 mark the beginning of full-fledged large-scale privatisation and development of all kinds of entrepreneurship. For the first time ever venture firms appeared. The age structure of entrepreneurs had stabilised, as opposed to earlier years when many people tried to establish their own businesses — often just to try their luck; at that stage young and middle-aged people comprised the majority in the age structure of entrepreneurs. 'Niches' for entrepreneurs of different ages also emerged: the older ones mostly dealt with franchising, chains, local monopolies, whereas the younger ones engaged in more traditional mass production or flexible market-oriented businesses.

After the initial fast growth the potential of super-profitable brokerage and agency activities was practically exhausted, so in 1995–98 many of the small businesses ceased to exist. The trend towards concentration and centralisation of capital was emerging in the economy; the first takeovers took place. At the current stage of small business development one can see its historical roots. Creation of mixed economy, entrepreneurial environment and small business development have a lot in common in terms of basic criteria, starting from basics of property ownership to principles of organisation, functioning and management in a market economy.

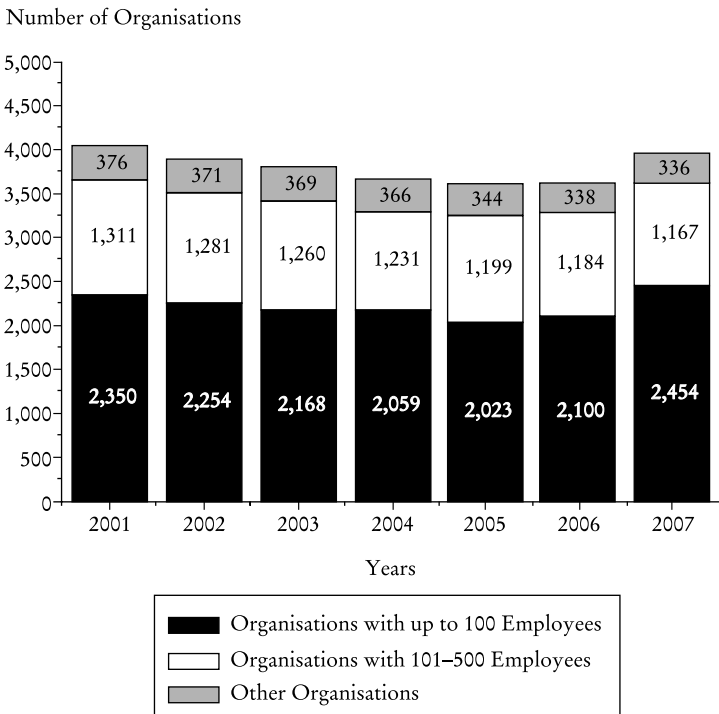
SMEs' history in Russia is over 20 years old now. At the All-Russian Forum — 'Small and Medium Business as the Foundation for Russia's Socio-Economic Development in the 21st Century' — which took place on 26 May 2008, the participants, mostly representing SMEs (58 per cent), were polled (RASMB 2011). The respondents' average experience in SMEs was about 10 years. Some of the survey results are presented in the Table 3A.

Most of the respondents were negative about the ultimate results of small business development during the previous years. The same is true about the current situation and the factors affecting the development of SMEs. However, the respondents were still optimistic about the future: in particular they believed that in the next few years the contribution of SMEs to the economy would grow, as would their competitiveness and scale of operations.

## The Role of SMEs in the High-Tech Sector of the Economy

SMEs play an important role in research and development (R&D) and innovation in Russia. Among all enterprises engaged in R&D in Russia, some 90 per cent are SMEs. Compared to 2001, the number of SEs engaged in R&D in 2007 did not increase significantly, while the number of such MEs had slightly decreased; in the middle of this period there was a drop in the number of both SEs and MEs conducting R&D (Figure 3.1).

**Figure 3.1:** Organisations Engaged in R&D



Source: HSE (2010a).

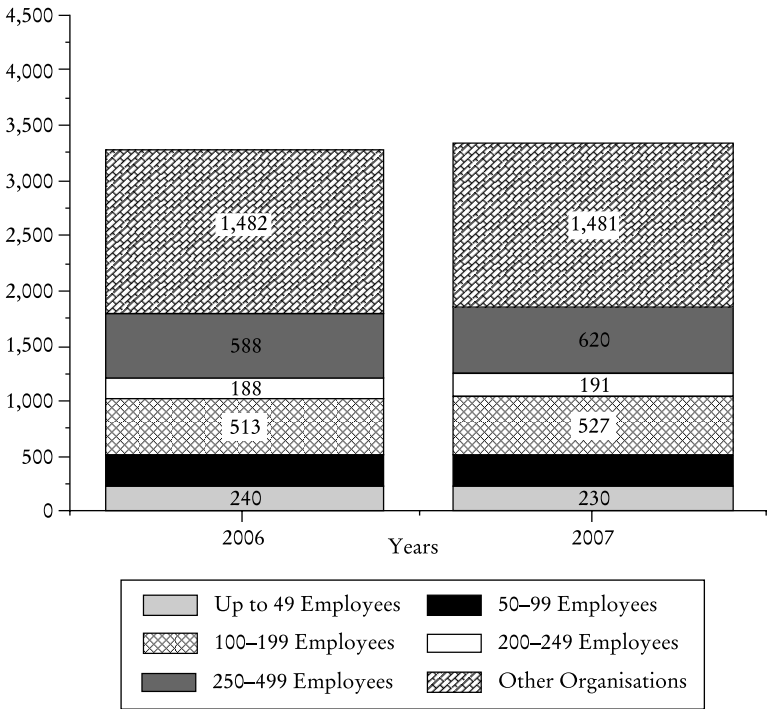
Among innovative organisations, large enterprises had the biggest share in recent years (2006, 2007) and their number remained practically unchanged; at the same time, the number of other enterprises



engaged in innovation activities grew, particularly that of companies employing: (a) 50–99 people, (b) 100–199, (c) 200–249, and (d) 250–499 people. The only group of enterprises that demonstrated a reduction of innovation activity were those employing less than 49 people (see Figure 3.2).

**Figure 3.2:** *Organisations Engaged in Innovation Activities*

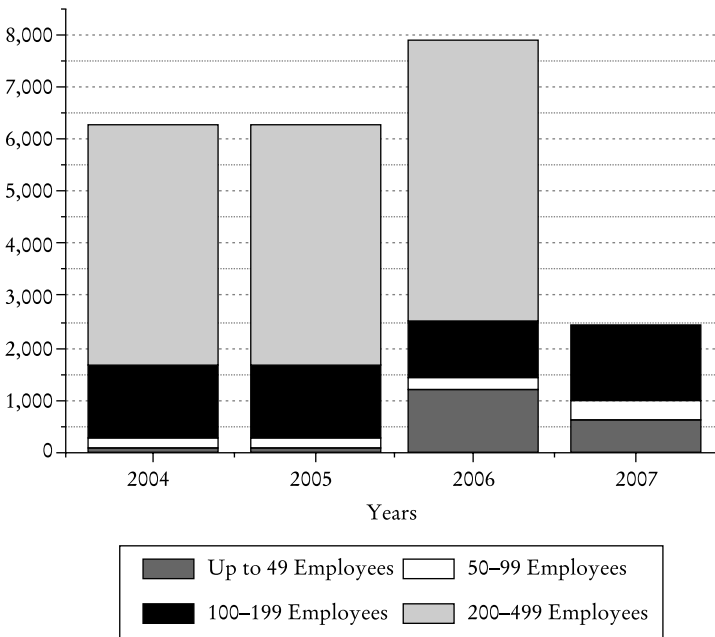
Number of Organisations



Source: HSE (2010b).

The amount of innovative goods and services (according to statistical definitions, innovative goods and services are the results of innovation activities aimed to be sold in the market)<sup>3</sup> produced by industrial enterprises increased during 2004–07; the biggest growth (compared to 2004) was achieved by companies employing up to 49 people, while other groups of enterprises demonstrated mixed and volatile results (see Figure 3.3).

**Figure 3.3:** *Output of Innovative Goods and Services Produced by Industrial Enterprises (in US\$ million)*



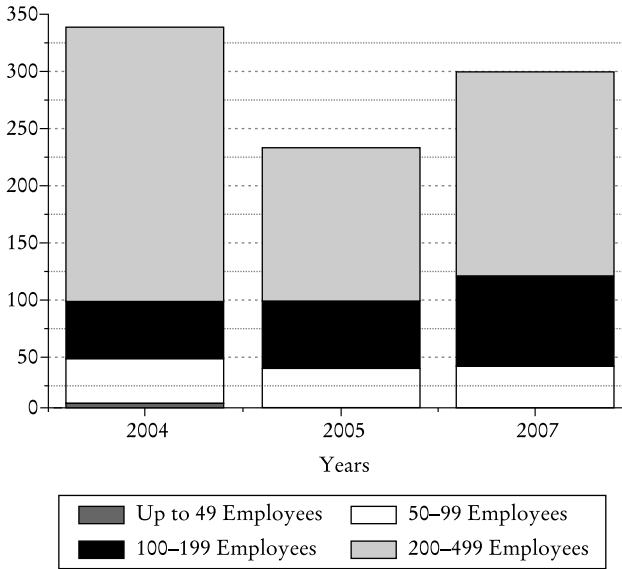
Source: HSE (2010b).

Exports of innovative goods outside the Russian territory by industrial companies employing up to 499 people, after getting seeing up to 2004, an overall reduction took place. It was caused by decreased exports by companies employing (a) up to 49 people, (b) 50-99 people, and (c) 200-499 people, while enterprises that employed 100-199 staff have reduced their export (see Figure 3.4).

Internal R&D expenditures in 2003-07 declined for enterprises employing between 100-499 people, while staying the same for those employing up to 100 people; it is important to note that total expenditures declined (according to Rosstat data) (Figure 3.5).

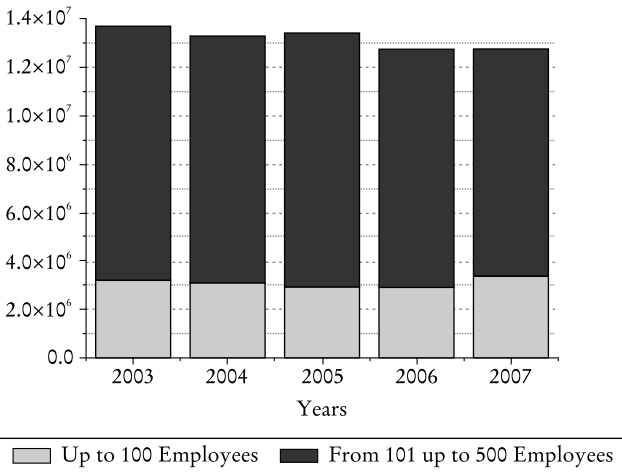
Innovation expenditures showed almost the same trend: in three of the five enterprise groups this indicator had dropped, the exceptions being companies employing (a) 50-99 people and (b) 100-199 people (see Figure 3.6).

**Figure 3.4:** *Export of Innovative Goods and Services Produced by Industrial Enterprises Outside the Russian Federation (in US\$ million)*

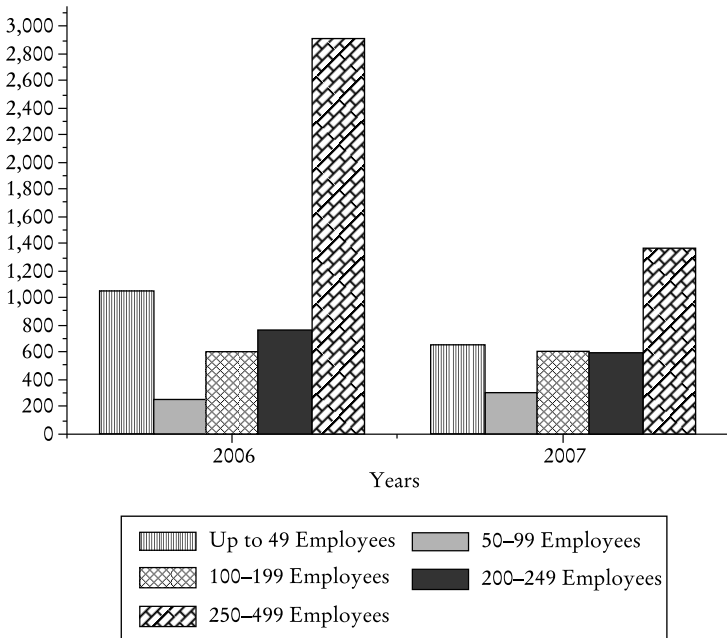


Source: HSE (2010b).

**Figure 3.5:** *Internal R&D Expenditures (in US\$ million)*



Source: HSE (2010a).

**Figure 3.6:** Expenditures on Innovation (in US\$ million)

Source: HSE (2010b).

An important indicator of innovation activities for SMEs is their involvement in joint R&D projects. Such projects could be initiated by any kind of client, including SME itself, a research institution or university, as well as by a bigger company or government agency. Funding could also be provided from different sources, e.g., from budget funds, government programmes, etc. There can be also various types and goals of the projects — from incremental R&D-based innovation to developing a brand new product. The important point is that R&D projects should be implemented in collaboration with an SME and research teams from elsewhere. The number of joint R&D projects increased in 2006, as compared to 2004, after a significant drop in two enterprise groups in 2005: employing (a) up to 49 people and (b) 100–199 people. At the same time, the number of enterprises engaged in joint R&D projects was much lower than the number of projects they implemented; indicating that one enterprise on an average participated in more than one R&D project. Unlike the

number of joint R&D projects, the number of participating organisations had been steadily growing through 2004–06.<sup>4</sup> These figures are in congruence with the findings of previous studies in which a strong positive relationship between firm size and collaboration in all economic sectors was explored. In particular, it was found that larger firms often function as nodes in interactive networks; they also tend to use networking more for screening potential sources of knowledge, experimenting with different partners, and monitoring activity in existing networks (Hagedoorn and Duysters 2000). In a study of collaborative R&D induced by the European Union (EU) framework programme, the Focus Group on Innovative Networks demonstrated that the majority of large firms were technology- or learning-oriented in their collaborative behaviour (Luukkonen 2001), while SMEs were typically more market-oriented (Torbett 2001).

Another key indicator for SMEs is related to technology transfer. It covers acquisition and sales of S&T knowledge and know-how with respect to provision of S&T services, applying technological processes, production of goods both with and without formal contracts. The number of organisations that acquired new technologies was growing in all enterprise groups, except in 2005 when there was a reduction for companies employing up to 49 people.

The number of companies selling new technologies elsewhere was significantly lower than those that purchased technologies (buyers).<sup>5</sup> This indicates that transferring promising technologies to the SME sector for subsequent development and commercialisation is much more popular in Russia than developing new technologies at SME for subsequent transfer and ‘replication’ at large enterprises.

### *The role of higher education institutions and state-owned research institutes in creation of new SMEs*

The mainline organisational mechanisms that enable higher education institutions and state-owned R&D institutes to participate in SMEs include industrial parks, business incubators and technological innovation centres. According to some estimates there are about 75 university industrial parks and approximately 40 technological innovation centres in Russia.

An important tool to support development of university industrial parks is the Inter-Institute Science and Technology Programme, 'University Industrial Parks and Innovation', implemented by the RF Ministry of Education and Science. It has the following objectives: (a) support university industrial parks' technological innovation projects and their small innovation enterprises; (b) provide research and methodological support for training and retraining personnel for industrial parks and their small innovative enterprises; (c) provide research and methodological support for international activities of university industrial parks; (d) provide research and methodological support for existing and new university industrial parks' organisational, informational and analytical activities.

A promising area for higher education institutions' (HEIs') increased participation in creation of new SMEs is Inter-Institute Entrepreneurial Complexes that pool together HEIs' resources to deal with various regional problems, staff training, development of infrastructure to support start-up entrepreneurs, and increase international standing and visibility of HEIs and relevant cities/regions.<sup>6</sup>

Another promising tool is a combined university technical park (Shukshunov 2009). Such parks are created jointly by several interested HEIs in the same city (region). When a new park is registered as a legal entity, its shareholders get shares of the park profits and revenues generated by the park's tenant companies. Entrepreneurs and inventors get access to certain physical assets — premises, research, laboratories, and production equipment. HEIs' R&D divisions may be contracted by tenant entrepreneurs to perform various jobs, or the entrepreneurs may be allowed to use these divisions' resources.

An important organisational mechanism for HEIs' participation in SME creation and operations is technological innovation centres (TICs). Development of TIC network started in 1998 as a part of the National Inter-Departmental Programme to Speed Up Technological Innovation in Russia for 1998–2000. The goal of the programme was to create a modern national innovation system which among other things would support development of TICs as basic infrastructure elements, on the basis of various organisations actively participating in high-technology innovation activities in Russian regions. It should be noted that all TICs are linked into an integrated network on the basis of the non-profit Union of Russian Technological Innovation Centres, established on their own initiative. This provides opportunities for a flexible co-operation between TICs and innovative companies

from various parts of the country, and allows for a start of large-scale innovative projects by pooling resources, potentials and knowledge of numerous innovative companies in various industries. To promote the network members' exports, the union launched the Gate2RuBIN project, which on 20 March 2008 was officially approved by the European Commission as a part of the European Competitiveness and Innovation Programme (CIP). The TIC network has a serious potential for advanced R&D and innovation, including in areas like nanotechnology, biotechnology, electronics, medical technology, navigation and aerospace, etc. Also, the model of existing TICs — members of the Union — can be replicated to create new TICs to develop basic innovations into marketable products (RUITC n.d.).

### *Venture capital's role in the creation of innovative SMEs in Russia*

Venture investments are becoming increasingly important in Russia. Currently there are 74 members in the Russian Venture Capital Association. In 2007–08, there were continued efforts towards developing a support structure for innovation economy and venture industry based on business–society partnership. The most important milestones included the following (RVCA 2008):

- Increased attention of the highest echelons of the country's government to the development of efficient national innovation systems, encouraging initiative and private business participation in switching the Russian economy to an innovation-driven growth model;
- Beginning of implementation of the Federal Goal-oriented S&T Programme for 2007–12;
- Emergence of venture funds created jointly with RVC and the second-stage tender to choose managing companies;
- New tenders held by the Ministry of Economic Development to set up regional venture funds;
- Emergence of Russian Investment Fund for Information & Communication Technologies (Rosinfocominvest) Inc.;
- Emergence of Rusnano state corporation;
- Amendments to legislation to bring it closer to international standards and practices.

The government budget is still the main source of funds for R&D and innovation activities in Russia, and each year its role as an investor is becoming even more important. One of the main funds allocation tools is the federal goal-oriented programmes. Funding of innovative enterprises and companies within the framework of the Federal Goal-oriented S&T Programme is administered by the Ministry of Education and Science, Government of Russian Federation. In 2002–06, Rosnauka implemented the first federal programme — ‘R&D in Priority S&T Areas’ — and then approved a second such programme for 2007–12.<sup>7</sup> The programme offers innovative companies a chance to take part in a tender for public investment. The state may provide 90 per cent of funding for research (with the other 10 per cent coming from non-public sources); 30–50 per cent of funding for engineering development projects; and 30 per cent when it is the business’ initiative and entrepreneurs are ready to invest serious funds. Rosnauka invites professional experts to evaluate applications submitted to tender. Funding is provided in the form of state contracts to perform appropriate work. One of the indicators of the success of the projects is the amount of private funding raised. The Federal Goal-oriented S&T Programme — ‘Commercialisation of Technology’ — section’s budget for 2007–12 is about US\$ 2,455 million (or about US\$ 403.4 million annually, on average); 36 per cent of that amount is coming from the government budget and 64 per cent from non-public sources.

The first federal-level organisation in Russia established to finance primarily private small innovative enterprises at the ‘seed’ stage was the Foundation for Assistance to Small Innovative Enterprises,<sup>8</sup> created in 1994 as a public non-commercial organisation. According to the Foundation, the companies it supported implemented more than 3,500 inventions patented in Russia and abroad, which allowed them to manufacture products for about US\$ 417.3 million, paying in taxes 1.8 times more than the amount of public money they received. Their output per worker in 2008 was about US\$ 104,000. Thousands of new jobs have been created.<sup>9</sup> The Foundation has 29 offices in research-intensive Russian regions. The main tools for providing support to innovative companies are programmes called START (providing seed capital to finance projects), TEMP (assistance to acquire licences for new technologies and technological solutions from Russian R&D organisations) and LAUNCH (funding of innovative projects of start-up companies based on R&D results and professional support of Russian universities).



The Venture Capital Innovation Fund (VCIF) was one of the first novel agencies during the early period of Russian venture industry. Established by the RF Ministry of Science and Technology and registered in St Petersburg, the VCIF<sup>10</sup> became the first tool that actually worked to provide government support to venture investors, and later on was used as a template to create other ‘funding foundations’.

RVC went through the setting-up period quite quickly and became operational, holding its first tender for managing companies as early as May 2007. The rest of the year was spent drafting up contracts with the winners, to define the sides’ obligations for the future registration procedure for trust managing rules, terms and conditions for putting together the declared venture funds. In the end, two venture funds were set up in 2007 with total assets of about US\$ 515.9 million:

- (a) Closed-end venture unit fund Russian Bank for Development and Foreign Economic Affairs (VTB) Venture Fund<sup>11</sup> with assets of about US\$ 260.6 million; and
- (b) Closed-end venture unit fund Bioprocess Capital Partners<sup>12</sup> with assets of about US\$ 255.3 million.

By the end of 2007, RVC’s own assets grew to US\$ 2,553.7 million. The established funds demonstrate highly dynamic investment activities, very much ahead of traditional venture funds.

The VTB Venture Fund’s Investments Committee analysed a pool of 14 investment projects with total investment requirements of about US\$ 190.7 million — about 55 per cent of the fund’s assets (four of the projects were proposed by foreigners willing to work in Russia). It should be noted that the management company’s pace was quicker than the ones normally shown by foreign equivalents. In 2007, the fund made the first investments in five to six projects to the total amount of about US\$ 48.8 million — 34 per cent of all approved budgets and 19 per cent of the fund’s total assets. VTB Venture Fund’s investment portfolio was distributed to cover priority S&T areas in the proportion of: 37 per cent for information and telecommunications systems; 25 per cent for sensible exploitation of environment and resources; 19 per cent for power generation and energy saving; 10 per cent for transportation and aerospace systems; 6 per cent for information processing, storage and protection technologies; and 3 per cent for software development — the maximum investment

being for information and telecommunications systems and sensible exploitation of environment and resources.

The Bioprocess Capital Partners is planning to invest about US\$ 102.6 million in various innovative projects. In 2008, the fund was planning to consider a pool of project to invest over 49 per cent of its assets.

In 2008, the second tender to select managing companies was announced; the total amount of capital to be managed by newly created venture funds reached about US\$ 625.9 million. After applications were accepted, 18 managing companies out of 20 applicants were authorised to take part in the tender. The total demand for investments during the second tender exceeded US\$ 3,400.8 million. Compared with the first tender, the number of participants was 50 per cent higher and the demand for investments grew by more than 85 per cent. The experts noted that the quality of applications improved as compared to the first tender. A sharp increase of the private sector's interest in getting into the venture industry is evident of the growing venture capital market and viability of the model based on public-private partnership. The bids were discussed by the RVC's board of directors and the following companies were selected: ROSNO Alliance Asset Management, Maxwell Asset Management, Leader, Inc., Sever Asset Management Company, and CentrInvest Managing Company.

Currently RVC is considering setting up seed capital funds in Russia. Problems which RVC has already encountered or might face in the future include difficulties in finding private co-investors and worthy projects to invest in, as experienced by RVC-established venture funds.

Accordingly, RVC may switch from its main objective — development of a venture funding system based on public sector-private business partnership — to dealing with secondary issues and substituting private investments with public money. Speaking about the Russian model generally, establishment of national venture funds with public participation is just the first step to launching the mechanism of venture industry. Much more important is another task: building partner relationships between RVC, private venture funds and market players, speeding up the collective training, development of highly-skilled professionals' market, and gaining world-level skills and competencies. The private sector also needs a convincing set of success stories to trigger the chain reaction of the market's further development. Creation of such sectors is one of the major objectives of RVC.

In 2007, the Federal National Property Management Agency approved the regulation to establish the Rosinfocominvest.<sup>13</sup> In November 2007, about US\$ 100.8 million of Russian Investment Fund assets were paid as the RF's share of Rosinfocominvest's chartered capital. In February 2008, the fund's assets were increased through additional emission, and later the same year a tender to select a managing company was held and Rosinfocominvest started investment operations. The fund's main objectives include efficient investments in Information and Communication Technology (ICT) companies, ensuring planned returns on investments, assisting the management of investment recipients to use the funds in an efficient manner, providing support for shaping and implementing investment recipients' marketing policy, improving ICT industry's investment image, assisting investment recipients to prepare for Initial Public Offer (IPO), and achieving liquidity of Rosinfocominvest's assets.

By the summer of 2008, about 20 regional venture funds were established to invest in small S&T enterprises, and tenders to select managing companies were held.

Some of the regional venture funds have already started operations and faced the first problems, including:

- Lack of projects in the region where the fund operates. Accordingly, in certain cases, venture companies have to move on to more promising regions by opening offices there.
- Small size of some of the first-order funds — inadequate to interest potential managing companies who can't see how their running costs will be covered (or managing companies start hiring 'cheap' staff lacking full qualifications).
- Problems with attracting private capital due to insufficiently developed legal status of and framework for close-end unit venture funds.
- Inadequate skills, qualifications and experience of certain managing companies' personnel, and in certain cases excessive workload (too many projects).

The Rusnano state corporation<sup>14</sup> was established in July 2007 to take part in investment and external economic activities in the area of nanotechnology, both in Russia and abroad, including joint projects with foreign capital. The corporation's main job is to invest in relevant projects jointly with private investors. Rusnano's mission is to

promote and implement the national policy aimed at making Russia a world leader in the field of nanotechnology in three main areas, namely: (a) making a significant contribution to generating new basic knowledge; (b) securing leading positions for Russian companies in the world markets of nanotech products; and (c) creating a global forum in Russia to discuss research, technological, production, investment, and environmental aspects of the world nanoindustry development. Rusnano also promotes Russia's recognition as a leader in the global nanotech community. The main targets for Russian nanoindustry — which the state corporation is supposed to help achieve — are the following: increasing sales of Russian nanoindustry products (from US\$ 1,390.9 million in 2008 to US\$ 51,136.4 million in 2015;<sup>15</sup> the total volume of sales in 2008–15 should reach about US\$ 161,931.8 million);<sup>16</sup> significant increase of Russian nanotech products' share in the world market (from 0.07 per cent in 2008 to 3 per cent in 2015); substantial increase of nanotech exports (from US\$ 278.2 million in 2008 to about US\$ 10,227.3 million in 2015).<sup>17</sup> To accomplish these objectives, Rusnano performs the following tasks: evaluates nanotech projects to select them for subsequent financial support with the corporation's funds; provides organisational and financial support to R&D in the field of nanotechnology; finances projects to implement nanotechnology or manufacture nanotech products; finances training projects for nanotech professionals; monitors implementation of nanotech projects financed with the corporation's funds; performs other tasks in accordance with the RF legislation. By the middle of 2008, Rusnano received 455 applications from 62 cities. Over US\$ 20,863.6 million was requested altogether (between US\$ 69.5 million and US\$ 5,424.5 million for specific projects). Most of the applications sent to Rusnano were for small-scale projects still at early development stages (R&D and engineering design). Rusnano sees itself as a partner in venture business. At the same time its key objective is eliminating barriers and limiting risks to venture funding of nanotech projects at all stages of the innovation process. Rusnano is willing to join forces with private venture funding companies to finance specific projects, establish early-stage investment funds, business incubators, and venture funds.

Legislation supporting venture funding includes the federal law of 6 December 2007 (No. 34-FZ — 'On Amendments to the Federal Law, On Investment Funds and Certain Other RF Bylaws'). The law is aimed at improving regulation of unit investment funds; managing

companies, specialised depositories and non-state pension funds by public authorities; and government supervision of the above activities including licensing, and creating new investment opportunities on this basis — in particular, introducing the institute of qualified investors. The law's objective is to provide better protection of rights and legal interests of persons who invest their savings in unit funds and non-state pension funds, and to encourage venture investments through investment funds created specifically for qualified investors.

## Policy to Support Innovation and Entrepreneurship in SMEs

The Federal Law no. 209-FZ (GRF 2007) sets a legal framework for development of small and medium business in Russia. The law regulates relationships between legal entities, individuals, and federal, regional and local public authorities in the RF in the sphere of SMEs; defines the concepts of SMEs actors, support infrastructure for SMEs and types and forms of such support.

The law describes the main goals and principles of the RF government policy to support small and medium entrepreneurship in the RF:

- (a) The RF government policy to support SMEs is a component of overall national socioeconomic policy and includes a set of legal, political, economic, social, informational, consultative, educational, and other steps by the RF federal, regional and local public authorities and self-government organs to implement the goals and principles established by this law.
- (b) The main goals of the RF government policy aimed at developing SMEs entrepreneurship include: (i) providing support to SMEs in order to create a competitive environment in Russia's economy; (ii) creating favourable conditions for the development of SMEs; (iii) ensuring competitiveness of SMEs; (iv) helping small- and medium-size businesses to promote their goods (services), intellectual activity results in Russian and foreign markets; (v) increasing the number of SMEs; (vi) promoting employment and self-employment; (vii) raising the share of products (services) produced by SMEs in

the GDP; *(viii)* increasing the share of taxes paid by SMEs to the federal, regional and local budgets.

- (c) The main principles of the RF national policy to support small- and medium-size businesses include: *(i)* division of responsibilities with regard to providing support to SMEs between federal, regional and local public authorities and self-government bodies; *(ii)* responsibility of federal, regional and local public authorities and self-government bodies for creating favourable conditions for the development of SMEs; *(iii)* participation of representatives of small- and medium-size businesses, and non-profit organisations acting in the interests of such businesses, in development and implementation of the national policy to support SMEs, and in expert assessment of draft federal, regional and local legislations regulating this sphere; *(iv)* ensuring that SMEs have equal access to support according to the conditions established in federal, regional and local programmes for development of SMEs entrepreneurship.

The law also defines special measures to support SMEs, such as: *(a)* special tax breaks, simplified accounting rules for calculation of tax, simplified tax return forms for certain taxes and duties for small enterprises; *(b)* simplified accounting rules for small enterprises engaged in specific industries; *(c)* simplified rules for presenting statistical data by SMEs, *(d)* preferential terms for privatisation of state and municipal property by SMEs; *(e)* special conditions for SMEs acting as suppliers (contractors) of products (services) to public (municipal) authorities; *(f)* taking steps to ensure that rights and lawful interests of SMEs are not breached in the course of government supervision; *(g)* taking steps to provide financial support to SMEs; *(h)* undertaking measures to develop support infrastructure for SMEs; and *(i)* other such actions.

To implement the national policy on supporting innovation and entrepreneurship in SMEs, the following organisations have been set up by the government: *(a)* RFTR, *(b)* Foundation for Assistance to Small Innovative Enterprises, *(c)* RVC, *(d)* Rusnano, and *(e)* a number of regional venture funds.

Recent policy developments in Russia include the previously mentioned PIDs of 47 largest Russian state-owned companies and 28 TPs approved in April 2011.<sup>18</sup>

TPs are considered among the most promising tools of innovation policy in Russia, and are a mechanism of public–private partnership in the field of innovation. They provide a communication place for key stakeholders in a particular promising technology area to discuss and share their mid- and long-term visions and articulate requests to the government aimed at facilitating development of that area. Eventually, TPs should help to overcome the lack of business innovation by bridging the gap between science and industry.

There were several steps taken in the campaign aimed at creation of Russian TPs. By December 2010, over 180 proposals to build TPs in particular fields were brought to the Ministry of Economic Development. There were more than 1,000 organisations behind those proposals altogether. By April 2011, all the proposals were evaluated, and the Government Commission on High Technologies and Innovation approved the list of TPs — which comprise many innovative SMEs as their members — that currently includes 28 particular platforms:

- (1) Closed Nuclear Fuel Cycle with Reactors Based on Fast Neutrons
- (2) Controlled Fusion Synthesis
- (3) Radioactive Technologies
- (4) High-speed Intellectual Railway Transport
- (5) National Space Technology Platform
- (6) National Information Satellite System
- (7) Aeronautic Mobility and Aircraft Technologies
- (8) Intellectual Energy System of Russia
- (9) Environmentally-Friendly Thermal Power of Enhanced Efficiency
- (10) Advanced Technologies of Renewed Energy
- (11) Small-scale Energy Distribution
- (12) Innovations Technologies Use to Increase the Efficiency of Construction, Security and Maintenance of Automobile and Rail Roads
- (13) Solid Minerals
- (14) Hydrocarbon Mining and Usage Technologies
- (15) Deeper Oil and Gas Processing
- (16) Ocean Exploration
- (17) Medicine of the Future

- (18) Bio-industry and Bio-resources — BioTech2030
- (19) Bioenergy
- (20) National Software Platform
- (21) National Supercomputer Technology Platform
- (22) Innovative Laser, Optic, and Optoelectronic Technologies — Photonics
- (23) Development of Russian Light Emitting Diodes Technologies
- (24) New Polymer Composite Materials and Technologies
- (25) Materials and Technologies of Metallurgical Engineering
- (26) Technologies of Mechatronics, Embedded Systems of Control, Radio Frequency Identification, and Robotics Industry
- (27) Ultra-high Frequencies Technologies
- (28) Technologies for Environmental Development

The PIDs were prepared and approved by the Governmental Commission by July 2011. Given the size of financial obligations taken by the 47 companies, the scale and potential effects of the implementation of PIDs seem great. Altogether all companies plan to stream unprecedented amount of funds to innovation. The total is about 3,000 billion roubles (see Table 3.1).

**Table 3.1:** *The Budget of Programs of Innovation Development of 47 Largest Russian State-owned Enterprises (1,000 roubles)*

	<i>PID Budget</i>			
	<i>(in 1,000 roubles)</i>			<i>(in %)</i>
	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2013 to 2011</i>
Largest Russian State-owned Companies, Total	732,257	949,850	1,441,220	197

*Source:* Ministry of Economic Development, Government of Russian Federation.

The increase of R&D expenditures of these companies leveraged by PIDs is also quite impressive and is expected to be more than two-fold in comparison to 2010 (see Table 3.2).

The implementation of the PIDs is to have a significant influence on innovative SMEs. Following the recommendations issued by the Russian Government Commission on High Technology and Innovation the largest Russian state-owned companies included special chapters devoted to establishing their relations with SMEs to their PIDs.



**Table 3.2:** *R&D Expenditures Leveraged by Innovation Strategies of the Biggest Russian State-owned Enterprises (in 1,000 roubles)*

	<i>R&amp;D Expenditures</i>				
	<i>(in 1,000 roubles)</i>				<i>(in %)</i>
	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2013 to 2010</i>
Biggest Russian State-owned Enterprises, Total	216,854	296,643	341,674	446,279	206

*Source:* Ministry of Economic Development, Government of Russian Federation.

The estimation made by the Ministry of Economic Development shows that increasing innovative demand of the state-owned companies will facilitate growth of innovative supply of SMEs. In particular, according to the PID, many companies plan to build targeted facilities to find, evaluate and implement innovation developed by SMEs and to improve their procurement mechanisms to support innovative SMEs' participation in relevant calls.

To support innovative SMEs some companies (like Rosneft, Gazprom, Rostelecom, Russian Technologies, etc.) plan to establish corporate venture capital funds together with the state development institutions and private investors. These foundations will put funds in stock capital of innovative SMEs.

Some PIDs also contain plans to create innovative SMEs as spin-offs of state-owned enterprises. Those spin-offs are aimed at developing and commercialising new technologies that could contribute to the growth of corporate technological level. Some companies even intend to develop their own corporate technological parks and business incubators which could help SMEs to implement projects with potential impact on corporate development, and enable them to use corporate science and technology infrastructure.

## Industrial Clusters

Industrial clusters in Russia are mostly concentrated in the mining industry. Typically, they demonstrate a comparatively low share of processing industries (e.g., wood-processing cluster in Arkhangelsk region, chemical cluster in Perm District) and insufficiently developed engineering components (e.g., wood-processing cluster in Arkhangelsk region, agrifood cluster in Krasnodar District). Nonetheless, there is a significant potential for further development of basic clusters.

## Production clusters

Several large production clusters are currently operating in Russia (Delovaya Rossiya and HSE 2012).

### Arkhangelsk Timber Products Cluster

Arkhangelsk is a leading Russian region from the forest industry point of view; for decades it has been a major exporter of timber products. The forest resources here are significant: by 1 January 2003, the region had 2,504 million cubic metres of wood.

**Cellulose Production:** The Arkhangelsk region traditionally has been the biggest cellulose producer in Russia. In 2004 the region produced 33 per cent of all cellulose in the country. Cellulose made in the region is either exported to other Russian regions or processed at the local factories. About 60 per cent of the cellulose produced in the region is used locally to make paper, cartons and related products. The main cellulose-based products manufactured in the Archangelsk region are cartons; the region is the national leader in this industry, accounting for 25 per cent of the country's carton production.

**Paper Production:** This is much less developed (the region is only the sixth biggest paper producer in Russia, at 8.6 per cent of the national output). However, its share has been steadily growing; as indicated by the paper and carton production per 1,000 cubic metres of logged wood, the region is at par with Canada and Sweden, but lags far behind Finland.

**Integrated Wood Processing:** This is less developed in the region: in plywood production it is the 11th among Russian regions (3.77 per cent in 2004). At the same time relevant production facilities are used at almost 100 per cent of their capacities. Taking account of abundant stock of raw materials in the region, there is a potential for new productions to be built.

Most of the timber and wood products made in the region are exported: in 2004 exports amount to US\$ 631 million.

The Arkhangelsk Timber Products Cluster is the biggest in Russia. At the same time it includes relatively few processing companies which make end products and use integrated wood processing technologies (such as furniture or prefabricated houses). Essentially, not only is

this cluster not sufficiently developed, it concentrates on making half-finished products such as boards, cellulose, paper, and carton, which are subsequently exported out of the region.

Manufacturing of machinery, equipment and components is also poorly developed. The Solombal machine works in Archangelsk mostly makes timber loaders. Enterprises have to buy imported equipment.

Members of the small enterprises cluster are mostly concentrated in the end-product sector (furniture, wooden window frames and doors, wooden prefabricated houses) and maintenance of the growing fleet of logging machinery and processing equipment. Their share in the cluster's total output is about 20 per cent. There are approximately 1,000 logging enterprises not registered as legal entities, and a lot of them work 'in the shadow'. However, the share of enterprises owned by large forest industry holdings is about 80 per cent.

The cluster's main problem is obsolete infrastructure, and it is becoming increasingly more acute. Other serious problems include: (a) depletion of forests due to protracted absence of efficient forestry coupled with active exploitation of forest resources; (b) lack of clear federal and regional forest and environment policies; (c) inadequate forest roads which would have allowed development of remote areas; (d) paucity of funding necessary to build new forest tracks; (e) growing costs of transporting timber from forests to consumers; (f) difficult procedures for getting logging permits; and (g) discrimination by 'natural monopolies'.

### **Krasnodar Agrifood Cluster**

The Krasnodar District has one of the largest economies in Russia. This is partly explained by demographic factors: with more than 5 million people it is the third largest Russian region. The other reason is its favourable location. The region's natural competitive advantages include excellent conditions for agriculture.

On top of all this, the regional administration is currently pursuing quite an efficient economic policy. An evidence of this are foreign direct investments in the region's economy — almost US\$ 2 billion in 2000–04, the third best result in Russia.

The service sector generates the biggest share of the gross regional product (GRP) — 53.8 per cent — out of which transportation generates 16.6 per cent and trade and other consumer services 12.8 per cent.

Industry and agriculture produce about 14 per cent of the GRP each, with the share for construction being 11.7 per cent. About half of the total industrial output (46.9 per cent) is produced by the food industry; thus enterprises of the agrifood cluster generate approximately 20 per cent of the Krasnodar District GRP.

The Krasnodar agrifood cluster is one of the most developed in the country, and not just in its own category but compared to clusters in other industries as well. SMEs are widely represented in its structural components. Particularly, in 2003, SEs comprise 11.9 per cent of the enterprises in the cluster, MEs employing up to 250 people 19.8 per cent, and MEs employing between 250 and 500 people 14.9 per cent.

**Cluster Root:** This component includes small, medium and large companies — e.g., Krasnodar meat-packing factory. Along with processing companies the ‘root’ also includes small food packaging firms.

**Raw Materials:** The district has a certain number of so-called ‘robust farms’ owning advanced machinery and equipment. These farms grow crops, livestock and poultry, and then sell it to enterprises for processing.

**Consumers:** SMEs here are mostly represented in retail and catering. Keeping in mind the size of the district’s internal market and the significant number of tourists, these sectors are very important to the cluster, but incomparably less so than exports outside of the region.

A particular feature of the cluster is a high degree of co-operation between its participants. For instance, a sugar-beet farmer can order a whole range of services from sowing and growing to harvesting and transporting the harvest to processing factories. Such services are provided by other small companies competing with each other.

The cluster’s weakest structural component is equipment manufacturing. On the other hand there are lots of suppliers offering imported equipment and machinery, and maintenance services.

As to the problems Krasnodar agrifood cluster is facing, the most serious ones are: (a) lack of skilled labour, (b) insufficient access to credit, (c) inefficient tax administration, and (d) competition from food manufacturers who use low-quality imported raw materials.

## Perm District Chemical Cluster

In terms of economic development, Perm District is among the most successful Russian regions. It's unusual that the regional industries, especially clusters — chemical, oil and power generating — kept growing even during the hardest period for the Russian economy, between 1991–97. For example, in 1993, major restructuring and renovation of two of the biggest enterprises of the chemical cluster began — Pezmnfteozgsintez, Inc. and Metafzax, Inc. Accordingly, a number of clusters not only managed to sustain their performance and output figures as compared to the Soviet era, but increased them. For example, the chemical cluster's production volume index in 2004 amounted to 155 per cent of the 1990s level.

Perm District has one of the most diverse and developed cluster portfolios in Russia after Moscow and St Petersburg. In particular, there are seven leading clusters in the district including chemical, wood processing, oil processing, oil and gas production and transporting, power generating, engineering, and aircraft engines and power machine building clusters.

At the end of 2005, the total number of SEs in the region was 10,600, employing 89,400 people. Most of the workers were employed in trade (30,100), construction (16,200) and manufacturing (14,300). In percentage terms, in 2003, SEs comprised 4.31 per cent of the enterprises in the cluster, MEs employing up to 250 people 19.4 per cent, and MEs employing between 250 and 500 people 10.2 per cent.

The Perm chemical cluster is the most highly developed in Russia in its category. Its specific feature is a combination of two well-developed components — organic and mainline chemistry. Organic chemistry mostly amounts to organic synthesis of oil and gas, production of mineral fertilisers, methanol, formaldehydes, etc., while mainline chemistry deals with production of potash fertilisers and soda. At the same time more complex chemical production technologies in the cluster are not sufficiently developed despite having the potential.

The Perm chemical cluster is advanced not just in terms of quantitative indicators but also from the basic structural components point of view — from raw materials to consumers, suppliers of parts and services to infrastructure and staff training.

The source of the Perm cluster's advantages — like any other chemical cluster's — is access to raw materials. The cluster's raw materials base includes Western Siberian gas fields, Verkhnekamskoye

potassium and other mineral salts sites, and oil fields of the district and Western Siberia. Raw materials are processed at the cluster's 'root' enterprises and then supplied to other industries and companies outside the region. The key consumers — very important to many SMEs — are oil-producing companies operating in Perm District.

The most highly developed components of the cluster include, first, mechanical engineering and second, network organisations. Production of potassium mineral fertilisers, organic synthesis of oil and gas and nitrogenous fertilisers has the highest shares in the overall output. More advanced kinds of production generating higher added value are less prominent in the cluster. However, they are being developed — for example, production of special chemicals and reactants, very high-purity substances, etc. These industries are developing thanks to SMEs established during the last 15 years on the basis of larger enterprises with high S&T potential, through foreign investments, or from ground zero with the capital provided by private Russian investors. Usually such companies were founded when there was a chance to implement a specific technology to manufacture particular chemical products, mostly for import substitution.

The share of SMEs in Perm chemical cluster isn't especially large: in terms of both output and employment it's no higher than 5–7 per cent. The number of such companies also is rather small, at about 20. Normally they employ no more than 100 people though there are a few with 500 and more workers. However, small enterprises play an important role in the cluster's development since they make the most advanced and innovative products.

The main problems regarding the development of Perm chemical cluster's SMEs include: (a) lack of skilled personnel, (b) high administrative barriers, and (c) low potential of the technologies they use.

### **Tatarstan Automobile Cluster**

The Tatarstan Republic has an industrial sector and cluster portfolio that is almost as diversified as that of Perm District. But unlike the latter, where authorities haven't been directly promoting enterprises' activities and have only provided limited support, the Tatarstan Republic's government consistently pursues an active industrial policy. The authorities not only create favourable conditions for business development but deal with enterprises directly, providing distinctly preferential treatment. Such a policy does bring results: the

republic's economy is steadily growing and has become one of the most industrially developed Russian regions. The total number of small enterprises here by the end of 2005 was 18,600 with a work-force of 146,500 people. Most of them were employed in trade (44,200), construction (37,300) and manufacturing (24,100). In percentage terms, in 2003, SEs comprised 5.2 per cent of the enterprises in the cluster, MEs employing up to 250 people 27.2 per cent, MEs employing between 250 and 500 people 11.3 per cent.

In terms of SME development, Tatarstan is far ahead of other Russian regions. The Tatarstan automobile cluster is sufficiently well-developed, and though it still specialises mostly in making trucks, cars are also built in the region. Truck parts and components are mostly manufactured locally, but car parts are imported from outside the region.

One of the region's strengths from the cluster development point of view is the existence of advanced infrastructure including engineering, information, communications, R&D, and education. The higher education system benefits from the following key aspects: (a) Kazan State University — one of the oldest in the country; (b) A. N. Tupolev Kazan State Technical University traditionally specialising in mechanical engineering (mostly aircraft construction); and (c) Kamskiy Polytechnic Institute (technical university) in Naberezhnye Chelny, specialising in training staff for the automobile industry.

At the core of the republic's automobile cluster is the truck manufacturer KAMAZ Inc. In recent years attempts have been made to diversify the cluster's root business, mostly by attracting foreign investors — car manufacturers. However, KAMAZ remains very important to the whole cluster, though in the mid-1990s only the republican government's support allowed the company to stay afloat and move on to the next development stage. This in turn created business for a large number of SMEs — suppliers of parts and components to KAMAZ and secondary markets. Preferential treatment of local Tatarstan suppliers openly announced by the KAMAZ management and the republic's government prompted suppliers from other regions to invest in developing local production facilities.

The republic's government policy to support SMEs, such as leasing and loan programmes with simplified procedures and preferential terms, free admission to fairs and exhibitions, free or preferential access to training and certification programmes, other support including

direct funding of certain projects allowed some of the SMEs to replace their equipment, launch new business initiatives, etc.

A significant contribution to the development of the regional SMEs was the opening of the Master Kama industrial park — the only one of its kind in Russia.

No other Russian region provides such active and powerful support to local industrial SMEs. It should be also noted that the republican authorities don't prosecute local SMEs — suppliers of parts and components to KAMAZ who also sell truck parts and components on the so-called 'grey markets', even if some of them are not officially registered at all — too actively. These entrepreneurs provide well-paying jobs to a lot of Naberezhnye Chelny residents, and serve as a 'growth medium' for more ambitious entrepreneurs willing to become legitimate official KAMAZ suppliers.

### **Tomsk Information and Communication Technology Cluster**

The structure of Tomsk Region's economy is rather unusual: a large share of the industrial output is generated by a few large companies such as the Gasprom and Tomskneft daughter companies, enterprises owned by SIBUR holding (e.g., Siberian Chemical Works), Tomskneftekhim Inc., and Siberian Methanol Chemical Company, Inc. On the other hand practically all of the remaining regional economy is represented by SMEs. In 2003, SEs make up 12.4 per cent of the enterprises in the cluster, MEs employing up to 250 people 25.2 per cent, and MEs employing between 250 and 500 people 12.2 per cent. Being aware of the importance of SMEs for development, the regional administration pursues a very energetic policy to support entrepreneurship, using revenues generated by mining industries to diversify the region's economy promoting mostly high-tech SMEs.

Tomsk SMEs are best represented and most competitive in the region's ICT sector. The sector's main development resource is Tomsk State University of Control Systems and Radioelectronics (TUSUR). The professional education system serves as the main driving force of ICT development in Tomsk, with several thousand new professionals with robust qualifications graduating each year. Apart from TUSUR, there's Tomsk Polytechnic University (TPU) oriented towards large industrial enterprises and the Tomsk State University, which specialises in basic research in the framework of federal research programmes; it also implements its own programmes



to develop innovative enterprises. These three very different education centres allow the region to train highly skilled engineers, researchers and managers according to traditional curricula on the one hand, and on the other to experiment with training specialists of a new kind — oriented towards entrepreneurship and innovations. Siberian State Medical University also plays a role in the Tomsk higher professional education system: along with a large number of medical research institutes and clinics, it affects the specialisation of many companies — members of the Tomsk ICT cluster.

The specific feature of Tomsk Region is the presence of strong universities that play a key role in the cluster. This allows it to be competitive even vis-à-vis regions that have more powerful R&D capacities concentrated in research institutions.

It's important to note that Tomsk is a major inter-regional education centre for the whole of Western Siberia. Tomsk universities train many more professionals than the region's economy can absorb. There are almost 100,000 students in the region with a population of 1 million, and almost 50,000 of them come from other regions.

The leaders of Tomsk Region's innovation cluster are companies that successfully compete in Russian and international markets such as EleSi (automatic control systems for oil industry), Micran (telecommunication equipment), ElecCard (software for enhancing digital images and sound), Electropuls (medical equipment for diagnostics and treatment of heart arrhythmia), SIAM (electronic devices for oil production), and many others — mostly medium-size companies employing between several hundred and thousand staff.

The weakness of the cluster's root business is in the distinct separation of the enterprises from each other and the lack of interaction and links between them. The companies of the Tomsk ICT cluster practically don't compete with each other, but don't have any motivation for networking and co-operation either.

### *Science parks and business incubators*

The first wave of Russian S&T parks emerged in the late 1980s (1989–early 1990s), and then a generic term covering them all appeared — 'industrial parks'. Most of these parks were created by higher education institutions (the USSR higher education system), so science parks were seen as HEI divisions, not as business partners. In 1990,

the first industrial park in Tomsk was created — the Tomsk Science and Technology Park. In the same year, during the first international workshop on industrial parks in Russia (again in Tomsk), it was decided to establish an association of S&T parks created on the basis of higher education institutes — the Technopark Association.

The early 1990s saw science parks boom in Russia (there were two science parks in 1990; in 1991 there were eight; 24 in 1992; and in 1993 the number almost doubled, reaching 43). The first industrial parks lacked infrastructure, real estate, trained managers, and usually weren't functional in terms of providing support to innovative enterprises.

Quantitative growth was followed by natural stratification of the country's science parks. Due to both objective circumstances and subjective factors, some of them (in Moscow, Tomsk, St Petersburg, Zelenograd, Ufa) started to develop much faster than others (and still do). In the mid-1990s the number of industrial parks continued to grow, including parks created on the basis of state research centres (SRCs) in academic towns, science towns, formerly 'closed' settlements: e.g., Moscow science parks Technopark-Centre and Aerocon; science parks in Moscow region's science towns such as Puschino, Chernogolovka, Troitsk, Dubna; Technopark-Novosibirsk, the technological innovations centre attached to St Petersburg Regional Fund for S&T Development; and the Obninsk industrial park. The first regional science parks appeared, with the regional and local authorities playing a major role in setting them up.

By the beginning of 1996 there were about 50 industrial parks in the RF, 'nurturing' about 1,000 small innovative companies and serving as bases for 150 maintenance and service firms. More than 10,000 new jobs were created in these industrial parks. However, many of them existed mostly on paper.

By April 2001 there were about 60 industrial parks in Russia (just five more than five years earlier); however, only a much smaller number was actually functioning. Just about 30 industrial parks were able to pass accreditation in 2000 and only 11 of them were certified as matching international standards.

Currently there are up to 85 industrial parks operating in Russia, many of them members of the Technopark Association created in 1990.

In 2006, the RF government issued Regulation no. 328-R to approve the state programme, 'Creation of High-Technology Industrial Parks in the Russian Federation', aimed at development of high-tech

industries and establishment of high-tech industrial parks. The programme covered the period between 2006 and 2010; the following steps were implemented:

- (a) 2006–07: management structures were set up to supervise high-tech industrial parks, carry out preparatory and design work required to begin construction, prepare basic infrastructure, build installations, design a programme for promotion of Russian high-tech companies in international markets, and carry out marketing and other organisational work.
- (b) 2008–10: infrastructure was developed for high-tech industrial parks, leading international high-tech companies invited to set up production facilities at high-tech industrial parks, and a programme implemented to promote Russian high-tech companies in international markets.

## Barriers and Problems Hindering Development of SMEs

There is a host of barriers hindering the development of small and medium businesses in Russia. The most important of these are described in this section (see, for instance, Simachev et al. 2009).

The lack of dynamism in the development of small businesses is related to an unfriendly environment and regulation. Many entrepreneurs prefer to do their business not registering as legal entities. Those that exist as SMEs are mostly engaged in trade and catering (they constitute 46 per cent of the total number of small enterprises). Small enterprises are mostly oriented towards local markets — trying to meet the demand of the local population; only a small share of their output is exported (only 7 per cent of small companies have consumers outside Russia). There is no evidence of growth in research-intensive, innovative SEs. The sector as a whole remains quite static: the number of newly established small firms is insignificant and inefficient companies are slow to drop out of business (34 per cent of SEs are unprofitable). At the same time, the entrepreneurial class does not grow per se — most of the new companies are registered by the ‘old’ circle of owners. The level of investments by small companies (compared to medium-size and large firms) is also very low. Small businesses show the strongest trend towards wasting capital on current expenditures.

Another kind of barrier is related to administrative regulation, which is related not so much to establishing a small firm as to its development (growth and diversification). The small firms are not interested in growth because — due to non-uniformity of administrative barriers — micro-enterprises get into the ‘pit’ where administrative pressure is lighter (the bigger the business the more it depends on public authorities, and the more ‘visible’ to authorities it becomes). Even higher barriers are present in research and production industries, which make SMEs neglect this area in favour of other fields. The high administrative ‘unit load’ small businesses have to bear is caused on the one hand by frequent inspections and numerous supervisors and on the other by the costs of preparing the required accounting and taxation documents.

Small business suffers from the competition with ‘shadow’ firms that are pushing legal companies of equal size out of the market since the former can sell their products (services) at more competitive prices. Under these circumstances new micro-enterprises have to either accept the ‘shadowy’ rules of the game or quit the market. At the same time these ‘shadow’ firms cannot legalise all their resources to make a move for dynamic growth.

Access to funding for small businesses is limited by their own sources: partner loans or bank loans. A distinctive feature of Russian SMEs is the significantly less important role of share investments in their funding sources; ‘compensation’ comes from partner loans. Another barrier for Russian small enterprises is the acute problem of providing loan securities to banks. The government support system (specifically its micro-loans component) is poorly ‘tuned’ for bridging the gap small companies face when they try to get bank loans.

During their life-time small companies face many specific problems. When a small firm is being established an important difficulty is putting together seed capital, and government support at this stage is minimal. After a while companies start to feel pressure from lack of financial resources to invest. Market advantages gained after a lengthy period of doing business (image, credit history, etc.) do not ‘compensate’ for the problem shortage of investment resources. The existing small business support system does not provide motivation for the evolutionary development of companies. In this respect strong links with large- and medium-size firms are very important for the development of ‘grown-up’ small companies.

Small enterprises in Russia are often not able to be integrated into relevant value chains. The demand from large enterprises for

innovation (which could be supplied by SMEs) is very limited. At the same time procedures for government procurement are not efficient in to promoting co-operation and networking among small/medium/large businesses because big companies are not usually inclined to subcontract small companies. There are no efficient programmes to promote exports by small enterprises. Peculiarities of VAT regulation make it hard for small companies using simplified accounting and taxation procedures to do business with medium and large firms — which also hampers their integration into the value chains.

Another source of serious barriers is related to taxation, which is unpredictable due to imprecise tax laws and regulations. Small enterprises have limited access to preferential taxation regimes.

The government support system is mostly oriented towards the needs of conventional small companies whereas non-traditional forms of small businesses often do not fit the established schemes and have to rely on themselves. The need to support and develop small business is commonplace in declarations of all relevant government bodies, but the principle of supporting small business is not seen as a major consideration when dealing with issues like promotion of exports, privatisation and tax reforms. The four goal-oriented federal programmes developed during 1994–2001 included specific target figures for small business development, but not one of these federal programmes was fully financed as planned; the funds actually allocated from the federal budget to programmes for small business support are insignificant. There exists an extensive arsenal of tools to support SEs, but they are poorly integrated and badly tuned to the needs of innovative science-and-production small companies — which leads to inefficient use of limited resources.

## Provisional Measures to Improve National Policy for Supporting SMEs

Various measures could be proposed to promote development of small businesses in Russia. Most of these need to be addressed by the Russian government and its particular agencies, as well as funding institutions. The most important set of measures is related to the improvement of the legal framework for the development of SMEs. This includes a need for robust legislation supporting development of SMEs, as well as amendments to existing laws, in order to:

- (a) give organisations operating under normal taxation regimen an opportunity to count 'incoming' VAT when they sell products (services) acquired from companies and individual entrepreneurs operating under simplified taxation rules, or paying single tax on imputed earnings;
- (b) improve procedures for applying special taxation regimens to small business;
- (c) relieve businesses paying single tax on imputed earnings from the obligation to use cash registers;
- (d) take into account the specific features of micro-finance activities, relationships in credit co-operation, radical difference between earning of cooperative members, and shareholders' profits when determining taxation elements;
- (e) speed up development and introduction to the State Duma of the draft federal law, 'On Micro-financial Organizations';
- (f) develop and approve federal goal-oriented programmes to prepare and implement a policy for targeted support of small and medium entrepreneurship, and to improve its competitiveness with Russia joining the World Trade Organization (WTO);
- (g) speed up the development of amendments to the federal laws 'On Citizens' Credit Consumer Cooperatives', 'On Agricultural Cooperation' and 'On Consumer Cooperation (Consumer Associations and their Unions) in the RF';
- (h) based on the law, 'On Trade', provide practical measures aimed at banning discrimination against small businesses in the consumer market, describe steps to be taken to improve competitiveness of Russian entrepreneurs and introduce limitations (similar to the ones existing in European countries) on operations of large retail networks (working hours, locations, lower domination thresholds, etc.);
- (i) develop a draft federal law which would grant the RF regions and municipalities the right to make lists of special properties to be leased to small businesses;
- (j) adopt relevant legislation as soon as possible, including lists, documents and conditions for applying simplified licensing procedures (Article 9, Paragraph 6 of the federal law of 8 August 2001, No. 128-FZ, 'On Licensing of Certain Activities') in order to simplify licensing procedures for small- and medium-size enterprises.

The federal law, 'On Banks and Banking', and relevant bylaws should also be amended to systematically cover specific features of micro-financial activities of non-bank depositary and credit organisations, and developed a programme to increase the range of retail financial services and improve remote banking system, paying particular attention to the development of micro-financial organisations as structures operating in regions where regular banks are poorly represented and providing services to start-up entrepreneurs and clients that are traditionally unattractive to banks.

In the field of credits provision for small businesses, an overall national system of government regulation and self-management of credit co-operatives should be developed. Relevant amendments to banking laws, legislation on non-profit organisations and credit co-operation to cover specific features of legal status and operations of non-bank depositary and credit organisations should be made. There is also a need to allow the establishment of second- and subsequent-level credit co-operatives, taking into account the specific features in the establishment and operations of co-operative banks and in the development of private micro-financial organisations.

There also could be undertaken measures to develop a special goal-oriented programme to support small businesses, introduce procedures for calculating tariffs to connect small businesses to engineering communications and a set of regional-level measures to prevent discrimination against small-scale retailers at the regional level.

Another big issue is development of human resources for SMEs. Creation of conditions favourable for highly-skilled professionals is on the agenda along with organisation of staff training and upgrading at Russian educational institutions, particularly in the following fields:

- (a) credit, consumer and agricultural co-operation;
- (b) special taxation regimens for small business;
- (c) micro-financial activities;
- (d) financing of small and medium-size businesses' projects;
- (e) venture funding;
- (f) creation and development of regional production clusters, industrial and technological parks, business-incubators;
- (g) co-ordination and implementation of state programmes for supporting development of small and medium businesses.

There should be efforts from the government to encourage training of managers specialising in development of SMEs, including short

workshops for top-level government officials (heads of regional administration, federal and regional ministers and department heads) and training courses for mid-level management and civil servants.

Training programmes aimed at increasing skills among SMEs have already been implemented. This activity has to be further developed with respect to:

- (a) summarising and classifying educational institutions' experience of developing relevant curricula and methodologies;
- (b) setting up a partnership network for training small business staff, including small and independent training institutions (virtual departments, research and education unions and centres, etc.);
- (c) developing relevant modular curricula and methodologies for training adequately skilled professionals;
- (d) initiating development of unified standardised curricula for schoolchildren and university students, beginner entrepreneurs, financial consultants, and small- and medium-size business staff (that should include training in legal issues related to SMEs); and
- (e) disseminating best regional practices for setting up staff training system for small business.

At the regional level specific mechanisms for supporting SMEs should be developed. In this respect there is a need to promote dissemination of regional experience in supporting small and medium entrepreneurship and improved access for SMEs to financial and credit resources, and summarise and classify best regional practices in the field of supporting small businesses. It is essential to develop programmes to support small business, including those that provide guarantees and assistance in securing loans; extend the network of regional traditional, innovative and student business-incubators; promote more intense development of the venture funding infrastructure for financing SME projects, including business angels,<sup>19</sup> private and private-public venture funds; and support small S&T enterprises.

Amendments to regional legislation should be developed and implemented to prevent discrimination against small businesses that operate in the consumer market by large retail networks, and to prevent preferential treatment to such networks. This is essential to ensure equal and fair competition between small and network retail formats. St Petersburg can be taken as a case in point and a



moratorium introduced on compulsory privatisation of floor space rented by small businesses from public authorities until appropriate amendments to federal legislation are adopted. Following Moscow's example it would be interesting to introduce wide-spread registries of 'honest small businesses', and offer them certain breaks and preferences (e.g., reduced rent).



## Notes

1. All calculations in US\$ are made as follows: first, the figure is converted from Russian roubles to US\$ at the exchange rate that is equal to the purchasing-power parity of that period (taken in accordance with Russian Federal State Statistics Services [Rosstat] data and the estimations of the Institute for Statistical Studies and Economics of Knowledge, Higher School of Economics, Moscow); second, the figure in US\$ of the respective period is adjusted to US\$ of 2010 by using Gross Domestic Product [GDP] deflator (in accordance with Organisation for Economic Co-operation and Development [OECD] data). The exception is Chapter 4 where the figures are taken in absolute terms.
2. We use data from the Rosstat, which was obtained from observations designed in accordance with the methodology developed by the Institute for Statistical Studies and Economics of Knowledge, Higher School of Economics, Moscow.
3. For detailed definitions, see OECD and Eurostat (2005).
4. The number of joint R&D projects with the participation of enterprises employing up to 49 people reached 360; between 50 and 99 people, 367; between 100 and 199 people, 585; and between 200 and 499 arrived at 1,087 joint projects in the year 2006. The number of enterprises participating in joint R&D projects and employing up to 49 people was 80 in 2006 (from 53 in 2004); the figure doubled in firms employing between 50 and 99 people — from 40 in 2004 to 88 in 2006. The figures in the year 2006 for those employing between 100 and 199 people, and between 200 and 499 people were 139 and 230 respectively.
5. The number of enterprises employing up to 49 people that acquired new technologies was 98 in 2004, 83 in 2005, and 125 in 2006; the corresponding number for those employing between 50 and 99 people was 86 in 2004, 91 in 2005, and 135 in 2006; for those employing between 100 and 199 people was 136 in 2004, 144 in 2005, and 210 in 2006; and for those employing between 200 and 499 people was 244 in both 2004 and 2005, and 330 in 2006. The number of enterprises employing up to

49 people that transferred new technologies was 14 in 2004, 15 in 2005, and 21 in 2006; the corresponding number for those employing between 50 and 99 people was 6 in 2004, and 16 in both 2005 and 2006; for those employing between 100 and 199 people was 18 in 2004 and 2005, and 21 in 2006; and for those employing between 200 and 499 people was 17 in 2004, 18 in 2005, and 28 in 2006.

6. <http://55study.ru/news/2413.html> (accessed 3 May 2013).
7. <http://fcpir.ru/> (accessed 27 March 2013).
8. <http://www.fasie.ru/> (accessed 27 March 2013).
9. See Foundation for Assistance to Small Innovative Enterprises, <http://fasie.ru/o-fonde> (accessed 27 March 2013).
10. <http://www.rvca.ru/rus/default.php?mid=7> (accessed 27 March 2013).
11. [http://www.vtb-am.ru/1.products/funds/private/vfunds/fund\\_venchur/](http://www.vtb-am.ru/1.products/funds/private/vfunds/fund_venchur/) (accessed 27 March 2013).
12. <http://www.2.bcvf.ru/> (accessed 27 March 2013).
13. <http://fasie.ru/o-fonde> (accessed 27 March 2013).
14. <http://www.rusnano.com/> (accessed 27 March 2013).
15. This is an equivalent of 900 billion Russian roubles planned to be received in 2015. To convert it to US\$ the PPP for 2008 is taken as an exchange rate.
16. This is an equivalent of the total of 2,850 billion Russian roubles planned to be received from 2008 to 2015. To convert it to US\$ the PPP for 2008 is taken as an exchange rate.
17. This is an equivalent of 180 billion Russian roubles planned to be received from export in 2015. To convert it to US\$ the PPP for 2008 is taken as an exchange rate.
18. See <http://www.tp.hse.ru/> (accessed 27 March 2013).
19. A business angel or informal investor is an affluent individual who provides capital for a business start-up, usually in exchange for convertible debt or ownership equity.

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**Table 3A: Selected Results of a Survey of SME Personnel**

<i>Question</i>	<i>Distribution of Answers</i>				
Are you generally happy with where small business has arrived in the last 20 years?	2% — yes; 31% — probably yes; 33% — probably no; 29% — no; 5% — can't say				
What were the more important contributions of SEs during the last 20 years (several answers were allowed)?	63% — growth of consumer goods market; 63% — providing jobs, promoting self-employment; 61% — promotion of private initiative; 37% — creation of competitive environment in the economy; 24% — increased tax proceeds to all government budgets				
How is SME's role in the economy going to change in the next year or two?	3% — will be much more important; 17% — will remain the same; 2% — will be much less important; 52% — will be growing; 5% — will be decreasing; 21% — can't say				
How would you describe the current situation for SME development?	3% — good; 41% — satisfactory; 49% — bad; 7% — can't say				
How important do the regional authorities think the development of SMEs is?	9% — very important; 29% — rather important; 39% — practically not important at all; 23% — can't figure it out				
How many of the public authorities demonstrate (provide) the following?					
	<i>Many (%)</i>	<i>About Half (%)</i>	<i>Few (%)</i>	<i>Nobody (%)</i>	<i>Can't Say (%)</i>
High-quality Service	2	14	58	24	2
Unbiased Decisions	3	13	52	29	3
Professional Staff	3	22	56	16	3
Would it be possible to be a successful entrepreneur if the following is true?					
		<i>Impossible (%)</i>	<i>Difficult (%)</i>	<i>Possible (%)</i>	<i>Can't Say (%)</i>
You never give bribes		38	46	14	2
You always comply with the letter of the law		43	42	11	4

(Table 3A continued)

(Table 3A continued)

Question	Distribution of Answers			
How ready would you say SMEs are to work in the market economy?	<i>Small Enterprises:</i> 3% — very ready; 44% — averagely ready; 49% — not ready; 4% — can't say <i>Medium-size Enterprises:</i> 5% — very ready; 53% — averagely ready; 20% — not ready; 22% — can't say			
How is SME's competitiveness going to change in the next few years?	34% — will grow; 13% — will decrease; 22% — won't change; 31% — can't say			
How would the following indicators of SME activities change in the next two to three years?				
	<i>Will Grow (%)</i>	<i>Will Remain the Same (%)</i>	<i>Will Decrease (%)</i>	<i>Can't Say (%)</i>
Diversifying into new spheres/industries	54	28	8	10
Number of SMEs	51	27	12	10
Number of innovative SME	47	33	61	4
Participation in social programmes	32	46	81	4
How would you describe your company's (organisation's) financial position?	13% — good; 66% — satisfactory; 8% — bad; 13% — can't say			
Do you envisage your company will grow in 2008?	55% — yes; 19% — no; 6% — probably will shrink; 20% — can't say			

*Source:* Survey of participants of the All-Russia Forum 'Small and Medium Business', 26 May 2008, Moscow. <http://permtp.ru/vestnik-files/260508opros.doc> (accessed 27 March 2013).

# On Learning, Innovation and Competence Building in India's SMEs

## *The Challenges Ahead*

*Keshab Das and K. J. Joseph*

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Small and Medium Enterprises<sup>1</sup> (SMEs) are generally considered capable of generating a large number of jobs, reducing desperate rural–urban migration, catalysing industrial dynamism, and above all, helping to achieve balanced regional development. Hence, India being a country with high regional variation in development, SMEs have been assigned a key role in its national innovation system that evolved over the years at the instance of the state. In fact, even before the genesis of India's national innovation system, the National Planning Committee (1938–41) accorded a status of significance to small-scale firms in India's industrial development (Tyabji 1980). Over the years, various institutional arrangements have been systematically made towards promoting learning innovation and competence building systems in the small-scale sector. These include, but are not limited to, reserving an increasing number of products for the small-scale sector, specific policy measures to promote industrial clusters and ensure concessional finance for investment, exemptions from industrial licensing, provision of specialised infrastructure and incentives for research and development (R&D), and promotion of import and export of capital goods along with a range of tax incentives. As a result of the varied institutional interventions, the small-scale sector (now called the Micro, Small and Medium Enterprise or MSME sector) has engaged in the production of over 8,000 products with significant

contributions to output, employment and export earning, and has emerged as a major player in India's national system of innovation and production.

With the initiation of market-oriented reforms that have had profound influence on the country's innovation system in general, there have been concomitant changes in the institutional arrangements that governed operations of SMEs as well. The changes, *inter alia*, included de-reservation of products for the small-scale sector and de-licensing leading to increased competition with the large-scale sector from within the country. Further, dismantling of tariff barriers implied the replacement of the earlier policy of infant industry protection with a regime of open competition with foreign firms. Along with the integration of India's innovation system with the world market, certain sectors within SMEs could manage to get access to the global market *inter alia* on account of their increasing participation in the global production networks (GPNs). But, given the weakness of the innovation system with the absence of institutional arrangements for interactive learning and competence building and the varied constraints that accompanied in the spheres of credit market, factor market (including labour and skill), product market, and technology, the large number of units in the SME sector could hardly withstand the heightened competition resulting from liberalisation. The outcome has been an unprecedented increase in the number of sick units and decline in the rate of growth in exports by the SME sector. To be more specific, the number of sick units increased from about 0.2 million in 1990 to over 0.3 million in 2000 and the rate of growth in exports declined from 31 per cent during 1986–91 to 18 per cent during 1991–2000.

Being a democracy, the state responded to the new challenges through a series of institutional interventions including policy changes and creation of new organisational structures to help promoting their efficiency and competitiveness through innovation. Thus viewed, the SME sector in India is at the crossroads as India's national system of innovation moved from import substitution and state planning to a greater play of market forces with reduced state intervention. Against this background, this chapter has two objectives. First, to analyse the system of innovation and production and to examine the extent to which a 'learning, innovation and competence-building system' as articulated in the national innovation system framework has emerged in this sector. Second, to highlight the recent institutional interventions

in the SME sector and their limits to help evolve an innovation system that, *inter alia*, involves the development of interactive learning and competence building.

## Systems of Innovation and Production in SMEs

### *On defining small-scale industries*

Prior to independence in 1947, Small-scale Industries (SSIs) mostly meant the village and urban-based cottage industries and those involved in manufacturing handicrafts (Bhatnagar 1995). The Industrial Policy Resolution of 1948 and the First Five-Year Plan (1951–56) documents identified SSIs as those that did not come under the Factories Act, 1948. The small industries included those that used power and employed less than 10 workers or did not use power and employed up to 20 workers. During the First Five-Year Plan the distinction between small and village industries was made. Small-scale industries were defined as those units that employed (a) less than 50 workers, if using electricity; or (b) less than 100 workers if not using electricity; or (c) having capital assets not exceeding US\$ 0.105 million. In 1960, the employment criterion was dropped and the SSIs were defined in terms of investment in plant and machinery alone. As per the 1966 definition, all industrial units with a capital investment of not more than US\$ 0.118 million were categorised as SSIs. In 1982 the service-oriented units were included in the small-scale sector, provided they were set up in rural areas and towns with a population less than 0.5 million and with an investment limit less than US\$ 0.021 million in plant and machinery. In the New Small Enterprise Policy announced in August 1991, the investment limit of SSI was raised to US\$ 0.264 million. The investment limit was raised to US\$ 0.826 million during 1997 due to inflation. Later in 1999, the investment limit was reduced to US\$ 0.232 million (Prasad 2004). In most countries, small- and medium-scale units are clubbed together for policy purposes and called SMEs. Hence, the recommendation of the Planning Commission Study Group on Development of Small Enterprises — which submitted its final report in May 2001 — to redefine the tiny, small and medium establishments in terms of investment limits of



US\$ 0.053 million, US\$ 1.059 million and US\$ 2.119 million respectively<sup>2</sup> has been accepted by the government (Bhavani 2002).

It may be observed that there have been persistent efforts at raising the investment limit for defining the small enterprise since the mid-1980s. Between 1985 and October 2006 (after which no changes have been made so far), the defining ceiling value of investment in plant and machinery has been subject to upward revision as much as six times. Not only has a limit of ₹3.5 million for small enterprises been raised to ₹50 million (about US\$ 1.2 million at the current exchange rate), the inclusion of the 'medium' enterprises with an investment limit of above ₹50 million reaffirms a growing bias towards larger enterprises that are likely to have strong export orientation. Even the gradual promotion of business service (distinct from manufacturing) enterprises within the ambit of the small-scale sector is an explicit move towards enhancing the competitiveness of the SMEs (Das 2008a: 123).

### *SMEs in the Indian economy*<sup>3</sup>

As per the quick estimates of fourth All-India Census of MSMEs for the year 2006–07, the number of enterprises is estimated to be about 26 million and these provide employment to an estimated 60 million persons. Of the 26 million MSMEs, only 1.5 million (about 6 per cent) are in the registered segment while the remaining 24.5 million (94 per cent) are in the unregistered one. But it is important to note that 6 per cent of the total number of units in the unregistered sector contributes to as high as 83 per cent of the total employment. The gender distribution of employment indicates dominance of men, accounting for nearly 83 per cent of the total employment, while only about 7 per cent of the units are owned by women. In terms of their area of operation, while the manufacturing enterprises dominate the registered units (67 per cent), the service sector units dominate the unregistered sector (74 per cent); the MSME sector as a whole contributes 8 per cent of the country's GDP, 45 per cent of the manufactured output and 40 per cent of the exports. In terms of product coverage, some of the major sub-sectors in terms of manufacturing output are food products (18.97 per cent), textiles and readymade garments (14.05 per cent), basic metal (8.81 per cent), chemicals and chemical products (7.55 per cent), metal products (7.52 per cent), machinery and equipments (6.35 per cent), transport equipments (4.5 per cent), rubber and plastic

products (3.9 per cent), furniture (2.62 per cent), paper and paper products (2.03 per cent), and leather and leather products (1.98 per cent).

The MSMEs are characterised by higher labour–capital ratio and rate of growth as compared to those in the larger-scale enterprises. The per unit value of fixed investment for those engaged in the manufacturing sector is US\$ 0.1 million and that in the service sector is only about US\$ 0.025 million whereas the per unit employment in the former is estimated at 8.4 and that in the latter is 2.4. However, the heterogeneity within them cannot be ignored. One end of the MSME spectrum contains highly innovative and high-growth enterprises. These include MSMEs in sectors like textiles and garments, leather and leather products, auto components, drugs and pharmaceuticals, food processing, Information Technology (IT) hardware and electronics, paper, chemicals and petrochemicals, telecom equipment, etc. Such enterprises not only have high potential for growth but could also contribute significantly to enhancing the country's exports.

While MSMEs are considered as having the potential to be dispersed regionally, thereby contributing towards achieving national objectives of growth with equity and inclusion, there exists a certain regional concentration in terms of their distribution. In terms of state-wise distribution of MSMEs, more than 55 per cent of these enterprises are in just six states — Uttar Pradesh, Maharashtra, Tamil Nadu, West Bengal, Andhra Pradesh, and Karnataka.

### *SMEs in high-tech industries*

Indian policy encouraged SMEs in a number of high-tech industries. The products reserved for the SMEs included electronic components, test and measuring instruments, consumer electronic equipments, and others. In case of the electronics industry, the strategy during the 1970s was to develop the industry within the confines of the public sector and the small-scale sector. The 'small-scale-led growth' strategy was based on certain economic rationale. First, the manufacture of electronic equipments essentially involved assembly and testing operations. It could be done at widely different levels of automation depending on the scale of operation. While at a larger scale of operation, it is feasible to achieve higher levels of automation involving wave soldering, automated wire insertion and wrapping, etc., at a lower scale of production, the scope of automation is limited. Given the smaller domestic market it was believed that under Indian conditions

there was no economic advantage for large-scale production (Joseph 1997). Second, this strategy appeared to be in tune with the objectives of regional dispersal of economic activities, utilisation of local skills, materials and capital, broadening of the entrepreneurial base, etc. Thus, in 1976, out of the 81 units licensed for the manufacture of TV receivers, 71 units with a total capacity of 2 million were in the small-scale sector. The remaining were organised sector units, which included units under the State Electronics Development Corporations of Kerala, Rajasthan, Haryana, Punjab, and Uttar Pradesh (Joseph 2004).

It has been estimated that at present there are over 3,500 firms in India's electronics industry that comprises 11 central public sector units with 31 manufacturing establishments, 46 units in the state public sector, about 500 units in the organised private sector, and more than 2,900 units in the small-scale sector. Over the years, with policy reforms, the share of organised private and small-scale sectors increased at the cost of public sector units. Today, the public sector accounts for only about 16 per cent of the total output, which was as high as nearly 35 per cent in 1981. The organised private sector, which also includes foreign firms with considerable share in computers and television, today accounts for about 46 per cent of the total output recording an increase of over 16 per cent since 1981. The increase in their share took place mostly during the last decade. Similarly, the small-scale sector also increased their share in output by about 10 per cent during the last decade to reach a level of 38 per cent in 2002 (GoI 2004).

Similarly, the small-scale sector plays an important role in the IT and software sector of India as well. India's software industry that comprises of over 1,300 firms is characterised by a long-tailed distribution wherein about 20 larger firms account for nearly 50 per cent of the production and export while the rest of the output and export is accounted for by a large number of firms in the small-scale sector. Many of the leading software enterprises of today began as small enterprises. Infosys, Satyam, Mastek, Silverline, Polaris, among numerous others, for instance, were started by software professionals and engineers with small savings and loans at very modest scales to begin with (Kumar 2001). Thus, the SME sector acts as a nursery of entrepreneurship, often driven by individual creativity and innovation. In case of the software sector there were a number policy instruments in place including the Software Technology Park scheme that apart

from providing a single window clearance facilitated access to built-up infrastructure as well as computing and communication infrastructure. In addition, as already noted, there were a number of venture funds that paved the way for the growth of small enterprises.

### *Policy framework*

Recognising the importance of SMEs in the development of the economy various policy initiatives have been put in place over the years. In the Industrial Policy Resolution of 1948, the government stressed the role of SSIs for balanced industrial growth, better utilisation of local resources and creation of employment opportunities. The primary responsibility for developing small industries by creating infrastructure has been provided to state governments. The Second Industrial Policy of 1956 provided for the support to cottage, village and small industries by differential taxation or direct-subsidies and integration of SSIs with that of large-scale industry. In order to improve the competitive strength of SSIs, 128 items were exclusively reserved for production in SSIs and 166 items were reserved for exclusive purchase by the government from this sector. The government, with the Industrial Policy Resolution of 1977, increased the number of items reserved for the SSIs to 504. In addition the policy also laid the provision for the establishment of District Industries Centres (DICs) so that in each district a single agency could meet all the requirements of SSIs under one roof. Provision was also made for technological upgradation, special marketing arrangements through the provision of services, such as product standardisation, quality control and market survey. The industrial policy of 1980 underlined the need for an integrated industrial development between large and small sectors. Industrially backward districts were identified for faster growth of the existing network of SSIs. 'Nucleus plants' in each industrially backward district replaced the DICs. Apart from this, preferential treatment was offered to agro-based industries recognising the need for strengthening the agricultural base.

The New Industrial Policy of 1991 that marked the era of liberalisation in India underlined the need for simplifying regulations and procedures by de-licensing, deregulating and decontrolling. Thus, SMEs were exempted from licensing for all articles of manufacture, equity participation by other industrial undertakings was permitted

up to a limit of 24 per cent of shareholding in SMEs, and priority was accorded to small and tiny units in the allocation of indigenous and raw materials. Market promotion of products was emphasised through co-operatives, public institutions and other marketing agencies and corporations. From the turn of this century, recognising the need for strengthening the SMEs in the context of new challenges, new policy initiatives were made in the years 2001, 2003, 2004, and 2005. While the process of import liberalisation along with de-reservation and de-licensing continued, various provisions were made for the strengthening of the SME sector, which included setting up of a corpus fund under the Credit Guarantee Scheme, finance at concessional rates, establishment of a Market Development Assistance (MDA) scheme, and cluster development not only to promote manufacturing but also to renew industrial towns and build new industrial townships.<sup>4</sup>

The government also set up different committees from time to time in response to the specific problems faced by the SME sector.<sup>5</sup> An Expert Committee on Small Enterprises was constituted to address the need for reforms in the existing policies and to design new policies for MSME development for facilitating the growth of viable, agile and efficient enterprises responsive to technological change and international competition (GoI 1997). In 1999, a Study Group on Development of Small Scale Enterprises was set up to examine the existing policies/programmes for SSI development, review the definitions and legal framework, examine the necessity of reservation policy, suggest innovative instruments/institutions to build up the equity base, review the fiscal policy/tax incentives, examine the impact of various regulatory laws and procedures, and review the problems/prospects of marketing concerning the SSI sector. In the year 1991, a committee was constituted by the Reserve Bank of India (RBI) to examine issues related to the matter of SSI finance followed by the setting up of a working group on flow of credit to the MSME sector in 2003. The National Commission for Enterprises in the Unorganised Sector (NCEUS), established in 2004, examined the problems faced by enterprises in the unorganised sector and made appropriate recommendations through several reports to provide technical, marketing and credit support to them. Finally, as an offshoot of the meeting of representatives of 19 prominent MSME associations with the prime minister, a task force was appointed in 2009 to reflect on the issues raised by the associations and formulate an agenda for action.<sup>6</sup>

## *Other institutional arrangements*

Along with the series of policy changes there are various institutions at the national, state and district levels for the promotion of SMEs. At the national level, the Central Small Industries Organisation (CSIO) had been established in the mid-1950s which was later renamed the Small Industries Development Organization (SIDO). Over the years this institution has emerged as the core promotional agency at the central level. It consists of 28 Small Industries Service Institutes (SISIs), 30 branch SISIs, 37 extension centres in specific products, and 74 workshops as in the year 1993. Though some of them have been wound up due to their financial non-sustainability when the policy shifted towards liberalisation, as of now, there exists a full-fledged ministry of MSMEs at the level of the central government. The ministry owes its origin to the establishment of the Office of Development Commissioner (Small-scale Industries) in 1954.

Over the years, it has seen its role evolve into an agency for advocacy, hand holding and facilitation of varied innovations in the small industries sector. It has over 70 offices and 21 autonomous bodies under its management. These autonomous bodies include Tool Rooms, Training Institutions and Project-Cum-Process Development Centres. [The] Office of the Development Commissioner (MSME) provides a wide spectrum of services to the Micro, Small and Medium Industrial sector. These include facilities for testing, training for entrepreneurship development, preparation of project and product profiles, technical and managerial consultancy, assistance for exports, pollution and energy audits, etc . . . Office of the Development Commissioner (MSME) . . . is currently focusing on providing support in the fields of credit, marketing, technology and infrastructure to MSMEs (Ministry of MSME n.d.).

For Khadi and village industries, a separate high-level commission has been set up under the Ministry of Industry. Similarly, there are separate divisions to promote handlooms, handicrafts, sericulture, and other non-modern small units.<sup>7</sup>

At the state level, Small Industry Development Corporations (SIDCs) have been set up to develop infrastructure in the form of industrial plots and industrial sheds, State Financial Corporations (SFCs) to provide long-term credit facilities, State Exports Promotion Corporations to give marketing assistance for exports, and

Technical Consultancy Organizations (TCOs) to offer technical, financial and marketing consultancy to the sector. In addition, Centres for Entrepreneurship Development (CEDs) and Institutes of Entrepreneurship Development (IEDs) have been set up to promote entrepreneurship through training.

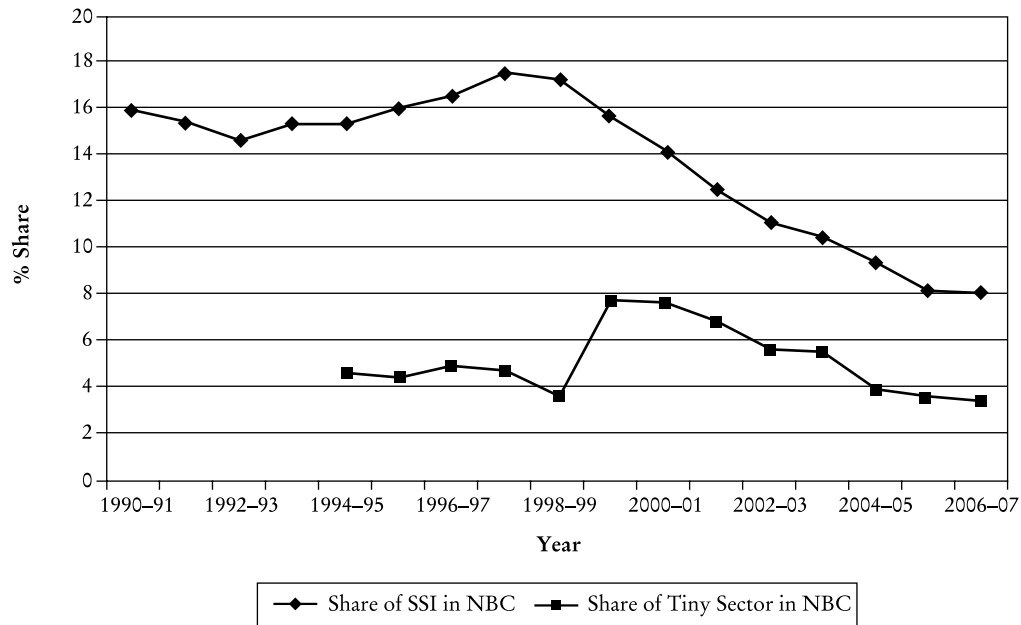
As mentioned previously, in the year 1978, the central government launched a programme of establishing DICs at the district level to provide, under a single roof, all the support services, clearances, licenses, and certificates required by the small entrepreneurs. There are more than 400 such centres, one in each district.<sup>8</sup>

### *Financing SME development*

Considering the importance of finance for the development of SMEs, different agencies have been established at the national, state and district levels for financing the SME sector as per broad guidelines laid down by the RBI. At the national level, the major institutions include the Small Industries Development Bank of India (SIDBI) (mainly through re-finance), the National Bank for Agriculture and Rural Development, the National Small Industries Corporation, the Khadi and Village Industries Commission, and the Development Commissioner, MSME. At the state level, SFCs, SIDCs and the State Cooperative Banks are the major sources of finance. In addition, at the district level there are Regional Rural Banks (RRBs), District Cooperative Banks, branches of state-level institutions and nationalised banks (about 65,000) and DICs. Here it is to be noted that since liberalisation at least three working groups/expert committees were set up to look into various finance-related issues faced by the SME sector.

Even as the new policy initiatives prepare MSMEs to participate in a globalised market space, the Achilles' heel has been poor or no availability of adequate and timely credit to numerous small and tiny units. Even as the 'priority' sector lending includes small enterprises as a vital recipient, the reluctance to serve them is apparent from the data for the period 1990–2007, as represented in Figure 4.1. The proportion of credit to SSIs (as percentage of net bank credit) has been on the decline since 1997–98 and has touched a low of a mere 8 per cent in 2006–07. Such figures for the huge tiny sector (for the period 1994–95 to 2006–07) have been hovering around a low level of 4 to 5 per cent till 2004–05, with the exception of a jump from 3.6 per cent to 7.8 per cent from 1998–99 to the subsequent year. The fall continued

**Figure 4.1:** Share of Credit to SSI and Tiny Sector in Net Bank Credit of Public Sector Banks, 1990–2007



*Source:* Up to 2004–05, <http://www.laghu-udyog.com/thrustareas/CREDIT.htm> (accessed 11 June 2008); and for 2006–07, RBI (2007: 73–74).

*Note:* NBC = Net Bank Credit.

Data for 2003–04 and 2004–05 are ‘provisional’. The net bank credit figures for 2005–06 and 2006–07 have been estimated based on the value and proportion of credit to the SSIs for the respective years. For the tiny sector for the year 2005–06, in the absence of data for the absolute value, the average of the corresponding figures for the preceding and succeeding years has been used.



and touched 3.4 per cent in 2006–07. It is beyond comprehension as to how with repeated and clear admonitions from the RBI, particularly, not to insist upon the collateral from tiny units, the priority-sector lending has failed to cater to the most crucial needs of loan finance to small and tiny enterprises. As observed by a national-level field-based study of small firms, ‘there are strong structural underpinnings to the inadequate flow: the organizational structure of banks, and processes within them, have taken them far from task orientation, and have created a specific bias against small loan portfolios’ (Morris et al. 2001: 11). The study also points out that the manner of discretion and supervision of commercial banks by the RBI coupled with the fact that there is no performance-based incentive system for proactive bankers assessing loan eligibility, the small firms, and especially the tiny units, find it hard to access the requisite loan finance.

The poor disbursement and management of credit to MSMEs have been linked to the fact that there is no transparency regarding their financial condition.

It could well be that some enterprise owners themselves may not grasp their financial conditions well. Under the condition, it is natural that banks hesitate to give loan to small-scale units. In fact, there is evidence to establish that a fairly significant proportion of loans given to small enterprises in the past have compounded the problem of non-performing assets (NPAs). Unless fairly detailed information on small firms is available, banks would hesitate to take risk. They might, in fact, prefer relatively larger (including the now medium) enterprises in order to comply with the RBI regulations (Das 2008a: 75).

Unlike in many developed nations where SMEs have enjoyed a strong credit guarantee support, it is only very recently that in India this issue has received some attention. The newly introduced Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE), being monitored by SIDBI, only insures the life of the chief promoters of the enterprises. Also there have been efforts by some industry associations who have signed memorandums of understanding with commercial banks and financial institutions to provide collateral security to upcoming entrepreneurs for their credit requirements (Kondaiah 2007: 7). Nevertheless, the provision of credit guarantee to Micro and Small Enterprises (MSEs), and particularly micro units, whether for starting or expanding business, is still in a nascent state and its broad-basing poses a major challenge to the existing financial system.

Private equity and venture capital funds cannot be expected to flow adequately and regularly to the SME sector given their singular focus on maximising returns over fixed periods of time. They, hence, are bound to flock to sectors that demonstrate the ability to reap profits for fairly longer periods of time. In the case of India, after the initial excitement about IT, real estate and infrastructure, most of the funds have come to concentrate in sectors like education, health care and micro-finance. As for formal institutional arrangements, the major initiative was taken by the SIDBI when it set up a wholly owned subsidiary, SIDBI Venture Capital Limited (SVCL), in 1999 with a stated mission of catalysing entrepreneurship by providing capital and other strategic inputs for building businesses around growth opportunities and maximise returns on investment. It manages two funds — the National Venture Fund for Software and Information Technology (NFSIT) in collaboration with the Ministry of Information Technology and the SME Growth Fund (SGF) in association with the leading commercial banks. The SGF, launched in 2004–05, focuses on a range of growth sectors including life sciences, retailing, light engineering, food processing, information technology, infrastructure-related services, health care, and logistics and distribution. It also envisions the development of international networking and exploration of possibilities of co-investment from international venture capitalists in subsequent rounds of financing. The NFSIT and SGF have 11 and 17 ongoing investments respectively.

### *Innovation and R&D*

Indian policy makers, particularly in the early years of Independence, highlighted the crucial role of technology and innovation in addressing the development problems in the country and underscored the role of domestic generation of technology. Accordingly, almost all the policies formulated over the first 40 years — including the policy statements exclusively for science and technology and others relating to industry, trade, investment, and fiscal measures — were intended to influence innovation in general and domestic generation or imports of technology in particular (Joseph and Abrol 2009). Apart from establishing various state agencies to promote innovation in almost all sectors of the economy including the SMEs, the government encouraged the private sector, with the aid of various policy measures, to engage innovation and in-house R&D activities.

Public research laboratories established across the country are a major source of technology for the SMEs. The government also encouraged the setting up of co-operative associations with the active involvement of industry such as textiles. In addition, there are product-specific arrangements like the Indian Diamond Institute in Surat for technology upgrading and for imparting training to labour in skill development. The National Institutes of Fashion Technology (NIFTs) have been established in New Delhi and Gandhinagar for providing information and forecast on latest fashions and for developing the industry technologically. Footwear Design and Development Centres have been established at Noida, Agra, Chennai, and Kanpur where the footwear clusters exist. The Central Glass and Ceramics Research Institute (CGCRI) has centres in Kolkata, Khurja and Naroda. It provides services to entrepreneurs on technology upgradation and training of skilled manpower. The Central Leather Research Institute at Chennai performs the function of designing and development, information dissemination, technology upgradation, and training of skilled manpower (UNIDO n.d.).

Within the general policy framework, a major initiative has been the establishment of the Technology Development Board (TDB) to provide financial assistance in the form of equity, soft loans or grants. This was followed by the setting up of Technology Business Incubators (TBIs) in 2001 where grants-in-aid are provided by the government department, both on capital and recurring for a set period. Another notable initiative has been the setting up of the National Innovation Foundation (NIF) to harness traditional knowledge. The NIF has scouted over 50,000 grassroots innovations and traditional knowledge from over 350 districts with the help of the Honey Bee Network and others. Many of these technologies have high potential for commercialisation by small- and medium-scale entrepreneurs through exclusive or non-exclusive licenses.

The SIDBI, which came into being as a subsidiary of the Industrial Development Bank of India (IDBI) in the year 1991, took up the initiative of cluster development during the first year of its operations in the area of promotion and development. The stated objectives of the programme are creation of awareness about new products, processes and technologies; skill upgradation; development of technology-related common facilities for the cluster; provision of unit-specific modernisation packages; promotion of energy conservation; and introduction of environment-friendly technologies. The SIDBI has so far selected

20 small industry clusters for technology upgradation. The product groups covered include locks, textile processing, bicycles and parts, scientific instruments, salt and salt-based chemicals, powerlooms, machine tools, rubber products, seafood products, glassware, gems and jewellery, brass and bell metal, wrought iron and steel products, leather and leather products, metal castings, and hand tools. Other national-level institutions that are supporting the small-scale sector are the National Research Development Corporation (NRDC), the Bureau of Indian Standards (BIS), the National Productivity Council (NPC), the Consultancy Development Centre (CDC), and the Electronics Test and Design Centres (ETDCs). The central financial institutions have also set up the Entrepreneurship Development Institute of India (EDII) at the national level to promote entrepreneurship.

While institutional arrangements for promoting innovation and R&D are fairly elaborate, it is rather difficult to assess the innovation performance. Though R&D expenditure could hardly represent important innovations in the sphere of organisations, markets and others, it is often considered a major indicator of innovations in terms of new products and processes.<sup>9</sup> The distribution of industrial R&D across public, private (large-scale) and small-scale sectors is presented in Table 4.1. It is evident that the share of the small-scale sector in

**Table 4.1:** *Distribution of R&D Investment by Broad Sector (in per cent)*

<i>Year</i>	<i>Public Sector</i>	<i>Private Sector</i>	<i>Small-scale Sector</i>	<i>Total</i>
1980–81	41	57	2	100
1981–82	41	57	2	100
1982–83	41	56	3	100
1983–84	47	51	2	100
1984–85	44	54	2	100
1985–86	45	52	3	100
1986–87	45	52	3	100
1987–88	49	48	3	100
1988–89	44	53	3	100
1989–90	45	52	3	100
1990–91	46	50	4	100
1991–92	46	50	4	100
1992–93	42	54	4	100
1993–94	39	57	4	100
1994–95	28	67	5	100
1995–96	24	71	5	100
1996–97	27	69	4	100

*Source:* Department of Science and Technology, R&D Statistics, relevant years.

terms of total industrial R&D has remained a paltry 4 per cent and has hardly improved during the 17-year period. This is very low when considered in terms of their contribution to output, employment or export earnings.

With a view to get a more disaggregated picture we have estimated the R&D intensity of small-scale firms across different industries during 1980–81 to 2005–06. It is evident that the R&D intensity (R&D expenditure as a proportion of sales) of the small-scale sector has been declining over the years. Nevertheless, their R&D intensity is much higher than for the economy as a whole and for the organised private sector as well. It is also to be noted that R&D activity is not prevalent in all the industries but confined to a dozen and others are yet to get involved in R&D in any significant manner. Also, R&D expenditure in most industries is rather erratic. This may be attributed to the fact that it includes current and capital expenditures, especially the cost of imported capital goods, which do not take place in all the years.

M. Sarma (2002) explored the extent of the integration of the small-scale sector with the public and private sectors in the innovation system framework. The study, by using a methodology in tune with revealed comparative advantage and location quotient, estimated the Revealed R&D Advantage (RRA) as well as the R&D base of these sectors.

In all the three sectors, the study found substantial internal consistency in terms of industries, which have higher RRAs. In other words, within the sector there is a high degree of focus on investment in R&D over the years, especially with respect to the public sector. This has resulted in the building up of appreciable technological capability as shown by other more in-depth studies. With respect to the other two sectors though there is sectoral consistency, the technological competence of firms in these sectors is circumspect due to the weakness of the sectoral system of innovation that prevailed. But the most alarming finding of the research has been the absolute lack of co-ordination between the sectors in terms of research investment. The fact that there is not even a single sector throughout the period of research, (1980–97) wherein the public, private and small sectors have  $RRA > 1$  is a matter of concern (*ibid.*). On the whole, the study found very low level of integration between different agents engaged in innovation, pointing towards the immature nature of India's innovation system.

## *Clustering, networking and interaction with universities and public research laboratories*

For long, sub-contracting as a means of promoting interactive learning has been systematically promoted in the SME sector. Several measures like ancillarisation, vendor development programmes, buyer–seller meets, and the provision for shareholding by large enterprises, among others, have been initiated. This helped a large number of MSEs to develop marketing linkages and get access to technological inputs that are strategic to competence-building through interactive learning. However, in view of the dependent relationship of such enterprises with large ones, they also face a different set of problems. New empirical evidence in the last two decades, therefore, challenged this passive view towards the development of the small-scale sector and portrayed small firms as integral to a country's long-term competitiveness and as important institutions that help building locally-rooted and diversified industrial capabilities in an era of intensified competition, uncertain markets and footloose capital (Tewari and Goebel 2002).

India is home to a large number of clusters and most of them have naturally evolved over the years without any external inducement (Das 2005). The size in terms of the number of units and the quantum of output of these clusters vary significantly. Some of them are so big that they produce upto 70 to 80 per cent of the total volume of that particular product produced in India. For example, the township of Panipat produces 75 per cent of the total blankets produced in the country. Similarly, Tirupur, a small township in the district of Coimbatore in Tamil Nadu contributes 80 per cent of the country's cotton hosiery exports. Yet another example would be of the city of Agra, virtually a 'Footwear City' with 800 registered and 6,000 unregistered small and cottage footwear production units, making 150,000 pairs of shoes per day with a production value of US\$ 1.3 million per day and exporting shoes worth US\$ 57.14 million per year. Similarly, Ludhiana in Punjab produces 95 per cent of the country's woollen knitwear, 85 per cent of the country's sewing machines and 60 per cent of the nation's bicycles and bicycle parts (UNIDO n.d.).

Though it has been argued that clusters are major sources of technology spillovers and increasing returns (Grossman and Helpman 1991; Krugman 1991; Romer 1986) studies in the innovation system would argue that the existence of clusters *per se*, however, is only a

necessary condition for facilitating innovation. While some of these studies highlighted the role of universities and educational institutions and public laboratories in encouraging cluster formation (Cooke et al. 1997; Padilla-Pérez et al. 2009) others have emphasised the role of region-specific characteristics, in particular, the role of networking within the region. Yet another set of studies highlighted the role of highly qualified and skilled manpower and the presence of good universities (Asheim and Coenen 2005).

While the available evidence, mostly from the developed world, indicates that interaction with universities and public research institutions (PRIs) is an important source of means of innovation in the manufacturing enterprises, in India, however, industry–university interaction is still in its infancy. A survey of 462 large industrial units spread across different industries indicated that even the large Indian firms are largely inward-looking and depended mainly on their own manufacturing process and customers as the major sources of knowledge for innovation. Neither universities nor PRIs have any important role as sources of information either in terms of suggesting new projects or helping to complete the existing ones. Only 11.3 per cent of the firms claimed that they had any form of collaboration with a university or a PRI. While the overall level of interaction is found to be low, for those who have interacted the collaboration has been a success in terms of achieving the objective (Joseph and Abraham 2009). However, the firms in the SME sector are increasingly making use of the testing tool room and other facilities in public research laboratories and universities. Though the relevance of interactive learning as articulated in the systems of innovation framework is yet to be appreciated explicitly in the policy circles, some of the recent committees appointed by the government (for instance, the NCEUS) have underlined the need for greater interaction with the public research laboratories and universities.

### *SME participation in global production networks*

With the formal opening up of the economy in 1991, the small enterprise sector, ‘protected’ as it was from external competition for over four decades since the First Plan at least, had to gear up to the impetus of globalisation. This implied that SMEs needed to develop their ability to engage in external orientation by focusing on competitiveness, innovative activities and networking with multiple ‘stakeholders’ both

within and beyond the domestic sphere. In 1991, the introduction of the new category of Export Oriented Units (EOUs) within the SSI sector and the recognition of the Small Scale Service and Business Enterprises (SSSBEs) were early indicators of motivating the small enterprises towards the global business arena. This definite proclivity towards outward orientation has, in fact, favoured those few units in a certain sub-sectors that have a global market presence and, hence, has left out a massive number of smaller units where the average capital investment has been far lower and the global market has no demand for their type of products.

Moreover, the hype regarding participation in the Global Value Chains (GVCs) or GPNs as the key to the success of small firms in developing nations has acted almost as a bait to getting entrapped in a production arrangement where the anchor or leading firm engages in what has been termed as 'rent-poor' activities, whereby, typically labour-intensive and low value-adding tasks are subcontracted to SMEs in poorer countries mainly to benefit from cheap labour. Clear incidences of decline of barriers to trade and Foreign Direct Investment (FDI) have resulted in the relocation and reconfiguration of processes of production beyond national boundaries, especially by large multinational enterprises (MNEs). Encouraged further by the rapid progress in the Information and Communication Technologies (ICTs) and reduction in transport costs, the global production systems have emerged in a number of modern and often labour-intensive sub-sectors: for instance, cosmetics, garments, furniture, furnishing textiles, leather goods, pharmaceuticals, computer/electronic goods, automobile parts, agro processing, scientific equipments, and so on.

Typically, GVCs are of a 'quasi-hierarchical' nature as most processes are controlled by MNEs. Moreover, the nature of control often is such that the local suppliers/assembling units hardly have any knowledge about the entire gamut of processes involved, the details of the final output and the markets these are headed for. Under such circumstances, the local firms do not have an opportunity to access facilities to upgrade or diversify their processes or, much less, the products. This could be attributed at least partly to the nature of the innovation system in which domestic firms operate wherein there are not able to provide the complementary capability set required by the MNEs and that in turn leads to an unequal participation in the GPNs. In a discussion on the 'downside' of the GVC promotion, a recent study notes that 'the controversial issue is whether firms are



also able to achieve functional upgrading, and to determine the role buyers play in furthering, neglecting or obstructing functional upgrading by their suppliers' (Knorranga and Meyer-Stamer 2008: 31). In fact, in addition to the well-known aspect of such global production systems taking undue advantage of local cheap labour in developing nations, there are serious issues in the process of participation *per se*. The stringent criteria adopted in selecting a particular sub-contractor and also disallowing opportunity to participate in non-labour or high-tech stages of a given process are instances of highhandedness in an obviously asymmetrical business 'partnership'. In the Indian context, the software as well as garment sectors, the two most typical examples of SMEs, have been feeling the heat of such blatantly translucent and essentially exploitative business relationship, where the participating enterprises mostly do not have complete information regarding the processes involved. In a study of Bangalore's famed IT sector boom, attributed to the growing preference of MNEs for this cluster, it has been argued that in terms of knowledge spillover, technological capacity-building and moving up in the value chains the SMEs have gained precious little (Vijayabaskar and Krishnaswamy 2004).

Another issue relates to the technological and organisational level at which MSEs function, as it determines their chances of being engaged by the global buyers for a specific activity or job. A typical case is the massive number of micro and small garment units that operate using outdated machinery, methods and skills. These units usually thrive with the characteristics of the informal sector with no reference to legal provisions of production, workplace safety and with exploitative labour conditions. These units are surely kept off the formal global subcontracting arrangements. Nevertheless, there have been relatively larger local units that have been producing for MNEs and/or exporting themselves. However, this sub-sector that employs a staggering 3.5 million workers has been widely criticised for poor working conditions (including payment of less than minimum wages) and serious compromise of the formal status of workers. The growing incidence of contractualisation, informalisation and casualisation of the workers, mostly women, has prompted various labour and social organisations to voice concern over the systematic subversion of workers' legitimate rights and social security (Das 2008a: 123–25). The so-called 'networking' efforts, under the governance of GVCs, have carefully kept off the labour question, except that there has been a nagging insistence for free labour regulations.

While globalisation has favoured only a small privileged section of the enterprises from a few sub-sectors (typically, garments, pharmaceuticals, electronics, and machine tools), one has to be cautious in being euphoric about participating in GPNs as the *sine qua non* for the progress of SMEs. Such practices have been encouraging a dependence syndrome in small enterprises and essentially been acting against generating an innovative ethos in the domestic arena. In fact, an overemphasis on external orientation can potentially result in the neglect of the domestic market, which needs various supportive measures including improvement of distribution channels so as to connect remote SMEs to larger markets within the country and also outside.

### *Growth performance*

Small firms, being highly heterogeneous, vary widely according to the sector they are in, the market they serve, the technology they use, the organisation of work within the firm, the nature of the workforce, and, most importantly, the nature of the productive and institutional relationships they are embedded in (Tewari and Goebel 2002). Going by the data obtained from the All India Census of Small-scale Industries, the small-scale sector recorded a relatively high growth in terms of number of units, investment, output, employment, and also exports during the pre-reform period (prior to 1991). This indicates that during this period this sector had been fairly successful in terms of achieving the declared policy objectives. As part of enhancing the competitiveness of Indian small firms, the strategy has essentially been to raise the capital intensity of production. However, given the preponderance of smaller or tiny units in this sector, it is likely that a few relatively larger units have emerged as competitive by being able to invest in expensive plant and machinery.

Unlike the conventional emphasis on supporting the small-scale sector with a clear purpose of promoting participation of labour, the policy mechanism has been driven by the interests of a small set of enterprises who would be keen on augmenting the machining capability of their units so as to be able to join the wider global market. Thus, as is evident from Table 4.2, while the output–capital ratio recorded a compound annual growth rate of 4.3 per cent during the pre-reform period, the corresponding growth during the post-reform period was negative. The labour intensity declined from about 156

**Table 4.2:** Selected Indicators of Performance of the Small-Scale Sector

<i>Item</i>	<i>1972–73</i>	<i>1987–88</i>	<i>2001–02</i>	<i>Growth Period 1</i>	<i>Growth Period 2</i>
Production/Investment in Fixed Assets	24.7	46.2	22.1	4.26	-5.13
Production/Employment	1.57	11.72	32.98	14.34	7.67
Employment/per unit of Investment in Fixed Assets	156.7	39.4	6.7	-8.79	-11.89
Investment in Fixed Assets/Employment	63.80	253.59	1489.29	9.64	13.48

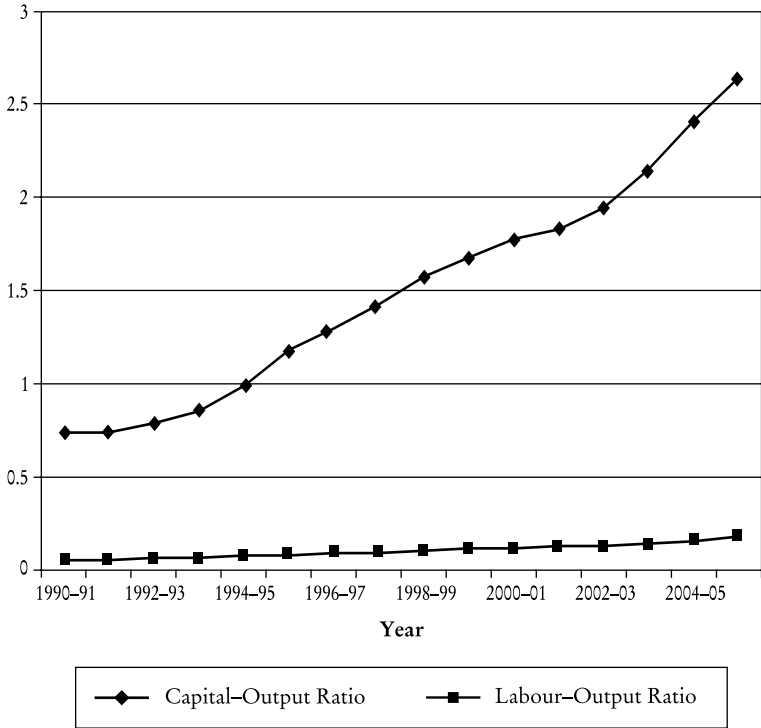
*Source:* Estimates based on All India Census Reports on Small-scale Industries, 1972–73, 1987–88 and 2001–02.

persons per million investments in 1972–73 to seven persons in 2001–02. While such an aggressive re-orientation has hardly helped in accelerating output growth (which has declined after 1992–93 and moved in a cyclical manner) of the small-firm sector during the last decade or so, it has led to an undesirable situation whereby the pace of rise in capital productivity (as expressed through the output–capital ratio) has far out-stripped that of labour productivity since the 1990s (Figure 4.2).

Estimates based on the All India Census Reports on Small-scale Industries, 1987–88 and 2001–02, indicated that labour productivity growth declined in almost all industries with the possible exception of food products. When it came to capital productivity, the reduction in growth rate was very drastic across industries.

### *A regional perspective*

In a country that is more diverse than most continents and in which balanced regional development has been upheld as a key policy objective, the role of the small-scale sector could not be overemphasised. While there have been varied policy initiatives to facilitate the regional spread of industries, even today, the distribution of industries is characterised by high regional concentration. The imbalance in the regional distribution appears to have accentuated with globalisation (Subrahmanian 2003). The point has been reinforced by the positive and highly significant value of the estimated rank correlation

**Figure 4.2:** Factor Productivity in SSIs, 1990–2006

Source: Das (2008a: 124).

coefficients over the years. Thus, as investment decisions got governed by the market test of profitability rather than social objectives even in the small-scale sector, their operations got confined to the developed regions. Here it appears that while the policy instruments and institutional arrangements have been in place, the small industries are not acting as catalysts of balanced regional development perhaps on account of the fact that regional innovation system does not exist or the interaction between different agents is too weak to facilitate the growth of industries. While growth rates in one or more of the three key variables — namely, number of units, employment and production — have often been negative even in industrially advanced states like Gujarat, Punjab and Tamil Nadu, most of the poorer states have fared badly during the liberalisation period (Sreepriya 2007). More

striking, perhaps, is the negative growth in West Bengal for all the three variables. The poor showing of the manufacturing sector in the state has been part of an overall decline of competitiveness of an erstwhile vibrant industrial sector and cannot be delinked from the nature of innovation system at the regional level and calls for more detailed investigation.

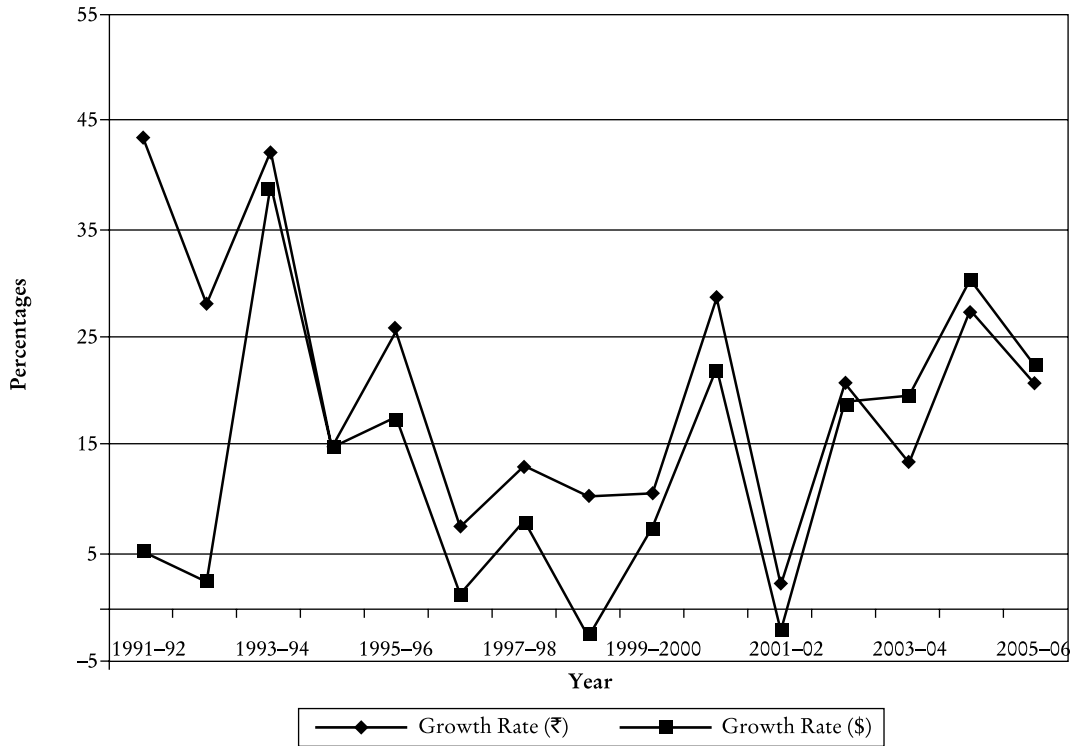
### *Exports: A mixed picture*

The performance of exports from the small firms in India presents a mixed picture. While ministry data suggests a steady rise in the value of exports, as between 1990 and 2007, growth rates have fluctuated heavily over the period. In fact, the growth rates based on dollar values have not only varied massively but have been negative for two years (Figure 4.3). The export performance in rupee terms hides more than it reveals.

If the available data is any indication, despite the share of SSI exports in total exports having gone up steadily over the years, its performance in relative terms lagged behind the economy as a whole during globalisation. To illustrate, the share of SSI exports in total exports almost doubled from about 16 per cent in 1973–74 to about 30 per cent in 1990–91. The increase thereafter has been at best modest. After reaching a level of 36 per cent in 1993–94 it declined to reach 33 per cent in 1996–97 and hovered around that level to remain 34 per cent in 2003–04. However, the 2008–09 data indicates that exports from the small-scale sector accounted for 40 per cent of total exports. This suggests that the innovation system governing the small-firm sector has been beset with factors hindering the learning innovation and competence-building process. Ensuring high standards of product quality across (and even within) most sub-sectors has remained a challenge. This could be due to the operation of informal practices (often influenced by price competition in the vast domestic market) and/or poor or no linkages with formal sources of R&D.

A consistent rise in the ratio of exports to production since early 1990s has not encouraged diversification in export composition. Considering values of major commodities exported since 1988, excepting for electronic and computer software, all other product groups have remained the same. Further, seven product groups (namely, garments, engineering goods, electronic and computer software, chemicals, pharmaceuticals, processed food, and leather goods) have

Figure 4.3: SSI Exports from India, 1991–2006



Source: Das (2008a: 128).

accounted for close to 90 per cent of exports from this sector. Thus viewed, it appears that while the innovation system in the SMEs as a whole is yet to be vibrant, there are certain sectors within the SMEs that appear to have displayed vibrancy. Therefore, there is scope for more detailed analysis using the sectoral systems perspective such that lessons could be learned for emulation by lagging sectors.

## Towards Evolving a Vibrant Innovations System: Recent Initiatives

Recognising the importance of SMEs from varied angles, various institutional interventions have been undertaken by the state with their implicit or explicit effect on innovation system in the SME sector. Despite these varied initiatives, if the discussion we had in the previous section is any indication, a vibrant innovation system in the SMEs is yet to emerge and this has been undermining their ability to be internationally competitive under globalisation and contribute towards the overall economic development. In this context, drawing from the reports submitted by different high-level committees, a number of new initiatives that are being undertaken require mention.

With the recent pronouncement of the 'landmark' Micro, Small and Medium Enterprises Development (MSMED) Act, 2006, the Indian government has clearly recognised the dynamic role to be played by the MSMEs in an increasingly globalised world. The clear thrust of the recent policy initiatives has been three-fold: (a) to enhance competitiveness through encouraging an innovative ethos amongst firms and being quality conscious, (b) to increase links with multiple stakeholders with a view to benefit from networks both nationally and globally, and (c) to strive for a larger market presence beyond the domestic. The policy attaches importance to networking with stakeholders both upstream and downstream in the entire GVC, from raw material procurement to processing/manufacturing, marketing and customer services. First, the Act has identified the category of 'medium' enterprises as a vital section in the manufacturing stream, and second, it has taken special note of distinct roles to be played by what are termed business service enterprises.

In addition to the MSMED Act, a plethora of contemporary policy initiatives in various spheres, particularly concerning SMEs, can be identified. It is important to state that these policy measures are fairly

nascent in origin and there hardly exists any basis to be euphoric about their effectiveness. Rather, one needs to be extremely cautious in extrapolating their impact, given that in the past many such policy measures with ample potential hardly have translated into enhanced performance of the MSMEs. Poor monitoring of implementation and effect of various small firm policies has been an issue of concern.

For the present purpose, it may be useful to discuss, briefly, the major policy initiatives in recent times that could have their effect on the innovation system as it operates in the SME sector (Das 2008b: 80–84).

### *Building competitiveness*

In the policy circles there has been a growing recognition of both the criticality and possibility of enhancing SME competitiveness through reducing cost of production, improving product/service quality and targeting niche markets. The most explicit such initiative has been the creation of the National Manufacturing Competitiveness Council (NMCC), which would, basically, identify and focus on certain clusters and firms in certain promising sub-sectors. The four major areas proposed to be covered for appropriate intervention, based on the diagnostic studies and discrete requirements of the enterprises or cluster or industry are: (a) manufacturing and engineering, (b) marketing, (c) financial and general management, and (d) information technology. The interventions would include technology upgrading, design and Intellectual Property Right (IPR) protection, marketing and sales promotion strategy, and skill upgrading, etc. Table 4.3 provides a list of the sub-schemes under the National Manufacturing Competitiveness Programme (NMCP).

The action plans would be implemented on a Public–Private Partnership (PPP) basis with provision for fund sharing by the firms and the government. As has been clarified on the official website, ‘[t]he Government assistance would not be in the nature of subsidy but for implementing the concrete interventions identified to improve competitiveness’ (NMCP n.d.). It also intends to link these initiatives with the existing schemes that promote competitiveness.

Another effort to encourage competitiveness in the SMEs has been the Visionary Leaders for Manufacturing Programme (VLMP), under the Indo-Japan Cooperation Agreement signed in December 2006.



**Table 4.3:** *Sub-schemes under NMCP*

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*Sub-schemes under NMCP*

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National Programme on Application of Lean Manufacturing  
 Promotion of ICT in Indian Manufacturing Sector  
 Mini-tool Rooms to be Set Up (by the Ministry of SSI)  
 Technology and Quality Upgradation Support for SMEs  
 Support for Entrepreneurial and Managerial Development of SMEs  
 Design Clinic Scheme to Bring Design Expertise to the Manufacturing Sector  
 Enabling Manufacturing Sector to be Competitive through Quality Management  
 Standards and Quality Technology Tools  
 National Campaign for Investment in Intellectual Property  
 Market Assistance/SMEs and Technology Upgradation Activities (the Ministry of  
 SSI in Co-operation with Technology Information, Forecasting and Assessment  
 Council/Council of Scientific and Industrial Research [TIFAC/CSIR])  
 Marketing Support/Assistance to SMEs

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*Source:* NMCP (n.d.).

The target group of the VLMP has been to create a critical mass of 300 ‘visionary’ managers, executives, Chief Executive Officers (CEOs), and entrepreneurs through imparting advanced training and exposure of ‘best practices’ from Japanese experience. These trained business leaders would help transform Indian manufacturing by underscoring industry–academia linkages and other business practices that increase competitiveness.

Promotion of products from rural areas and provision of marketing support to these and numerous other products in the sector have somehow missed the attention of the concerned state agencies in the globalisation drive; the situation, incidentally, had never been better even during the earlier decades. As one looks into the various ‘new’ initiatives of the government — especially the various sub-schemes under the NMCC — concerning building competitiveness, an explicit emphasis upon focusing on *selected* product groups which have potential for global competitiveness resonates partiality favouring the well-off sub-sectors and within those the bigger alert ones. The industries chosen to be promoted are food processing, garments, engineering, consumer goods, pharmaceuticals, capital goods, leather, and IT hardware. The question of providing basic business infrastructure to the huge number of enterprises in non-metro regions and connecting them to the mainstream marketplace has not been an issue of concern. There remains a major lesson to be learnt from the Chinese strategy of

the state playing a vital role in creating a dynamic business environment (including building physical and economic infrastructure) for networking between manufacturers and traders who are otherwise disadvantaged by distance and limited local market.

### *Promoting innovativeness and awareness about quality*

A key area of worry for SME development has been ensuring a business environment that generates an innovative ethos and a serious concern for product/service quality. While it is well recognised that product/service quality determines marketability, especially, in the global arena, Indian SMEs, with exceptions, are yet to gear up to face the challenge. While in certain sectors FDI in technology and services has been on the rise and are welcome as well, its broad-basing has remained a major issue; sub-contracting relations with MNEs has not been an automatic and unconditional mechanism to enhance innovativeness in domestic firms. Recent policy measures have attempted to address this issue of facilitating a greater number of SMEs to improve the level technology through accessing support from the recently-created Technology Bureau for Small Enterprises (TBSE). This SIDBI arm has collaborative arrangement with the Asian and Pacific Centre for Transfer of Technology (of the United Nations Economic and Social Commission for Asia and the Pacific [UNESCAP]) that would help enterprises to strengthen their capabilities to 'develop, transfer, adapt and apply technology; improve the terms of transfer of technology; and identify and promote the development and transfer of technologies relevant to the region' (APCTT n.d.). This would provide a good opportunity for SMEs to establish business collaboration with foreign firms as also to access professionally-managed acquisition of foreign technology.

Amongst various measures initiated to upgrade quality, an insistence upon obtaining ISO certification has been somewhat well responded to, with the provision of reimbursement of 75 per cent of costs in acquiring the certification; on an average, annually over 3,000 enterprises have been availing this service for close to 15 years now. Further, for aspiring MSEs, schemes to reimburse part of the expenses to units opting for bar coding and credit-linked capital subsidy for technology upgrading have been launched. In order to improve entrepreneurial

skills, state governments could provide financial assistance up to 50 per cent of total costs to Entrepreneurship Development Institutes (EDIs), which engage in creating training infrastructure. Similarly, the government would partly contribute to setting up of mini tool rooms and testing centres by industry associations. The emerging mechanism of providing micro-finance for micro-enterprises is also visualised as a preliminary step in 'preparing' them to develop with stronger technological abilities.

### *Enabling SMEs to participate in global value chains and markets*

For Indian SMEs, participating in the GVCs to upgrade the technological capability and quintessentially expanding global market access has not been easy as constraints exist in terms of these firms being World Trade Organization-Intellectual Property Rights (WTO-IPR) regulations compliant, awareness regarding appropriate steps involved in an international sub-contracting, familiarity with complex bureaucratic procedures in external trade, and conducting business through e-commerce. Contrary to the previous 'protective' regime, there has been substantial relaxing of FDI norms that has, in fact, resulted in increasing interest of MNEs to invest in India, particularly in the sphere of garments, automobiles, electronics, chemicals, etc. Although in its formative stages, government efforts are on to facilitate networking between SMEs and foreign firms. Advisory and other services are being made available to SMEs to link with GPNs towards activities such as joint procuring of inputs, co-operative selling and undertaking and benefiting from joint market research. Some of the steps in this direction include starting of a number of business support services as awareness and training programmes for familiarising firms with systems of patenting, norms under the IPR regime; the establishment of the National Intellectual Property Organization (NIPO) has been an effort in that direction.

As far as participating in external markets are concerned, there have been the MDA schemes of both the Ministry of Commerce and Ministry of MSME which offer funding support for participation in international fairs, study tours abroad, trade delegations, publicity, etc. Further, in its recently revised MDA scheme (April 2006), the

Ministry of Commerce has underscored the following aspects of business promotion by Indian SMEs abroad:

- (a) assist exporters for export promotion activities abroad;
- (b) assist Export Promotion Councils (EPCs) to undertake export promotion activities for their product(s) and commodities;
- (c) assist approved organisations/trade bodies in undertaking exclusive non-recurring innovative activities connected with export promotion efforts for their members;
- (d) assist Focus export promotion programmes in specific regions abroad like Focus (Latin American Countries), Focus (Africa), Focus (Commonwealth of Independent States) and Focus (ASEAN +2) programmes;
- (e) residual essential activities connected with marketing promotion efforts abroad.<sup>10</sup>

As is well recognised, greater use of ICT has emerged as the *sine qua non* of business networking and growth, both at home and abroad. Given that India has an added advantage in this aspect, policy efforts are being directed towards making the best use of this technology. However, as indicated earlier, caution needs to be exercised in linking local business with GPNs.

### **Fostering Industrial Clusters: Strategic Limitations**

With the launch of the cluster development programme in India by the United Nations Industrial Development Organization (UNIDO) in 1997, promoting clusters as a strategy to enhance the competitiveness and to participate in the GVC has been almost a celebrated strategy countrywide. The surge of various cluster schemes could be observed since 2000. Numerous government and quasi-government documents have acknowledged cluster development as the most important initiative to improve the performance of the MSMEs in the country (Das 2006: 117–18). For instance, the Draft 11th Five-Year Plan document states that '[a] cluster approach can help increase viability by providing these units with infrastructure, information, credit and support services of better quality at lower costs, while also promoting their capacity for *effective management of their own collectives*' (Planning Commission 2006: 35; emphasis added).

The acknowledged traditional benefits of clustering, identified in the literature on agglomeration economies, include the following: (a) information/knowledge spillover at the enterprise level; (b) sharing of inputs, services and technology; (c) multi-skilling of labour leading to improvement in job opportunities; and (d) draws the interest of both customers as well as suppliers/wholesalers. Moreover, the advent of globalisation has opened up newer spheres of networking and business spread.

Cluster development has attracted much attention in the policy circles as it has potential for broad-based networking amongst the government, private sector, academia, and various support/service agencies, both within and outside the country. Some dynamic and modern sectors such as garments, pharmaceuticals, IT-based industries, leather goods, and machine tools seem to have benefited extensively through following the cluster approach and there is redoubled enthusiasm to extend these advantages to the traditional and artisanal clusters spread across the country.

Given the vast range of goods produced in clusters, levels of technology and markets accessed, a recent policy-oriented study (Das et al. 2007) has classified the clusters into: (a) high-tech clusters (mostly knowledge-based and IT-linked); (b) traditional manufacturing clusters (non-high-tech and non-micro sectors like leather goods, ceramics, garments, etc.); and (c) low-tech, poverty-intensive micro-enterprise clusters (including handicrafts, handlooms and other labour intensive micro-enterprises). Despite major limitations of obtaining cluster-specific data, information on some key variables has been compiled in Table 4.4; no useful database concerning the so-called service clusters is available.

**Table 4.4:** *Typology of Industrial Clusters in India*

<i>Parameters</i>	<i>Micro-enterprise Clusters</i>	<i>Traditional Manufacturing Clusters</i>	<i>High-tech Clusters</i>
Number of Clusters	6,000 (93.6%)	388 (6.1%)	20 approximately (0.3%)
Estimated Share of Employment (by Cluster Typology)	80%	14%	6%
Average Wage Levels	Low	Medium	High

*Source:* Das et al. (2007).

It is important to note here that there exist a number of government schemes/programmes to support various requirements of MSMEs, including provision of industrial estates, marketing support and concessional credit. Nevertheless, these schemes typically address the need at the enterprise level. The cluster approach to the contrary (and as mentioned previously) focuses on a range of activities that concern collective issues, whether provision of common facility centres, cluster-specific transport infrastructure, linking to the external markets, or encouraging participation in trade fairs. The most important advantage, however, is the potential of networking with an array of stakeholders in the business that widens scope for both enhancing product/process quality and operating gainfully in a larger market space. The synergy of collective action improves manifold as enterprises in the similar product line pursue certain common business goals.

A close look at most schemes/programmes focusing on cluster development in India reveals that these discrete initiatives have often defined clusters differently and are being implemented by a diverse set of agencies including central government ministries, state governments, international agencies, and other specialised (e.g., financial) institutions. These schemes have diverse agenda and support instruments and focus upon a specific group of products/clusters in different parts of or entire country. Despite a diverse set of actors, limited interaction and co-ordination between them on account of the limited understanding of the need for evolving an innovation and production system for the SMEs appears to be an issue that requires immediate attention.

In order to distinguish cluster policy from policies for MSMEs, it is important to recognise that the quintessential cluster concept is multi-dimensional and encompasses aspects such as the sub-sector, space and its various linkages with agencies/institution, both internal and external, to the site of production that in turn help the emergence of a vibrant system of innovation and production. While the sub-sector represents the activity/services per se, space relates to the regional dynamics within which it works on location; the spatiality of clustering is not merely a reference to the *place*, that is, say, rural or urban, but indicates the level of local development that determines the cluster's access to both social and economic infrastructure and institutions. The variety of internal and external linkages (whether in terms of intra-community ties, business associations, technology sharing, support from specialised institutions, trust, networking, co-operation, etc.)

suggests the extent to which the sub-sectoral/regional policy and institutions are able to articulate the demand for developmental intervention or determine the path of the progress of the cluster.

The performance of a cluster, including its potential to move up in the value chain and be innovative, depends crucially upon these factors. These amply indicate the nature of policy intervention cluster promotion shall entail. Although a cluster is a meso-level entity, it is obvious that a combination of macroeconomic, sectoral and regional/local policy instruments would effectively address complex and multiple issues facing its growth and competitiveness. In order to appreciate the need for a multi-pronged approach to promote clusters, it is essential to recognise the following key dimensions of clustering in India: first, market access, and second, the nature of technical processes (concerning product quality, technology, adherence to legal norms, labour use, etc.) that characterise the cluster dynamics.

Clusters in India cater to varied and substantial markets at local, regional, national, and international levels; the vast size of the domestic market necessitates distinct strategies to network among different actors to promote them. It is natural that the market for certain products could be limited by the locality or culture-specific need or absence of cost-competitiveness due to high material or transport cost. In such cases supportive interventions need to be made towards product diversification and upgrading local technological capabilities of these clusters. Exploring ways of rendering the products geared towards a high-value-adding export market through linking with the GVCs thus becomes an important policy focus. This is especially challenging as one deals with the specific cases of what may be classified as poverty clusters.

It needs to be acknowledged that a large number of industrial clusters in India often derive advantages through functioning in an informal/illegal manner as exemplified through poor labour standards, inferior input use, copying trademarks/designs, flouting of fiscal/environmental regulations, etc. These are indicative of either the absence of, or at best, the presence of an innovation system that is immature or in its infancy.

## Concluding Observations

India is one among the developing countries that have undertaken a series of institutional interventions to develop an innovative and

vibrant SME sector on account of their role in generating employment, facilitating balanced regional development and other social objectives in the country's national system of innovation and production. As a result, with the proliferation of a large number of small enterprises, the SMEs sector has emerged as a major source of industrial output, employment and export earnings. With the initiation of market-oriented reforms there have been changes in the institutional arrangements that governed the innovation system in the SME sector as well. Going by the available indicators, the SME sector has not been able to withstand competition from the world market as the earlier regime of protection and regulation gave way to competition under globalisation. The sector in general lagged behind in terms of employment generation and also exports. Also, it appeared that as investment decisions got increasingly governed by the dictates of the market, even the SMEs began to get regionally concentrated into more advanced regions, thus aggravating rather than mitigating regional inequities.

Elaborate institutional arrangements for the financing of SME development at the national, state and regional levels notwithstanding the share of SMEs in the total net bank credit by the public sector banks has been on the decline since 1997–98 and has touched a low of a mere 8 per cent in 2006–07. It may not be an exaggeration to state that the maze of institutions for promoting science and technology across space and product spectrum in SMEs in India has no parallel in the developing world. Yet the R&D intensity in the small-scale sector has been declining over the years. Moreover, R&D activity is not prevalent in all the industries but confined only to a dozen with others yet to get involved in any significant manner. Interestingly enough, there is absolute lack of co-ordination between the sectors (small-scale, private and public sectors) in terms of research investment. Yet the study locates a few sectors that display substantial vibrancy which in turn leave scope for learning from within. The SME sector has been taking a backseat with respect to credit allocation calling for a proper system of financing SME development.

While India is home to a large number of natural industrial clusters dominated by SMEs and subcontracting has been systematically promoted through varied policy initiatives, learning, innovation and competence building systems as articulated in the National Innovation System framework is yet to evolve in its real sense. All these indicate the immature nature of India's innovation system as it operates in the



MSME sector. Hence, there is much need for institutional arrangements that go beyond clustering and subcontracting to facilitate interactive learning through clustering, spin-offs, new modes of financing investment and skill upgrading, user–producer interaction and communication with the universities and public research laboratories, and increased participation in global/local production networks.

While a plethora of new measures are being initiated under the recent MSMED Act toward strengthening the innovation system, much would again depend on how these function in a realistic scenario. External orientation and a global outlook for the SME sector must first address persisting basic constraints facing the sector in terms of evolving a vibrant system of innovation and production. As the Indian SMEs are looking forward to a newer and larger market space with numerous advantages of skills, raw materials and a large domestic market as well, networking with various stakeholders both within and outside the country is a worthwhile attempt. To the extent that such interaction with different actors and the learning that is accrued is crucial for competence building, the key challenge is to evolve a vibrant innovation system which apparently is in its infancy at present.



## Notes

1. At the outset it needs to be noted that the category of ‘medium’ enterprises has been introduced only recently in India — in October 2006 — with the promulgation of the Micro, Small and Medium Enterprises Development (MSMED) Act, even as in certain sub-sectors ‘small’ enterprises had invested in plant and machinery far above the amount stipulated.
2. The investment limit as of now for the enterprises engaged in serviced activities is US\$ 0.021 million, US\$ 0.423 million and US\$ 1.059 million respectively in case of small and medium enterprises.
3. In the discussion that follows, we use the term SME interchangeably with Small-scale Industry (SSI) and MSMEs.
4. For a more detailed discussion, see Sreepriya (2007) among others.
5. For an overview of all the reports in terms of the major recommendations made and accepted by the government, see GoI (2010).
6. For more details, see *ibid.*
7. For more details, see Ministry of MSME (n.d.).
8. For more details, see UNIDO (n.d.).

9. In India, R&D data across different industries have been compiled and published by the Department of Science and Technology (DST) from 1976–77. These data relate to units registered with the DST initially (1973–84) and subsequently with the Department of Scientific and Industrial Research (DSIR). Notwithstanding the comprehensive nature of the database in terms of the large number of variables included, the coverage of units is quite problematic. Though data are collected for public, private and small-scale sectors, data pertaining to R&D investment in the small sector are poorly represented, as the registration of R&D units by the industry is voluntary and may not capture the R&D expenditure of those units which do not find it necessary to register with the government. It has also been argued that a sizeable number of firms utilise the R&D units' registration scheme as a means of importing restricted machines and very little R&D work happens in these units (Desai 1984). Moreover, the classification of data as 'public', 'private' and 'small-scale' is odd since the first two are based on ownership and the last one is based on size; hence, comparisons are bound to be biased and skewed.
10. <http://commerce.nic.in/trade/mda-guidelines.pdf> (accessed 10 June 2013).

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# 5

## National Innovation Systems in China

### *Role of SMEs*

*Yuan Cheng and Jian Gao*

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With the arrival of a knowledge-based economy in China, the development of the national innovation system has become a key strategic objective in the development of the country. As a core element of the national innovation system, Small and Medium Enterprises (SMEs) are its driving force. In fact, in China SMEs account for more than 99 per cent of the total number of enterprises and have made tremendous contributions to economic development. Particularly science and technology (S&T) SMEs — a number of them holding intellectual property rights — have enjoyed rapid growth and become the most active innovation drivers in the new era, and an indispensable force in China's future economic development. Since SMEs' role in technological innovation and the national innovation system is so important, an objective analysis of this role will help us understand and promote innovation, and further encourage the development of national innovation systems.

The definition of the standards for SMEs enterprises are based on the 'Interim Regulations on Small and Medium-Sized Standards', which was issued jointly by the State Economic and Trade Commission, the State Planning Commission, the Ministry of Finance, and the State Statistics Bureau in April 2003. These standards establish the number of employees, the amount of sales, total assets as indicators,

combined with the characteristics of the industry, and are applicable to all types of ownership and various forms of business organisations. The standards' provisions are provided in Table 5A.

SMEs are playing an increasingly important role in the modern economic development of all countries. China despite being a relative latecomer to modern industry has been very successful; the manufacturing sector has especially enjoyed high growth rates. Since China adopted a reform and opening up policy in 1978, the number of SMEs has steadily grown. As of October 2006, the number of SMEs reached over 42 million, accounting for 99.6 per cent of total enterprises. The value of products and services created by SMEs accounted for 58.5 per cent of national Gross Domestic Product (GDP) and 68 per cent of total import and export. National taxes paid by SMEs accounted for 48.2 per cent of total revenue.

China's scientific and technological innovation system has undergone three development stages since the reform and opening up in 1977. The first innovation stage, from 1978 to 1995, involved application of plan-led models, explored the development of the national innovation systems and innovation policy, and introduced a reform of policies and measures. During this stage, the state established a series of plans: national scientific and technological plans; High-Tech Development Plan (863 Program); the Torch Program; the Spark Program; the National Natural Science Foundation; and the Climbing Plan. It also set up a number of S&T parks.

The period from 1995 to 1998 is considered to be the second developmental stage for the national technology innovation system. During this stage, China examined the patterns of technological innovation of enterprises, established an enterprise reform and property rights systems, and tried to strengthen market economy-based innovation functions, and speed up the commercialisation and market orientation of scientific and technological achievements. The state also launched the 'Science and Education Country' strategy. In 1998, China launched a 'technical innovation project', focused on enhancing the technological innovation capability of enterprises. In June 1998, the Chinese Academy of Sciences of the State Council decided to start the first 'Knowledge Innovation Program' as a pilot of national innovation system, thus entering its third phase.

## Methodology and Framework

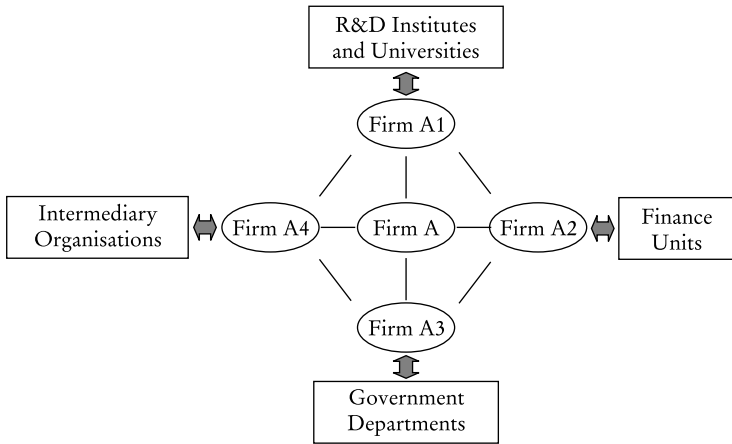
### *Methodology*

This study begins with an analysis of two forms of industrial clusters: manufacturing industry and innovation. The manufacturing industry cluster is a traditional one that includes traditional crafts and labour-intensive industries such as textiles, textile, garments, footwear, furniture, and metal. A large number of SMEs are organised in clusters and have organic links to a network of market organisations. Innovation clusters are clusters of high-tech industries, which rely mainly on local R&D capability, such as well-known universities and research institutions. There is close co-operation among enterprises, with a strong atmosphere of innovation. Most enterprises located in the two clusters are SMEs which, through the focus on development, innovation and promotion of industrial clusters, in effect promote the development of the national innovation system.

Cluster analysis is increasingly used to analyse the interaction among knowledge flows between different agencies which constitute a part of the national innovation system. By looking at the process of knowledge innovation activities — from the emergence of the concept to the development and maturity of a particular innovation — we can start to understand the essence of the process of knowledge creation, transmission, reservation, and transformation. This in turn would help us to improve innovation efficiency and facilitate business connections, therefore further enhancing knowledge flows.

Individual enterprises' understanding of a particular innovation comes mainly from internal research and development (R&D), cooperative R&D and spillovers. However, in industrial clusters, which own complementary resources and capabilities, the source of knowledge is not only that located in individual enterprises within but also the one arising from the interaction between businesses and between enterprise and research institutions, and from interactions with stakeholders beyond the clusters. Models of the flow of knowledge among different clusters have significant differences. Figure 5.1 illustrates the inter-linkages between various parts.



**Figure 5.1:** *Components and their Linkages in a Cluster*

Source: Yang et al. (2006: 9).

Industry clusters are the engine that promotes the interaction between companies and their production and innovation efforts. In the late 1990s, along with the rapid development of China's electronics industry clusters — such as Zhongguancun (Beijing), Dongguan, Guangdong — and that of computer parts in Zhejiang, Jiangsu, Shanghai and other places, industrial clusters have become the main driving force of regional development. At present, the number of clusters in the world is growing rapidly and China is becoming a major growth region.

## Framework

This chapter first defines SMEs and national innovation systems, then takes industrial clusters as the research object and analyses two types: manufacturing industry clusters and innovation ones. In the manufacturing cluster, we will look at the development status, contribution to the national economy and development characteristics of the Pearl River Delta and Yangtze River Delta as typical examples. In the innovation clusters, the main research objects are national high-tech zones, the S&T incubator and University S&T Parks. We examined the status of their development, contribution to the national economy, and their impact in terms of promoting the development of SMEs. Based on these, we undertook a further analysis of the characteristics

of innovation clusters. We then looked at the limitations and difficulties facing SMEs and did a simple study of the development of public policies and venture funds to support SMEs and the innovative services system.

## Manufacturing Clusters

Manufacturing is the core of China's national economy and the driving force of industrialisation; it is fundamental to increasing China's economic power and its comprehensive national strength. The Pearl River Delta and Yangtze River Delta are the most dynamic economic zones in China. As the country's two fastest-growing economic areas, the growth rate of the Double Triangle has maintained a double-digit growth for many years. After three decades of opening up and development, the Pearl River Delta and Yangtze River Delta have become widely known as 'world factories'. Compared with other regions, the most obvious characteristic of the Double Triangle is that the manufacturing industry plays a central role in the dynamics of its development, helping it to become a significant industry cluster.

### *Pearl river delta*

#### **Brief Introduction**

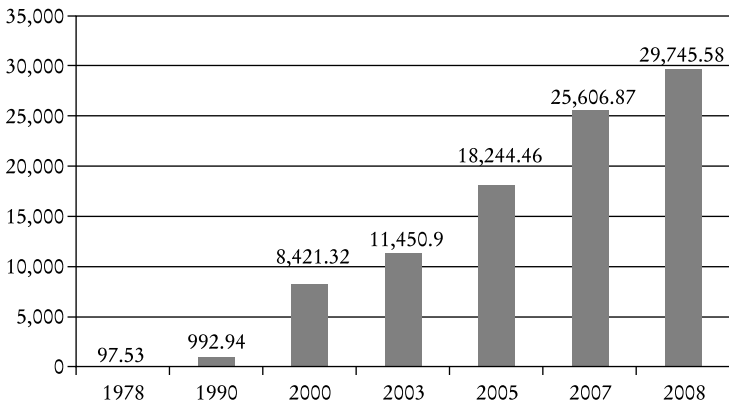
The Pearl River Delta Economic Zone is located in the northern part of Hong Kong and is composed of nine cities: Guangzhou, Shenzhen, Foshan, Zhuhai, Dongguan, Zhongshan, Huizhou, Jiangmen, and Zhaoqing. Its area is 24,437 square kilometres, less than 14 per cent of the land area of Guangdong Province. After 30 years of restructuring and opening up, the regional economic development of Guangdong shows specific characteristics. Its leader, the Pearl River Delta region, has become the vanguard of reform and opening up, showing a robust pattern of interaction between industrialisation, urbanisation, information, and internationalisation and has become the most vigorous, vital and fastest growing economy in the world. It is also the most influential region in China and a major production-manufacturing base of the world. In the 21st century, the Pearl River Delta has been enhancing its leading position, and its economic relations with Hong Kong and Macao have become much closer. It has also improved its development dynamics and adopted more innovative market mechanisms.

On 8 January 2009, the State Council issued the ‘Reform of the Pearl River Delta Region Development Plan (2008–2020)’, which pointed out that by 2012, the Pearl River Delta Region would be an example of socioeconomic leadership with per capita GDP at US\$ 11,765; by 2020, its GDP per capita will reach US\$ 19,853. It had reached US\$ 13,905 by 2012.

### Contribution to the National Economy

(a) *Total Economic Output*: Steady increase in total economic output in the Pearl River Delta will continue to enhance future development. In 1978, the GDP of the Pearl River Delta was US\$ 1.43 billion; in 1990, it reached US\$ 14.60 billion. The region came into the fast lane in the 21st century, achieving a GDP of US\$ 1,238.43 billion in 2000, US\$ 0.17 billion in 2003, US\$ 0.27 billion in 2005, and US\$ 0.38 trillion in 2007. In 2008, the GDP of the Pearl River Delta was close to US\$ 3 trillion with a total value of US\$ 434,284 million, accounting for 10 per cent of gross GDP. GDP per capita is higher than the national average. Figure 5.2 shows the GDP of Pearl River Delta over the years.

**Figure 5.2:** Evolution of Gross GDP in Pearl River Delta Region (in US\$ 100 million)



Source: China Statistical Database. <http://219.235.129.58/welcome.do> (accessed 6 June 2013).

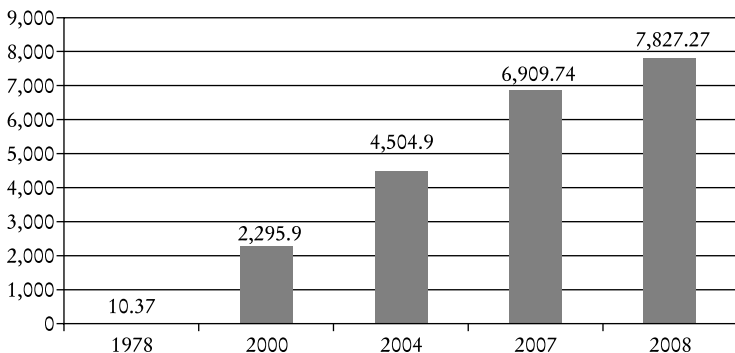
In 2008, per capita GDP of the Pearl River Delta reached US\$ 9,019.9. The figure for Guangzhou, Shenzhen and Foshan went up to

more than US\$ 10,000; Shenzhen, the highest, reached US\$ 12,932.0, exceeding the level of national income under the first-class standards, which is the highest income level in China (Guangdong Provincial Bureau of Statistics 2008).

(b) *Investment in Fixed Assets*: Steady increase in investment in fixed assets in the Pearl River Delta region in 2008 amounted to a total fixed asset investment of US\$ 115.11 billion, 13.5 per cent more than the US\$ 101.61 billion invested in 2007, and 755 times more than the investment in 1978 — US\$ 0.15 billion. Three cities — Guangzhou, Shenzhen, Foshan — reached US\$ 70.52 billion in investment, which accounted for 42.9 per cent of total investment in the province (ibid.). There was investment in building a number of major projects that were completed or are progressing smoothly: the Huizhou CNOOC and Shell Petrochemicals project was completed and put into production; the Shenzhen Ling Ao Nuclear Power Phase II project is in the process of large-scale construction and will provide a reliable energy supply to Guangdong after being completed; Guangzhou has opened four subway lines, built and opened a total number of 59.3 kilometres of lines and other lines are under construction; Guangzhou University City is proceeding smoothly; and a group of projects related to electric power, posts and telecommunications, highways, ports, and some other large investment projects are stepping up construction.

The pattern of fixed assets investment in the Pearl River Delta over the years is shown in Figure 5.3.

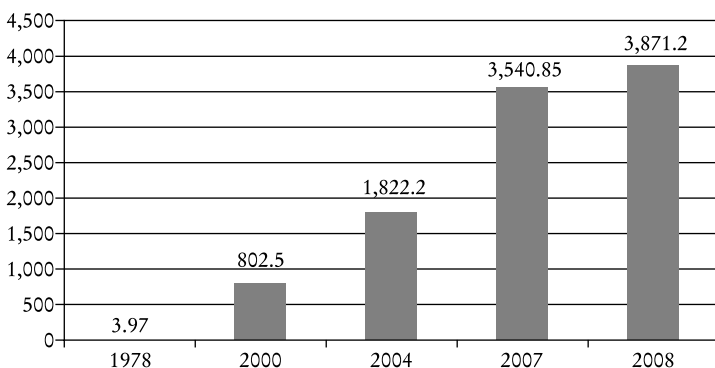
**Figure 5.3:** *Investment in Fixed Assets:  
Pearl River Delta (in US\$ 100 million)*



Source: China Statistical Database. <http://219.235.129.58/welcome.do> (accessed 6 June 2013).

(c) *Exports*: The Pearl River Delta region is a major market for imports and exports. In 2008, the total annual import and export reached US\$ 656.74 billion, with an increase of 7.6 per cent including exports of US\$ 387.12 billion, 9.3 per cent more than the US\$ 354.085 billion in 2007, and 975 times more than in 1978. Shenzhen's total exports in 2005 exceeded US\$ 100 billion, becoming the country's first super-export city of US\$ 100 billion. Following that, in 2007, the exports reached US\$ 168.542 billion, and in 2008, US\$ 179.74 billion (Guangdong Provincial Bureau of Statistics 2008). The major countries and regions that the Pearl River Delta exports to are Hong Kong, the United States (US), Japan, the European Union (EU), Association of Southeast Asian Nations (ASEAN), and Taiwan. Commodities that are exported include mainly machinery and electrical products, and high-tech products such as mobile phones, data-processing equipment, monitors, television sets, motorcycles, etc.; traditional goods exported comprise textiles, clothing, furniture, plastic products, footwear, and so on. The situation of foreign trade and exports of the Pearl River Delta over the years is shown in Figure 5.4.

**Figure 5.4:** Evolution of Pearl River Delta Exports (in US\$ 100 million)



Source: China Statistical Database. <http://219.235.129.58/welcome.do> (accessed 6 June 2013).

From 1979 to 1999, foreign capital utilised in the Pearl River Delta amounted to US\$ 70.613 billion, accounting for 63.8 per cent in the province. From 2000 to 2007, the Pearl River Delta attracted foreign direct investment of US\$ 95.865 billion. The allocation of investment changed progressively from manufacturing sector to service industries, international finance, insurance, logistics, advertising, and other

industries. By the end of 2007, 160 of the world's top 500 enterprises had investments in Guangzhou. A large number of foreign investment flows into real estate, finance, exhibition, consulting, culture, entertainment, and other services, greatly enhancing Guangzhou as a regional centre. In 2007, the number of approved foreign investment projects of at least US\$ 10 million in Guangzhou reached 246 (Guangdong Provincial Bureau of Statistics 2008).

(d) *Living Standards*: Rapid development of the Pearl River Delta economy provides a rich source of revenue and increases the wealth and income of residents. In 2008, the Pearl River Delta region completed the general budget of local fiscal revenue, which amounted to US\$ 33.06 billion, or 19.5 per cent more than the US\$ 27.68 billion budget in 2007. This is 106 times that of 1978, or 0.7 per cent higher than the average for the province. The proportion of local financial revenue on the total general budget for the province went up from 53.8 per cent in 1978 to 67.6 per cent in 2007. The proportion reached 69.9 per cent in 2008, which is part of the initiatives towards the growth of the revenue of Guangdong. Disposable income per capita of urban residents showed a steady increase and people's living standards have improved significantly (ibid.).

### **Characteristics of the Pearl River Delta**

Economic development relies heavily on labour-intensive industries and the Pearl River Delta is one of the areas that attract mostly external labour force. Low labour cost advantages have been fully utilised. During the 1980s and 1990s, a large number of labourers gathered in the Pearl River Delta. Together with various other factors for production that concentrated in the region (the means of production, capital, technology, human resources), this greatly promoted the urbanisation process, helping to further improve the economic status of the region.

Economic development has benefited from the interaction between Hong Kong and Guangdong. Due to geographical proximity, the investment from Hong Kong, Macao and Taiwan accounted for the vast majority of the manufacturing investment from foreign sources. Hong Kong's 'three plus one trading mix', which includes custom manufacturing ('with materials, designs or samples supplied by the customer') and compensation,<sup>1</sup> started the process of industrialisation in Shenzhen. Hong Kong's activities created a prototype for an export-oriented economy in Shenzhen. This led to economic development

of other cities in the Pearl River Delta. Import and export trade with Hong Kong and Macao accounted for the majority of the import and export trade in the Pearl River Delta region. This includes the tourism, real estate and financial services industries, all of which take advantage of the 'Hong Kong factor'. Due to the geography of the region, Hong Kong's investments are more concentrated in Shenzhen, Dongguan and Guangzhou; Macau's investment are more concentrated in Zhuhai and Guangzhou; and Taiwan's investments, which are more social in nature, are more concentrated in the Dongguan and Zhongshan.

The Pearl River Delta's manufacturing is at the bottom of the value chain in the division of labour and global co-operation. Industry clusters, formed by transferring manufacturing from Hong Kong and Taiwan, are mostly vertical-type ones, which means that they participate in the global competition and production by assembling or processing labour-, capital- or technology-intensive products. The added value and profit are very small. A relatively stable production and sales network has already existed before the formation and concentration of foreign-funded enterprises. The industrial cluster is a replication and extension of the existing vertical structure of production networks in the Pearl River Delta. It is embedded in a low-level industrial structure, which means enterprises in these clusters only imitate foreign-funded enterprises and have less capital and subordinate technology. Foreign investments in the Pearl River Delta are majorly labour intensive. Multinational enterprises transfer labour-intensive businesses to China, which helps the local economy in the process of industrial transfer and industrial restructuring, and shifting less-advanced industries to the Pearl River Delta to make room for the local development of more advanced industries.

Although the proportion of technology- and capital-intensive industries has increased, even the information industry — which is concentrated in Dongguan and is a priority, including the hot spots areas of Taiwanese investment — is in the low-end value chain. Because high value-added segments, such as core technology, marketing, design, and management, were grasped by parent companies, the local enterprises can only engage in processing, assembly and other low-end segments, and as a result their capability for independent innovation is weak, the profit relatively thin, and its potential role as driver of the local economy very limited.

## Difficulties Pearl River Deltas Faced During the Financial Crisis

Low labour cost advantages are mainly due to the large number of available rural migrant workers, and manufacturing enterprises depend on them. However, the Pearl River Delta has recently suffered from a shortage of workers. Although orders have increased, unit prices for goods have decreased, therefore reducing gross profit to only 3 to 4 per cent. It is highly possible that many low-end manufacturing SMEs will not survive in the future because of low profitability and increasing labour cost. Why is there a lack of rural migrant workers? Increasingly, young rural workers aspire to a better working environment. Also, having higher educational level than older ones, they have started paying attention to labour rights. However, lots of labour-intensive SMEs ignore the demands of employees, and as a result many rural workers would rather stay in the countryside than migrate to cities to work for those enterprises.

### *Yangtze river deltas*

#### **Brief Introduction**

The Yangtze River Delta region, in eastern coastal area of China, is crucial to China's economic development. Since reform and opening up, the Yangtze River Delta has made full use of international and domestic markets, and risen rapidly to become one of the most dynamic regions in the country. The Yangtze River Delta Metropolitan Area is the belt composed of 16 cities on the fan-shaped alluvial plain around the Yangtze River delta. Shanghai is the area's leader city; the other cities include Hangzhou, Ningbo, Jiaxing, Shaoxing, Huzhou, Zhoushan, and Taizhou (2003 accession) in Zhejiang Province; and Nanjing, Wuxi, Changzhou, Suzhou, Nantong, Yangzhou, Zhenjiang, and Taizhou in Jiangsu Province, all of which are within 100,000 square kilometres from Shanghai. Due to the differences in city size in the Yangtze River Delta region, the level of their economic development has relatively big variations. In recent years, Shanghai, as the central Yangtze River Delta city, has played a leading role in the economic development of the Yangtze River Delta. Second, there was a rapid economic development in southern Jiangsu, especially the

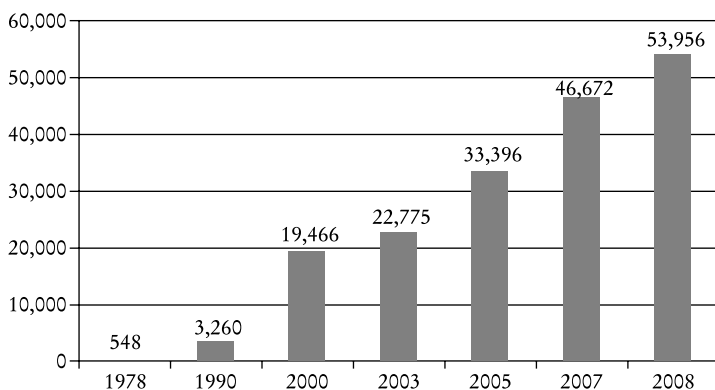


Suzhou-Wuxi-Changzhou region, due to the economic influence of Shanghai. The growth of the seven cities in Zhejiang province lacks the dynamic drive of the large metropolis so the pace of development there is slower than in the eight cities of Jiangsu.

### Contribution to the National Economy

(a) *Total Economic Output*: The Yangtze River Delta cities enjoyed rapid economic development and a rising economic output. The GDP reached US\$ 64.195 billion in 1990, while in 1978 it was US\$ 36.53 billion. In 2003, GDP reached US\$ 275.4 billion and by 2008, the 16 cities in Yangtze River Delta region had a regional GDP of US\$ 777.4 billion and its proportion of the national economy, which was 15 per cent in 1978, increased to 19 per cent in 2007 and dropped to 17.9 per cent in 2008 (Jiangsu Statistical Bureau 2008). The GDP of Yangtze River Delta region over the years is shown in Figure 5.5.

**Figure 5.5: GDP Evolution:**  
Yangtze River Delta Region (in CNY 100 million)

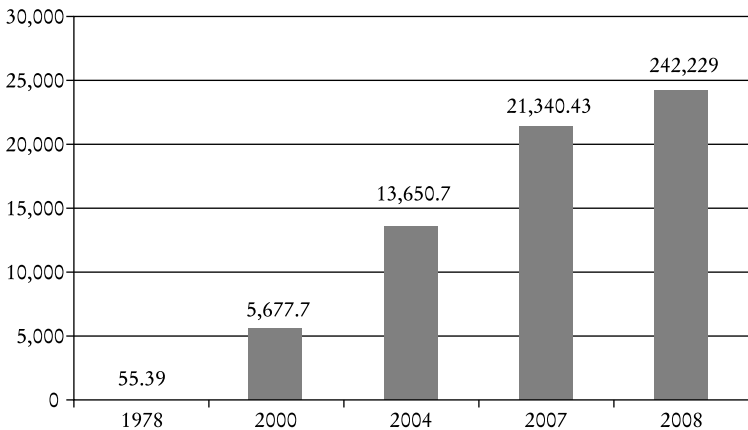


Source: Jiangsu Statistical Bureau (2008).

(b) *Investment in Fixed Assets*: The scale of investment in Yangtze River Delta cities is growing. In 1978, investment in fixed assets amounted to US\$ 0.81 billion; it went up to US\$ 83.50 billion in 2000, US\$ 0.20 trillion in 2004, and US\$ 0.31 trillion in 2007. In 2008, investment in fixed assets of the 16 cities of the Yangtze River Delta region throughout the year reached US\$ 0.36 trillion, representing an increase of US\$ 42.51 billion over the previous year, that is, an

increase of 13.6; the growth rate dropped by 1.5 per cent from 2007. China's total fixed asset investment reached US\$ 2.53 trillion in 2008, 25.5 per cent more than that in the previous year; the growth rate rose by 0.5 per cent over that in 2007. The growth of investment in fixed assets of Yangtze River Delta region was 11.9 per cent lower than the national average, accounting for 14.1 per cent of the GDP, with a decrease of 1.4 per cent from what it was in 2007 (Jiangsu Statistical Bureau 2008). The size of investment in fixed assets of Yangtze River Delta region over the years is shown in Figure 5.6.

**Figure 5.6:** Investment in Fixed Assets:  
Yangtze River Delta (in US\$ million)

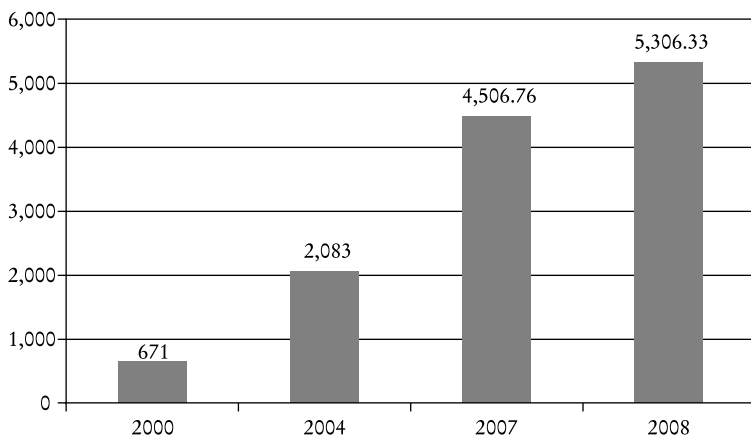


Source: China Statistical Database. <http://219.235.129.58/welcome.do> (accessed 7 June 2013).

(c) *Exports:* Foreign trade of the Yangtze River Delta region is prosperous and active. In early 1990s, the development and opening up of Pudong stimulated the export-oriented economy of the region. Internationalisation of the economy has become the goal of urban development of cities in the Yangtze River Delta. Shanghai and some cities in Jiangsu took the lead in the development of an export-oriented economy. Opening up of the Yangtze River Delta region created a brand new situation. In 2000, the total amount of import and export in the Yangtze River Delta region was US\$ 123.58 billion, of which exports comprised US\$ 67.1 billion. In 2004, the total amount of import and export in Yangtze River Delta region was US\$ 401.23 billion, with exports amounting to US\$ 208.3 billion. By 2007, the

total import and export had reached US\$ 777.4 billion, accounting for 26 per cent of that of the country, and 35.8 per cent in 2000 (the exports amounted to US\$ 450.676 billion). In the most unusual 2008, the growth of foreign trade in Yangtze River Delta region has experienced the largest fluctuations since 1998. Compared to the rapid initial growth (more than 20 per cent over the six years after China's entry into the World Trade Organization [WTO]), the growth rate of export fell to the total of US\$ 530.633 billion. China's total exports in 2008 amounted to US\$ 1.4285 trillion, an increase of 17.2 per cent. The total exports of the Yangtze River Delta region account for 37.1 per cent of that of the country, 0.1 per cent higher than that in the the previous year. The growth rate of total exports is higher than the national rate by 0.5 per cent. Export volume through foreign trade in the region over the years is shown in Figure 5.7.

**Figure 5.7:** *Yangtze River Delta Exports (in US\$ 100 million)*



Source: China Statistical Database. <http://219.235.129.58/welcome.do> (accessed 7 June 2013).

The use of foreign capital in the Yangtze River Delta region has grown substantially. Since the 1990s, cities of the region focused on the creation of good facility, policy, social, and market environments to attract investment from a large number of internationally renowned multinational enterprises, and the use of foreign capital has significantly grown. In 2000, foreign capital actually utilised by the Yangtze River Delta region reached US\$ 10.564 billion; in 2004,

it went up to US\$ 20.99 billion; in 2007, US\$ 37.423 billion. The figure was US\$ 41.992 billion in 2008; 13.1 per cent more than in 2007, with decline of the growth rate being 4.3 per cent annually (Jiangsu Statistical Bureau 2008).

### **The Characteristics of the Yangtze River Delta**

Co-ordination and co-operation between cities is the driving force behind economic development of the Yangtze River Delta. About half of the world's top-100 large enterprises have set up offices in the region. Shanghai and its satellite cities established good co-operative relations; this is one of the most important reasons why Yangtze River Delta attracts investors. Surrounding Shanghai are its satellite cities with highly developed industrial and services sectors; Shanghai's own dynamic development of industry and technology, through various forms of economic co-operation, promoted the development of these surrounding cities and formed a closely-knit industrial chain. The concentration and distribution of industry, low costs of operation, strong aggregation effect, and the industrial collaboration among all the major cities, including a reasonable division of labour, are some of the factors that determined the region's current forms of economic co-operation.

The Yangtze River Delta enjoys a unique advantage when it comes to high-quality human resources. The region is rich in cultural history, has a good socioeconomic foundation and highly skilled population, including good teaching and research cadre, high density of S&T specialists and a high proportion of highly educated personnel. The region also has more than 1,000 scientific research institutions, 150 institutions of higher colleges and 300 specialised secondary schools.

In addition, it has a large number of highly skilled technical workers. These factors are very beneficial for the introduction and absorption of foreign advanced technology, which further transforms traditional industries and helps develop new ones. Under the strong driving force of the development and opening up of Pudong, the Yangtze River Delta region — especially given its advantageous starting point, fast growth and rich human resources — shows a lot of promise.

### **Difficulties Yangtze River Deltas Faced During Financial Crisis**

The insufficiency of funds is the most urgent problem the Yangtze River Delta faced during the financial crisis. From 2007, SMEs in

Jiangsu, Zhejiang Province and Shanghai found themselves in an apparently longer cycle of received payments, an apparently slower turnover of capital, and could barely ask for bank loans, which were already difficult to obtain before the crisis. Two conditions account for this situation. One is the increase in production costs. The prices of electricity, water and coal all increased in 2008, but this cost could not be made up for by a rise in product price. Because most domestic enterprises are very sensitive to costs of production, a large increase in production cost will impact a lot of enterprises. The other reason is the increasing difficulties in the repayment of loans — in recent years, most financial customers are SMEs. According to a vice president of the Hangzhou branch of a joint-equity bank, since December 2007, there are one or two enterprises that cannot pay back matured loans weekly, and this phenomenon is not restricted to the banking community in Hangzhou.

If the enterprises are not financed the chain of capital may break and lead to bankruptcy. If they are financed, they are financed by either of two channels: banks or non-governmental financing. However, at this time either of the two sources makes the borrowing too impractical and expensive for SMEs. According to a survey by the China Banking Regulatory Commission in Jiangsu Province, since 2007 the cost of borrowing increased dramatically. The discount rate of bank acceptance decreased from 9 per cent at the beginning of 2007 to 2.3 per cent at the end, and remains about 6 per cent in 2013. The addition of interest in June 2007 made the one-year lending rate increase from 6.12 per cent to 7.47 per cent. The prime rate also increased and commission fees were added. For example, most banks began to charge commitment fee of 1 to 3 per cent. According to a vice manager of a software company in Suzhou's high-tech zone, enterprises could formerly apply for working capital loans from commercial banks at any time, but nowadays the application process is very difficult. Even if a loan is available, it would be discounted and the rate would be increased. In the meantime, commercial banks increased the price of credit for SMEs generally, and the domestic banks in Shanghai have increased the price by 30 per cent. As a result, few SMEs can borrow from commercial banks. According to a sampling survey of 120 SMEs in Jiangsu province, carried out by the China Banking Regulatory Commission, the fulfilment rates of SMEs' credit in the four quarters of 2007 were 92.53 per cent, 91.51 per cent, 83.87 per cent, and 80.23 per cent, respectively, showing a trend of quarterly decrease.

## *Summary of manufacturing clusters*

Since the reform and opening up, the Double Triangle region, with its unique advantages, has attracted a large amount of foreign investment. It has contributed greatly to the development of the national economy, but the profits of the two-triangle's manufacturing industry are very low, because the design, development and marketing networks of the products are under the control of international multinational corporations. This means that a large number of key materials and components in production processes must be internationally procured and most advanced production equipment is imported from abroad. As a result, international groups essentially lead the manufacturing industry in the Double Triangle region, and although the region contributes significant labour, machinery, equipment, and land resources, its interest in the operation is very small. Although the regional industry clusters provide a great competitive advantage for 'Made in China' products on an international scale, if the current development model is maintained, the region will continue to be merely a processing and assembly base for international companies. Moreover, it will be very difficult for it to remain the world's manufacturing centre. Lack of innovation abilities and the weak technological innovation capabilities of the industrial clusters create important development bottlenecks.

The source of competitive advantage of the industrial clusters located in the region is the traditional agglomeration economy, based on economies of scale and scope. The region's competitiveness is based on low-cost advantages, but these advantages are difficult to maintain as labour costs, land prices and production costs continue to rise. In addition, the low-cost advantages of China's industrial clusters, which were built on cheap labour costs and raw materials, can easily be imitated because competitors can look for new low-cost production environment and resources to replicate this type of competitive advantage, or enter by direct investment to gain a competitive advantage. However, if innovation capability becomes the core competitive advantage of industrial clusters, it becomes more difficult to imitate and copy; it is thus a more solid foundation on which to base competitive advantage. Therefore, enhancing the capability of independent innovation and promoting upgrading from labour-intensive manufacturing clusters to innovative industrial clusters will play a positive role in the promotion of the Double Triangle area industrial

development, cultivation of the core competitiveness of industries and improvement of its international competitive advantage.

## Innovation Clusters

Innovation clusters is an important concept that was introduced by the Organisation for Economic Co-operation and Development (OECD). Innovation clusters can be understood as industrial clusters with innovation-oriented enterprises and personnel as the main components, comprising knowledge or technology-intensive industries, branded products, innovative organisation networks, and business models operating within an environment and a culture beneficial to innovation. Different from labour-intensive manufacturing clusters, this cluster is based on knowledge- or technology-intensive industries. Its innovation includes not only product and technological innovations, but also business-model, channel and brand innovations.

### *High-tech zone*

High-tech zone, as a government infrastructure investment region, is an important policy tool for attracting foreign investment and creating employment. In order to promote the development of high-tech industries, China has planned and constructed 56 national-level high-tech zones since 1985. Construction and development of these high-tech zones has made a great contribution to the high-tech boom in China. High-tech zones use the new policy of decentralisation that replaced central planning. The new policies put more emphasis on individual innovation and networking, and the spirit of innovation of enterprises and institutions. In the high-tech areas, industry and commerce, taxation, public security, courts, and other agencies are readily available; the high-tech zone is no longer the concept of a high-tech industrial park but becoming a real administrative region. The goal of high-tech zones is to establish a breakthrough in low-level clusters of the manufacturing sector to promote the transformation of scientific and technological achievements, and to encourage independent innovation of enterprises and the spirit of entrepreneurship. It is also aimed at promoting new commercialisation of high-tech achievements, industrialisation of new high-tech products and the internationalisation of high-tech industries.

## *Milestones of high-tech zone*

- 1985: the first high-tech zone is established in Shenzhen.
- 1988: China's first national-level high-tech industrial development zones, approved by the State Council, established — the Zhongguancun Science Park — and 18 preferential policies formulated (which included taxation, financial and others on the Customs and Excise Department, the price of talent and other aspects of the corresponding requirements).
- 1991: 25 National High-Tech Industrial Development Zones approved.
- 1992: the 26th National High-Tech Industrial Development Zone approved.
- 1997: the 53rd National High-Tech Industrial Development Zone was set up in Shaanxi Yangling, which is the first national agricultural high-tech park.
- 2007: the 54th National High-Tech Industrial Development Zone set up in Ningbo.
- 2009: the State Council approved a high-tech industrial park in Xiangtan, Hunan Province, and the pharmaceutical high-tech industrial development zone in Taizhou, Jiangsu Province, as the 55th and 56th state-level high-tech industrial development zones.

## *Economic output and innovation in high-tech zones*

### **Economic Output**

As shown in Table 5.1, in 2007, the total operating income of high-tech zones throughout the year reached US\$ 807.72 billion; industrial added value reached US\$ 0.16 trillion, with an increase of 26.8 per cent and 25.8 per cent over the previous year. Total industrial output value was US\$ 652.60 billion, with a net profit of US\$ 46.46 billion, and taxes paid amounted to US\$ 38.44 billion. Import and export volume reached US\$ 249.52 billion, with total exports of US\$ 25.41 billion. Compared with 2006, industrial output value, net income, profits and taxes paid, and total exports achieved steady growth of 23.6 per cent, 48.4 per cent, 32.2 per cent, and 27 per cent, respectively.



**Table 5.1: Overview of High-tech Zone Enterprises, 2000–07**

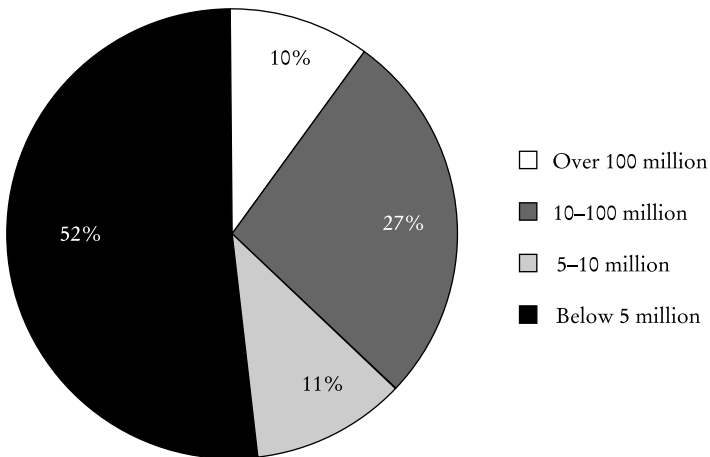
	2000	2001	2002	2003	2004	2005	2006	2007
Number of Enterprises	20,796	24,293	28,338	32,857	38,565	41,990	45,828	48,472
<b>Numbers of Employees (in million)</b>	<b>25.1</b>	<b>29.4</b>	<b>34.9</b>	<b>39.5</b>	<b>44.8</b>	<b>52.1</b>	<b>57.4</b>	<b>65.0</b>
Industrial Output Value (in US\$ 100 million)	1,168	1,488	1,903	2,538	3,329	4,259	5,279	6,526
Industrial Added Value (in US\$ 100 million)	291	385	483	641	815	1,003	1,253	1,576
Gross Income (in US\$ 100 million)	1,354	1,754	2,254	3,079	4,036	5,061	6,371	8,077
Net Profit(in US\$ 100 million)	88	95	118	166	209	236	313	465
Taxes Paid (in US\$ 100 million)	1,168	1,488	1,903	2,538	3,329	4,259	5,279	6,526
Total Exports (in US\$ 100 million)	186	227	329	510	824	1,117	1,361	1,728

Source: Ministry of Science and Technology (2008b).

## Enterprise Development

In 2007, high-tech enterprises in the national high-tech district numbered 48,472, representing an increase of 2,644 over the previous year. In terms of total income and size of business, the number of companies with CNY 1 billion or more revenue was 5,051, and accounted for 10 per cent of the total number of enterprises; the number of those with no less than CNY 10 million and less than CNY 1 billion revenue was 13,098, accounting for 27 per cent of the total number of enterprises; the number of companies with no less than CNY 5 million and less than CNY 10 million revenue was 5,134, and accounted for 11 per cent of the total number of enterprises; the number of companies with than CNY 5 million revenue was 25,189, accounting for 52 per cent of the total number of enterprises. The total revenue and size distribution of business enterprises in national high-tech zones in 2007 is shown in Figure 5.8.

**Figure 5.8:** Enterprise Income Distribution:  
National-level High-tech Zones, 2007



Source: Ministry of Science and Technology and NBS of China (2008).

Enterprises with a revenue of more than US\$ 13.16 million employed 4,585,000 people at the end of 2007, accounting for 70.5 per cent of the total number of employees in high-tech enterprises at the end of the year; with a business revenue of US\$ 0.73 trillion,

accounting for 90.7 per cent of the total operating revenues of high-tech enterprises; with a total industrial output value of US\$ 599.16 billion, accounting for 91.8 per cent of the total industrial output value of high-tech enterprises; with an industrial added value of US\$ 143.49 billion, accounting for 91.1 per cent of the total industrial added value of high-tech enterprises; with an industrial output value of total exports of US\$ 166.72 billion, accounting for 96.5 per cent of total exports of high-tech enterprises (Ministry of Science and Technology and NBS of China 2008).

### *Output of scientific and technological activities*

In 2007, new product output value of the high-tech zone achieved US\$ 0.17 trillion. Sales revenue of new products reached US\$ 179.65 billion, which accounted for 26.9 per cent of total sales revenue. New product exports reached US\$ 39.06 billion, accounting for 22.6 per cent of total exports of high-tech zones. New product exports of 25 export bases of the high-tech zone amounted to US\$ 33.32 billion, accounting for 85.3 per cent the total new high-tech exports (*ibid.*).

In 2007, the number of patent applications of high-tech zones reached 55,252, of which invention patent applications amounted to 29,166, accounting for 18 per cent of the volume of invention patent applications of the total businesses. The number of patents authorised reached 24,552, of which the number of invention patents reached 7,658, accounting for 16 per cent of the total invention patents of national enterprises. In 2007, the total number of patents held by high-tech enterprises reached 49,680, most of which are foreign-invested enterprises — amounting to 13,677. Limited liability companies reached 12,594, and incorporated companies reached 6,733. The number of invention patents held per million people in the high-tech zone is 76.4 (*ibid.*).

### **Role of National High-tech Zone in China's Innovation Clusters**

The national high-tech zone is important for the implementation of the strategy of independent innovation. It is the core region to build innovation systems with enterprises as the main body, and in the meantime is also a service platform for upgrading industry impact on

and promotion of regional economic development. It plays a leading and exemplary role in the development of innovation clusters, makes efforts to upgrade its operations from industrial to innovation clusters and promotes low- and high-end industrial clusters to form innovation clusters.

National high-tech zones achieved fruitful results in the promotion of high-tech industrialisation, institutional innovation, transformation of production, optimisation of the economic structure, attracting talents, and the provision of entrepreneurial environment. The high-tech zones guide the deployment of science and technology in industry, and demonstrate how scientific and technological innovation and entrepreneurship can take the road of high-tech industrialisation with Chinese characteristics.

Innovation, know-how, new policy, industry concentration, and other characteristics of the national high-tech zones provide a platform for integration and development of regional enterprises in the direction of specialisation, internationalisation and high-end clusters. These in turn favour big industries, strengthen industrial competitiveness and form proliferation and escalation of profits for the global industrial chain.

In the past 20 years, high-tech zones relied on China's scientific and technological strength and industrial base, while using all possible foreign advanced technology resources, capital and management tools, and domestic and international markets. They encouraged the implementation of preferential policies and reform measures aimed at high-tech industrialisation to create a local innovation environment, and maximise the liberation and development of science and technology to promote the scientific and technological industrialisation process. All these measures laid a good foundation to establish a relatively complete system of high-tech industry of our country and promoted the innovation of industrial clusters.

## *Incubators*

### **History and Development of Incubators in China**

Business incubators, an idea born in the United States in 1959, are programmes designed to accelerate the successful development of entrepreneurial companies through an array of business support

measures. Because of its unique role in the promotion of the growth of start-ups, it received a lot of international attention immediately after its inception.

In recent years, the function of incubators has been transformed: from the original idea of providing venue and funds to small entrepreneurs to providing technical support and training to entrepreneurs, establishing an enterprise system and fostering corporate culture. In China, after more than two decades of development, S&T business incubators played an active role in promoting the development of high-tech industries, supporting SMEs and transforming scientific and technological achievements and regional economic growth. They have become an important component in the national innovation system.

Since the setup of China's first incubator in East Lake in Wuhan in 1987, which was subject to inspection by the government, incubators have made significant progress. At the end of 2007, there were 614 S&T incubators in China, which is second only to the United States. There were 197 S&T incubators approved by the state-level ministry, and 150 incubators that enjoyed four annual tax breaks in 2008, approved by the Ministry of Finance and the State Administration of Taxation.

Table 5.2 shows that, in 2007, businesses incubated by 614 technology incubators reached 44,750 tenant enterprises, with more than 930,000 technology start-up staff. The total incubator space of the national incubator is 22.7 million square metres, with a total of 23,394 graduated businesses, and the cumulative revenue nearly five times more than at the time of start-up. Incubator graduates with annual revenue amounting to US\$ 100 million reached more than 600, with stock market enterprises numbering more than 60. The industrial

**Table 5.2:** *The Development of Incubators in China*

	2000	2003	2005	2006	2007
Number of Incubators	131	431	534	548	614
Tenant Enterprises (10,000)	7,693	27,285	39,491	41,434	44,750
Number of Employees	12.88	48.25	71.70	79.00	93.00
Number of Graduated Enterprises	2,770	8,981	15,815	19,896	23,394

*Source:* Ministry of Science and Technology (2006a, 2007a, 2008a).

output value of the Torch Program reached US\$ 0.32 trillion and technology contract transactions that were implemented amounted to US\$ 32.74 billion.

### **The Role of Incubators in Promoting Innovation in SMEs**

As an S&T intermediary service system in the national innovation system, the main body and service clients of Technology Business Incubator are start-up SMEs. And innovation is at the root of SMEs' survival. Thus, it is worthwhile to take a look at the role that science and technology plays in business incubators, especially as it pertains to enhancing the innovation capability of SMEs in the following areas:

- (a) *Incubator Promotes SMEs Innovation:* Before the emergence of incubators, other sub-system elements of national innovation system already existed, such as scientific research institutes, universities and government, and others. But effective mechanisms of communication, exchange and co-operation were lacking between these stakeholders, and so the national innovation system found it difficult to fulfil its functions. Today, the incubators serve as a bridge that links the sub-system elements. The incubators draw projects from scientific research institutes, universities and other knowledge sources, and obtain policy support from the government, financial support from financial institutions and human resources from educational institutions. They then integrate these factors of production into a physical space, incubate successful enterprises as its own products, and thus strongly promote the function of national innovation system as a whole.
- (b) *Incubators can reduce the Start-up Costs:* Incubators reduce the overall start-up costs of enterprises. Before the emergence of incubators, all entrepreneurs had to start their businesses on their own, including registering, looking for factories and offices, searching for loans from financial institutions, etc. With the incubators, these SMEs entrepreneurs will be able to entrust these complicated affairs to the incubator. Incubators reduce the cost of innovation for SMEs through the provision of production and R&D space as well as infrastructure services. SMEs' scale is also smaller because incubators help

with the resources required to purchase or build necessary infrastructure, thus avoiding wastage and inefficiency. At the same time, incubators have a clustering effect: they improve the efficiency of the overall innovation through R&D and manufacturing collaboration.

- (c) *Incubators will Help Enterprises to Obtain External Resources:* Understanding the characteristics of the industry has a significant impact on the success of entrepreneurs, but information and tacit knowledge can be difficult for a single enterprise to obtain. Incubators gather similar industries in the same space, making it easy to establish collaborative relationships between similar industries, which often results in industry clustering, helping efficient allocation of resources in the industry. Informal relationships established between enterprises during the incubation help them to share not only infrastructure provided by the incubator, but also their entrepreneurial experience, and lessons and resources to form a learning network. Incubators can also provide environment and conditions for incubation of businesses with universities and research institutions.

Funding support is necessary to start up enterprises. Incubators serve as bridges connecting venture capital and start-ups, and play an important role in the reduction of investment risk as a result of information asymmetry existing between the two sides. Through the evaluation of various enterprises in incubation, established by the incubator, we have a more comprehensive and in-depth understanding of the development of enterprises in incubation. It also makes it possible to evaluate the potential for success of entrepreneurs, and assess and identify the basic risks inherent in start-ups, which is the kind of information that venture capitalists study. In other words, financial institutions and institutional investors can use incubator-generated data to make more accurate investment decisions and provide start-up funding to enterprises in the incubator.

### *Cultivation, innovation and entrepreneurial spirit*

The cultivation of entrepreneurship is above all the main activity SMEs need to focus on. Incubators provide a good platform for start-ups. Here, entrepreneurs combine knowledge and market information in the process of incubation and learn to effectively organise a variety of

factors of production. These factors include SMEs' ability to manage human elements so as to ensure productivity, to gain knowledge of cost accounting and maximisation of profit, and to learn to take risks and overcome difficulties. All of these require not only empirical skills training, but also knowledge and innovative ideas. The business-improvement process, regardless of the size of the business, is a continuous process of positive exploration and development, learning modern management techniques, and serious self-evaluation and continuous learning. Incubators thus provide a good platform for learning and development for enterprises and entrepreneurs alike.

### *University science parks*

#### **Brief Introduction and Development of University Science Parks**

University science parks are an important component of university-based co-operation, and include a combination of university teaching, scientific research and industrial production. Universities cultivate high-tech enterprises through scientific and technological resources and achievements. High-tech enterprise incubators help with the flow of technology from university to industry. The collaboration of the two enhances regional innovation capability and helps the establishment of a national innovation system. The construction of University S&T parks is the starting point for building a national innovation system.

The Northeastern University was the earliest to establish a University S&T park in China; by the end of 1988, it had established the Northeastern University Software Park. It was followed by Beijing University and Tsinghua University; other S&T Parks have also been set up. At the end of 2007, the total number of national university S&T parks was 62, with a park space of 5,283,000 square metres, with 6,574 businesses in incubation and total staff strength of 129,000. On 16 February 2009, the Ministry of Science and Technology and the Ministry of Education authorised seven universities as S&T parks, including the Chinese People University Science and Technology Park. Thus, the number of national university S&T parks in China has risen to 69.

According to statistics, by the end of 2007, patents authorised in 62 national university science parks reached 2,339 in number, 1,002 of which were authorised invention patents. Existing incubation area is



5,165,000 square metres, the number of enterprises in incubators 6,720, with a total income of US\$ 4.33 billion, an industrial output value of US\$ 3.68 billion, and accumulated graduate enterprises of 1,794. The number of enterprises graduated with income over US\$ 100 million exceeds 85; 18 of these graduated enterprises have entered the stock market and play an important role in local economic development.

### **The Role of University Science Parks in Promoting Innovation in SMEs**

A university S&T park, as an important component of the S&T intermediary service system of the national innovation system, is in essence an incubator; thus it has the basic features and functions of one. But S&T parks also have their own unique features, which are an important extension of the social functions of the university in the knowledge economy.

*A Source of Innovation for Enterprises:* What sets apart University S&T Parks from general business incubators is that they include a group of R&D institutes. These R&D institutions are set up by universities and enterprises, and are jointly rich in R&D projects, resources and research results; most of the research results have considerable technical advantages and high selectivity for development and incubation. S&T parks provide one of the most effective platforms and interfaces for guiding university research results into business through the encouragement and support of university staff and students.

### *The absolute advantage of human resources*

Colleges and universities have the most abundant highly-skilled human resources. In China, the number of full-time teachers at colleges and universities exceeds 1 million, of which 30,000 people are full-time staff engaged in scientific research institutions and 170,000 are master's degree or PhD supervisors. There are also millions of doctoral and master's degree students, and more than 10 million undergraduate students. Besides that, there are numerous graduates and students abroad who maintain contact with their mother schools, which is an unmatched advantage compared to other research institutes. In addition to providing staff, senior consultants and appointed project managers, University Science Parks also use links with universities

to organise professional training seminars for the special needs of SMEs, as well as formal or informal activities, such as technical visits to other companies. In order to enhance the innovation capability of SMEs, we also need to enhance the competitiveness of their human resource base.

### *A wealth of library and network resources*

Universities usually have a very comprehensive library and information network. A large number of books and databases create favourable conditions for researchers, and provide the richest and most cutting-edge information for scientific and technological innovation activities. Universities also offer state-level teaching in key disciplines, central laboratories, engineering centres, numerous advanced instruments and equipments, and many platforms for technological testing and development. Many of these would be unavailable to general enterprises, which highlights the advantages of university S&T parks compared to general incubators.

In general, the role and status of high-tech zones, incubators and S&T parks in China's high-tech industrialisation are different. High-tech zones emphasise mature technology and businesses, and incubators and S&T parks are focused on services to high-tech business incubation and technology innovation. A high-tech zone is a cluster of innovative elements of both technology and talented people, and the base from which to develop high-tech industries. Incubators and S&T parks are mainly high-tech business incubators and are a continuous innovation base for high-tech industry, as well as a cradle for fostering innovation and entrepreneurial talents. Therefore, if S&T parks and incubators are nurseries of high-tech enterprise, then high-tech zones can be regarded as fertile land to cultivate these high-tech enterprises.

## Characteristics of Innovation Clusters in China

### *Aggregation of high-end industry*

There are about 1,300 industrial clusters in China. One of the most obvious characteristics of innovation clusters is that it attracts a

considerable number of high-end cluster industries. The main industries in the clusters are those with a high level of knowledge or technology, such as high-tech industries and other knowledge- or technology-intensive industries, including traditional industries that are in transition, and high-tech services, software, integrated circuits, new energy, bio-pharmaceuticals, and optical communications. Typical clusters include the Zhongguancun Science Park, established in 1988 in Beijing, with high-tech services as the core; the Tianjin Hi-tech Zone, set up in 1988, with bio-medicine and green energy as main industries; the Wuhan East Lake High Technology Park, established in 1993, with photoelectron field as the core; the Shanghai Zhangjiang High-tech Park, established in 1992, specialising in integrated circuits and software, and bio-pharmaceuticals; the Shenzhen high-tech zones dealing with the telecommunications industry; and the Zhengzhou High-tech Zone with superhard materials as the core industry.

### *Development of the technology innovation system*

After more than two decades of exploration and development, S&T parks have made significant progress in human resources, R&D and the technical service system, and the technical innovation system is gradually taking shape.

#### **Human Resource Areas**

S&T parks, with their own preferential policies and comprehensive service functions, increase start-up enthusiasm of S&T staff, help science- or technology-educated people establish a business, and train entrepreneurs in practical experience and awareness of innovation through systematic training and advisory services. Second, they link people within and outside the region through their social network relations, and promote the understanding of the incubator region. They are also attracting highly qualified personnel from outside the region because of their excellent business environment, and thus have the function of gathering talent.

In 2007, high-tech zone enterprises employed 6,502,000 people, 767,000 more than in 2006. Among them, 2,753,000 people had college education — 435,000 more than the previous year — representing 42.3 per cent of the total number of employees in high-tech zones.

Of these, 1,250,000 employees had a bachelor's degree, 216,000 had a master's degree, and 29,000 had a PhD. The number of senior employees was 897,000, accounting for 13.8 per cent of the total employees. In 2007, the high-tech zones absorbed a total number of 263,000 college graduates; 1,203,000 have a scientific and technological background — 217,000 more than the previous year — representing 18.5 per cent of employees in high-tech zones.

### **R&D Investment**

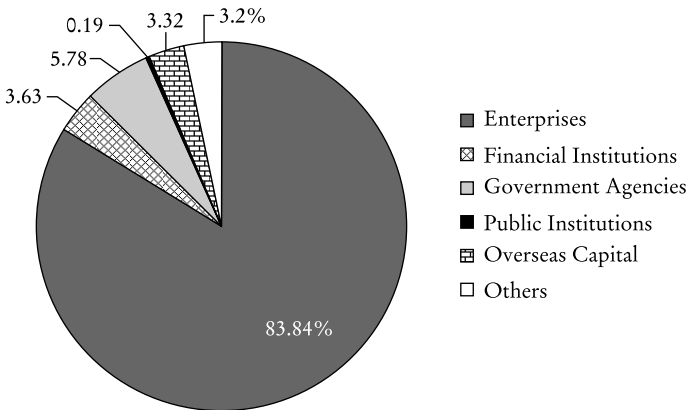
In the evaluation of national innovation capacity, R&D investment is to a certain extent the indicator of the overall level of national innovation. Looking at the history of the development of Western countries, the continued growth in R&D investment stands out as a significant feature. In the environment of economic globalisation and international competition, investment in science and technology R&D activities is a key contributor to economic growth. According to statistics, the R&D expenditure in China's S&T parks is more than eight times the national average R&D expenditure. Likewise, R&D expenditure per person is six times the national average.

In 2007, funds raised for scientific and technological activities in high-tech enterprises amounted to US\$ 32.06 billion, that is, US\$ 6.10 billion more than the previous year. Of this, US\$ 26.87 billion are enterprise funds, US\$ 1.16 billion are loans from financial institutions, US\$ 1.85 billion comes from government departments at all levels, US\$ 61.76 million from institutions, US\$ 1.06 billion from foreign funds, and US\$ 1.04 billion from other sources. Financing sources for scientific and technological activities of high-tech enterprises are shown in Figure 5.9. S&T expenditure of high-tech enterprises amounted to US\$ 31.82 billion, US\$ 8.51 billion more than the previous year. In 2007, R&D expenditures of new high-tech enterprises amounted to US\$ 19.84 billion, US\$ 4.34 billion more than in the previous year. R&D expenditures accounted for 3 per cent of sales.

### **Growth and Development of the Intermediary Service Systems of Science and Technology**

With guidance funding from all levels of government and the support of relevant policies, the number of S&T agencies is growing, and their ability to improve the technological innovation of SMEs is increasing, making it an important part of the national innovation system.

**Figure 5.9:** Financing Sources of Scientific and Technological Activities of High-Tech Enterprises (in per cent)



Source: Ministry of Science and Technology (2008a).

- (a) *Productivity Promotion Centre:* Productivity Promotion Centres provide many services to SMEs, including information services, consulting services, training services, etc. By the end of 2007, the number of National Productivity Promotion Centres had grown to 1,425 — the highest in the world. The total number of employees was 19,000. In 2007, the National Productivity Promotion Centres completed service revenue of US\$ 0.60 billion; the total number of service enterprises was more than 150,000. Increase in enterprise sales amounted to US\$ 19.10 billion; increase in profits to US\$ 2.85 billion; increase in employment to 1,106,000 people; increase in fresh capital amounted to US\$ 7.86 billion in foreign exchange with 2,150 new projects and 87,300 people.
- (b) *Technology Market:* In 2007, the total number of technology contracts registered nationally was 220,900, with an increase of 7 per cent; the total amount of turnover was US\$ 32.74 billion, with an increase of 22 per cent. Out of this, the technology development contracts turnover was US\$ 12.88 billion, which was 22.2 per cent more than in 2006, and accounts for 39.4 per cent of the four types of contracts. Technology transfer activities are more active; the turnover was US\$ 6.18 billion, with an increase of 30.8 per cent. This is responsible for for

19 per cent of the total national turnover. Technical services and technical consulting contract transactions amounted to CNY 840 billion and CNY 9.0 billion, with an increase of 20.9 per cent and 5.9 per cent, respectively.

- (c) *National Technology Transfer Agencies*: In 2007, the Torch Plan arranged technology transfer special funds of US\$ 3.26 million, and supported technology transfer projects of 32 institutions (five of which were universities), five research institutes, two industry sectors, and 20 districts. At the same time, in 2007, public technical service agencies grant funds supported more than 30 projects of technology transfer institutions, with the funding amounting to more than CNY 2,000 million.

### **Setting up of Local Financing and Venture Capital Funds in S&T Parks**

Venture capital is an essential incubation factor for high-tech enterprise growth. In China, due to the lack of standardised management practices, the financial system and supporting mechanisms are lagging behind, and so because of the lack of relevant laws and regulations, and other factors, the development of venture capital has been slow. With the development of national technology innovation system, the state promulgated a series of policy and financial reform measures to support the development of venture capital. In recent years there has been a new trend: incubators and venture capital are gradually moving toward integration. Incubators have been introducing venture capital to accelerate growth, and venture capitalists are also active in grafting incubators to improve services. Because incubators have experienced every step of the process of business growth, they can understand the technology, market conditions and management capacity of the businesses more easily, which is an important basis for risk assessment. Venture capital institutions were established in the S&T parks so as to enable them to learn first-hand about the various start-ups and help them make the right investment decisions. This reduces decision-making delays and mistakes due to information asymmetry, resolves the difficulties of financing for incubation businesses, helps the incubators provide financial support to innovative companies, prevents the loss of investment opportunities due to cumbersome procedures of external capital, and strongly promotes the speed of growth of start-ups.

## Networking: Prevalence of Various Forms of Co-operation

An important current developmental trend of S&T parks and incubators is networking. Through the co-operation with scientific research institutions, universities, venture capital, and government, S&T parks establish city, regional, national, even international networks, and form a dynamic alliance of innovation. With the incubator as the centre, members of the network can enjoy effective communication, complement incubation functions, and maximise the efficiency of the resources through flow and exchange of services, technology, information, and other resources. The S&T parks and incubators create opportunities and conditions for external exchanges and co-operation for SME enterprises, promote multidisciplinary cross-fertilisation, integration and penetration, and achieve technological advancement, which will enable SMEs to become leaders in regional innovation and technology transfer. At the same time, S&T parks and incubators also improve the ability of technology and management to align with the international community of enterprises and strengthen the capacity of enterprises to expand to overseas markets by attracting foreign staff expertise in technology, management and sales.

## Constraints on SMEs in China

The problems faced by China's SME enterprises are varied. In the situation of fierce competition, their disadvantages are obvious, and these are discussed in this section:

### *The problem of shortage of talent and brain drain faced by SMEs*

The early SMEs were family-based, and so were lacking modern scientific management ideas, effective incentives and competition mechanisms; could not mobilise the enthusiasm and creativity of national and international talent; or attract and retain this talent. The phenomena of shortage of talent and brain drain make it difficult for SMEs to cultivate loyal employees, thus making it difficult to upgrade the management level and technological innovation capacity of enterprises. This leads to lower labour productivity, high costs, lack of product development capacity, weak market competitiveness,

low capacity to use external information, limited inputs, and lack of financing and advisory services (for the purchase of machinery and equipment and raw materials). As a result, it is difficult to achieve economies of scale and compete with large companies that own sufficient capital and have developed mature technology.

### *Problem of insufficient funds and financing channels*

The production scale of SMEs enterprises is small and so is the number of workers. SMEs lack venture and working capital, and financing channels available to them are limited, forcing them to mainly rely on internal accumulation and bank loans. As a result of China's less-than-perfect financial system, the situation wherein SMEs essentially rely on the four major commercial bank loans has not improved. The over-focusing on the financial structure makes it difficult for the vast majority of competitive SMEs enterprises to get financial support, which in turn inhibits development and reduces the efficiency of capital allocation. While commercial banks for SMEs do exist — the advantages of which include low transaction costs, efficient monitoring, short chain of management, low-level operating flexibility, high adaptability, strong ability to control risk — the funding they can provide is far from what the four major state-owned banks offer. At the same time, their network and settlement system is far inferior to that of the four major state-owned banks, and the development of regional small capital markets services specifically for SMEs is slow. In addition, the development of entrepreneur capital and venture capital is relatively slow and the equity market is not growing either. All of this affects SMEs: causing difficulties in financing, increasing financial costs and leading to such tight cash flows that its anti-risk ability is in danger of collapse.

### *Financial crisis hampering exports*

After the sub-prime crisis in the United States, the global economy suffered a lot which resulted in the decline of international demand and enterprise exports. In 2008, the annual total import and export volume was US\$ 2.5616 trillion, 17.8 per cent more than in 2007. Exports amounted to US\$ 1.4285 trillion, with an increase of 17.2 per cent; imports to US\$ 1.1331 trillion, a rise of 18.5 per cent. Net imports (exports minus imports) are US\$ 295.5 billion, an increase



of US\$ 32.8 billion over that in 2007. China's export growth rate was 8.5 per cent less than the 25.7 per cent in 2007; growth rate of exports to the US was 6 per cent less than the 14.4 per cent in 2007 over the same period.

Import and export volume in the Pearl River Delta region enjoyed a growth of 7.6 per cent, with a decline of 12.7 per cent year-on-year, of which growth in exports was 9.3 per cent, a decline of 10 per cent. Foreign trade in the Yangtze River Delta region has experienced growth since 1998. Compared to the rapid growth (of 20 per cent per year continuously for six years) after China's entry into the WTO, the growth in exports fell to achieve total exports of US\$ 530.633 billion in 2008, an increase of 17.7 per cent over the previous year; the growth rate dropped 8.9 per cent, making the export growth rate lower than the consumption growth.

## Public Policy

### *Public policy to promote SME innovation and entrepreneurship*

To better serve SMEs, the government and relevant policy makers have been actively pursuing measures to improve the overall policy environment.

#### **SME Promotion Law**

SMEs are the main component of the market economy. In the face of China's further reformation, SMEs have become the main driving force of economy reform. In 2003, the SME Promotion Law was promulgated and implemented to improve the SMEs' business environment, promote healthy development, expand urban and rural employment, recognise the important role of SMEs in national economy and social development, and protect the rights and interests of SMEs. This promotion law includes provisions for improved financial support, entrepreneurial support, technology innovation, market development and social services, and creating a good legal environment for the development of China's SMEs, and has played a positive role in promoting rapid development of SMEs and business incubators.

## **SMEs Board in Shenzhen Stock Exchange**

In May 2004, China's SME Board was established in the Shenzhen Stock Exchange. As of May 2012, there are 673 companies listed on the SME board. The formation of the SME market broadened the channels of direct financing of SMEs, and to a certain extent diminished the problem of financing. It also set up a good atmosphere for SMEs: the capital structure of SMEs before and after listing changed markedly — the increase in equity financing led to significantly lower rates of assets and liabilities and reduced financing costs of SMEs. All this has played an active role in promoting their development.

China's SME board was exploring the second board market, or Growth Enterprise Market (GEM). The second board market mainly solves financing problems of SMEs in the mid- and late-stage of venture, after more than 10 years of preparatory work in all aspects. On 1 May 2009, 'Interim Measures for the Administration of IPO [Initial Public Offerings] and listing on the GEM' officially came into effect. On 8 May 2009, the Shenzhen Stock Exchange issued 'Shenzhen Stock Exchange GEM Listing Rules (draft)' to the public for comments.

## **Over-the-Counter Securities Trading System (Third Board Market)**

On 16 January 2006, approved by the State Council, non-public offering shares of corporations located in the Zhongguancun Science Park Co., Ltd., entered the transfer agent of securities companies for the pilot system of transfers of shares, commonly known as the new three-board stock market, named as the GEM 'incubator'. On 23 January 2006, two companies in Zhongguancun Science Park, Courier Century Science and Technology Branch, soft-landed three board markets. At this point, the three-board market went through a qualitative change, and ultimately formed a multi-level stock market system with Chinese characteristics. On 18 February 2009, nine enterprises in Zhongguancun Science and Technology Park landed 'three new boards' in the Shenzhen Stock Exchange. By 2012, there were more than 100 enterprises that had already been listed on the three-board market. The pace of the introduction of GEM is increasing. The administrative departments of the state are planning to expand the new three-board market involving more technology parks.

Companies on the three-plate are expected to enter the small- and medium-sized board or the Shenzhen and Shanghai stock exchanges more easily, which will gradually solve the problem of the flow of shares and financing for SMEs in S&T.

### *Faster growth of innovation funds*

The Innovation Fund was founded by the Ministry of Science and Technology, People's Republic of China in May 1999, with the purpose of central governance of funds. After a full 10 years of development, innovation funds now support more than 13,000 innovative projects with US\$ 8.1 billion of the state's financial capital (through grants, loan interest subsidy and capital investment); they also sustain and guide technological innovation activities of SMEs in S&T and promote the transformation of scientific and technological achievements. The evolution of the National Innovation Fund for Small- and Medium-sized Enterprises of Science and Technology is shown in Table 5.3.

**Table 5.3:** *Evolution of National Innovation Fund for SME*

<i>Year</i>	<i>Number of Applications</i>	<i>Number of Approvals</i>	<i>Capital (in US\$ 100 million)</i>
1999	3,329	1,089	1.20
2000	4,974	872	0.97
2001	3,682	1,008	1.15
2002	4,215	780	0.79
2003	4,249	1,197	0.98
2004	4,925	1,464	1.22
2005	5,406	1,552	1.45
2006	6,399	1,905	1.24
2007	3,120	1,151	1.40

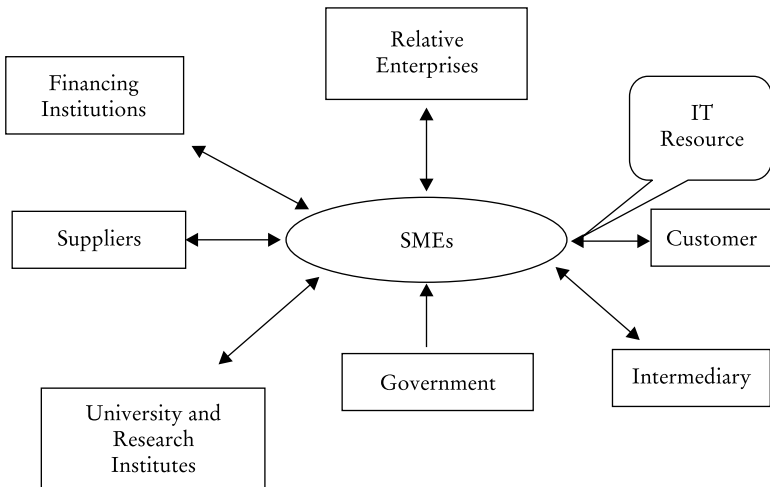
*Source:* <http://www.innofund.gov.cn/index.asp#javascript> (accessed 7 June 2013).

In recent years, the innovation fund continuously perfects itself in the process of operation, introducing new support methods and financial products, optimising the innovation fund networking system to help independent innovation and continuous development of SMEs.

## *Innovation network-building and support system upgrade*

The continuous development of the national innovation system promotes the formation of SMEs' innovation networks, technology parks and incubators. It also provides a good platform for the development of SMEs, while at the same time building SME innovation networks through national policies and incentives, technical support and technical intermediary services, as shown in Figure 5.10.

**Figure 5.10:** *SME Innovation System Network*



Source: Zhao (2008: 31).

## *Role of female entrepreneurs*

The number of female entrepreneurs has grown rapidly. As of 2013, female entrepreneurs account for 21 per cent of domestic enterprises, 60 per cent of whom started after 1996. Out of the SMEs led by female entrepreneurs, 95 per cent attain profits. By the end of 2002, the annual profit of nearly 40 per cent of female entrepreneurs exceeded US\$ 147,058.8, among which the annual profit of 7.4 per cent of female entrepreneurs exceeded US\$ 147,058.8. Chinese female entrepreneurs

are also characterised by average age structure and higher level of education — 80 per cent of female entrepreneurs are aged between 30 and 50; 55.8 per cent of female entrepreneurs have achieved junior college level or above, which is 2.5 per cent higher than that of male entrepreneurs. Nearly 60 per cent of female entrepreneurs are optimistic about the future of their SME.

## Summary

We can see from the analysis in the chapter that SMEs, which are the core element of the national innovation system, have played a pivotal role in the development of China's manufacturing clusters, and the emergence and development of the two major manufacturing clusters — Pearl River Delta and Yangtze River Delta.

In China, the technological innovation system is gradually taking shape with the provision of S&T intermediary services and the establishment of local financing and venture capital funds in S&T parks. The innovation network is being formed with various forms of co-operation taking place, providing a sustaining environment and solid foundation for the further development and innovation of SMEs. In innovation clusters, where national high-tech zones comprise the typical pattern, small and medium technology-based enterprises obtain the support of various elements of the national innovation system, and through their own continuous innovation, promote the development of China's industrial clusters — from low-cost manufacturing clusters to innovative clusters, and finally, to form clusters of high-end industries.

Of course, SMEs, both due to their own limitations and the imperfect policies and systems in China in general, are experiencing setbacks in the development process, including inadequate management, lack of development funds and poor financing channels. But instead of waiting for further improvement in state policies and systems, SMEs must rely on themselves to upgrade the management structures and innovation capacities, and make full use of the resources that are available.



## Note

1. [http://zhongantrade.en.ec21.com/company\\_info.jsp](http://zhongantrade.en.ec21.com/company_info.jsp) (accessed 6 June 2013).

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**Table 5A: Standards of China's SMEs**

<i>Industry</i>	<i>Index/Unit</i>	<i>Medium-sized</i>	<i>Small-sized</i>
Manufacturing	Number of Employees/Number	300–2,000	Less than 300
	Sales/US\$ 1,000	4,410–44,118	Less than 3,000
	Total Assets/US\$ 1,000	5,882–58,824	Less than 4,000
Construction	Number of Employees/Number	600–3,000	Less than 600
	Sales/US\$ 1,000	4,410–44,118	Less than 3,000
	Total Assets/US\$ 1,000	5,882–58,824	Less than 4,000
Wholesale	Number of Employees/Number	100–200	Less than 100
	Sales/US\$ 1,000	4,410–44,118	Less than 3,000
Retail	Number of Employees/Number	100–500	Less than 100
	Sales/US\$ 1,000	1,470–22,508	Less than 1,000
Transportation	Number of Employees/Number	500–3,000	Less than 500
	Sales/US\$ 1,000	4,410–44,118	Less than 3,000
Postal	Number of Employees/Number	400–1,000	Less than 400
	Sales/US\$ 1,000	4,410–44,118	Less than 3,000
Accommodation and Food and Beverage	Number of Employees/Number	400–800	Less than 400
	Sales/US\$ 1,000	4,412–22,508	Less than 3,000

*Source:* NBS of China (2005).

## 6

# National Systems of Innovation and Small Enterprise Development in South Africa

*Lindile L. Ndabeni*

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South Africa has experienced over 300 years of colonialism, and over 46 years of apartheid. During these years Small, Medium and Micro Enterprise (SMME) promotion, particularly for the majority of the population, was not encouraged. By contrast, blacks were meant to provide labour to the white business establishments. Consequently, the policy framework was geared towards the promotion of large enterprises often leaving SMMEs at a disadvantage. Monetary, foreign-exchange and industrial strategies were formulated to support the specialisation of large firms in capital-intensive production, feeding the higher end of the market. Small-scale producers were left to produce inferior goods, commonly catering to the lower end of the market and using labour-intensive means of production. That is to say, the past government adopted a discriminatory approach in the promotion of SMMEs which was in line with its policy of discrimination. Such discrimination sowed the seeds of the two disconnected and parallel economies that exist in South Africa today — first economy and second economy which are discussed in the third section in this chapter. Following political freedom in 1994, the important task of transforming and deracialising the economy and opening up business opportunities to previously excluded black South Africans was started (Ndabeni 2005). That is, it was only after 1994 following South Africa's democratic dispensation that SMME promotion was encouraged,



particularly through public policy initiatives. In particular, the government acknowledges the potential impact of SMMEs on poverty reduction, job creation and their general impact on the national economy. Typically, small- and medium-sized enterprises are an important component of the national economy. More specifically, this chapter acknowledges the important role of SMMEs in the national systems of innovation (NSI). Accordingly, the report emphasises the role of organisations and institutions in the NSI. Politically, the government highlights the role of SMMEs as an instrument for economic development among the previously disadvantaged communities. Typically the SMME sector has increasingly been targeted by the government as a means of stimulating economic growth in general, as a vehicle for wealth distribution and for attaining equitable growth, and as a means to addressing rising unemployment. Therefore, the promotion of the SMME sector is a key element in the government's strategy for job creation and poverty eradication (Biepke n.d.). However, their development is hampered by a number of constraints including finance, markets and managerial skills (Biepke n.d.; Ndabeni 2005). Accordingly, the objectives of supporting SMMEs include creating and enabling environment for SMMEs; facilitating greater equalisation of income, wealth, and earning opportunities; supporting advancement of women in business; creating long-term jobs; and preparing the SMME sector to comply with challenges of an internationally competitive economy (Republic of South Africa 2005). However, there is still an uneven geographical distribution of service providers as they tend to cluster in urban areas; that is, within the NSI of South Africa, there are disparities in terms of a rural and urban divide. Provincial disparities have also been observed as service providers tend to be located in the prominent provinces of Gauteng, Western Cape and Kwa-Zulu Natal.

The aim of this chapter is to present a national perspective of SMMEs in the NSI of South Africa. This paper uses the systems of innovation approach as it enables us to employ the historical and evolutionary perspectives in the analysis of SMMEs in NSI. In preparing this paper, data was collected from various secondary sources including policy and strategy documents. The analysis includes identification of relevant organisations and institutions that impact upon the SMMEs as they relate to the NSI. Limitations regarding the role of SMMEs in the NSI are also recognised. For example, in developed

countries more revenue is said to be generated from Small and Medium Enterprises (SMEs) which are also seen as engines of economic growth (Biepke n.d.). By contrast, in South Africa, SMMEs are expected to contribute to poverty alleviation and create jobs although such jobs are generally of low quality. Overall, it is acknowledged that there is relatively little scholarship concerning the issues surrounding SMMEs in the NSI. The need for such dedicated research is, however, widely recognised. This chapter seeks, therefore, to contribute to the limited literature on SMMEs in the NSI in South Africa and more broadly, to African scholarship regarding SMMEs in the NSI including the link between science policy and SMME promotion.

## The South African SMME Economy

In South Africa, the term 'SMME' is used to describe a diverse range of activities that differ in size, sector, ownership structure, formality, and technology. Thus, this research takes as its starting point the complexity of its SMME economy and acknowledges the paucity of data that is available on them. Due to the variety of sources that estimate the size of the SMME sector, it is estimated that there are between 1.6 and 3 million SMMEs in South Africa (see Table 6.1).

Again, due to this paucity of data and systematic figures, it is difficult to use any particular statistics and when it is used it is only an estimation rather than definitive. Therefore, it must be kept in mind that the situation in South Africa is markedly different from that of many research environments in the developed and other developing countries where there may exist a large body of pre-existing scholarship on SMME development. Thus, the volume of research with practical orientation and policy relevance is still limited, considering the needs of South Africa. Such data would enhance our understanding of SMMEs in the NSI and provide better insights in terms of generating a more relevant innovation policy for SMMEs.

The SMMEs discussed in this chapter are geographically spread throughout South Africa. As shown in Tables 6.2 and 6.3, Gauteng, Western Cape and KwaZulu-Natal provinces continue to account for the majority of entrepreneurial activities. These three remain the growth poles for the South African economy (Maas and Herrington 2007).

**Table 6.1: Indicators for the Size of the SME Sector**

<i>Source</i>	<i>Survivalist</i>	<i>Micro</i>	<i>Very Small</i>	<i>Small</i>	<i>Medium</i>	<i>Large</i>	<i>Total</i>
Ntsika	184,400	466,100	180,000	58,900	11,322	6,017	906,739
Statistics SA, 2000/Ntsika 2000	Informal: 1,138,854		330,271	94,804	52,620	12,249	1,628,797
Business Partners	2.3 million		600,000		35,000	NA	2.9 million
Management Sciences Group Survey, 1999	Micro: 960,740		Formal: 445,880 (of which 357,780 Private)				2.3 million
	'Informal': 862,580						
Eskom Survey, 1999	900,000 'In-Home Businesses'; Total 3 million if one includes Farmers					NA	3 million

*Source:* Berry et al. (2002).

*Note:* NA = not applicable.

**Table 6.2:** Geographical Distribution of SMMEs in South Africa's Provinces

	<i>Ntsika 1997</i>			<i>Ntsika 2000</i>	
	<i>Survivalist Micro</i>	<i>Very Small and Small</i>	<i>Medium</i>	<i>Total SMMEs</i>	<i>Total SMMEs</i>
Mainly Urban Provinces: Gauteng, Western Cape and KwaZulu-Natal (in %)	415,800 (63.9)	175,400 (73.5)	8,770 (77.5)	599,970 (66.6)	944,034 (57.9)
Mainly Rural Provinces (Other Provinces) (in %)	234,900 (36.1)	63,400 (26.5)	2,552 (22.5)	300,752 (33.4)	685,622 (42.1)
Total Number of Enterprises	466,100	180,000	11,322	900,722	1,629,656

Source: Berry et al. (2002).

**Table 6.3:** Geographical Distribution of SMMEs in Various Localities

	<i>Survivalist</i>	<i>Formal and Semi-Formal</i>	<i>Total</i>
Metro	320,309 (47.7%)	1,081,043 (64.8%)	1,401,352 (59.9%)
Small Town	148,310 (22.1%)	251,509 (15.1%)	388,819 (17.1%)
Rural	203,575 (30.3%)	335,898 (20.1%)	539,473 (23.0%)
Total	672,194	1,668,450	2,340,644

Source: Berry et al. (2002).

The classification of enterprises in terms of the categories small, medium and micro is meant to enable policy makers and service providers to know the target groups they need to assist with regard to policies and services. At the same time, small business owners need to know which target group they fall in so that they can determine which support measures they qualify for (Republic of South Africa 1997: 8). These different forms of SMMEs are analysed in this section.

Survivalist informal enterprises can be defined as a set of activities that are often undertaken by black people who are unable to find regular employment in the formal job market. In this group of enterprises the income generated is less than the minimum standard or the poverty line, little capital is invested, skills and training are negligible, and there are scant prospects for opportunities for upward growth into a viable small business enterprise (Rogerson 1997). This group of enterprises

is seen as 'pre-entrepreneurial' and consists of hawkers, vendors and subsistence farmers (Republic of South Africa 1997: 9). In this category of SMMEs, the use and diffusion of technology is low and the focus is more towards outside opportunities than on developing the enterprise. What makes it more difficult is the low level of education among the entrepreneurs. This challenge technically excludes them from benefiting from technology transfer and competence-building activities as they tend to demand some level of education. This further makes it more challenging for them to contribute or benefit from the NSI. In the sub-sector as a whole, there are no paid employees and the asset value is minimal. One key problem that emerges from research concerning this group of enterprises is that while blockages can be identified across informal enterprises, there is a need to desegregate the analysis and focus on the specific problems that confront different types of survivalist informal enterprises (Nobanda 1998: 21). That is to say, a sectoral approach would be more helpful than a generic one in the NSI.

The most wide-spread observation on the SMME economy across South Africa demonstrates the overwhelming survivalist character of the sub-sector. It is observed that the balance in the SMME economy is currently weighed heavily in favour of 'necessity entrepreneurship' rather than 'opportunity entrepreneurship' (Driver et al. 2001). It is apparent that the primary dynamic of SMME growth is as a product of supply-push forces rather than demand-pull forces. Thus, the major reason for initiating an SMME is due to circumstances of necessity in terms of search for means of household survival rather than launching an SMME due to a perceived business opportunity. That is, whilst new SMMEs are being created, the majority of these enterprises exist at only the barest levels of survival and tend to concentrate on activities such as survivalist retailing. This makes it difficult for them to contribute to economic growth. In detailed studies conducted on non-farm enterprises in Limpopo and North-West Provinces, J. Kirsten (1995, 1996) found that 77 per cent of enterprises were retail or service ones, largely of a survivalist character. Her research further demonstrated that only a handful of enterprises were involved in value-added activities (only these should in reality be included in the analysis of SMMEs in the NSI) such as manufacturing, processing or construction, showing that there is a lack of diversity in the non-farm economy (Kirsten 1995). The lack of diversity and concentration of

SMMEs in a somewhat narrow range of economic activities results in fierce local competition, 'overtrading' and low returns to entrepreneurs (Rogerson 2002a). Finally, this category of enterprises is often categorised under 'micro-enterprises'.

Micro-enterprises are very small enterprises, often involving the owner and some family members and at most hire one to four employees (Rogerson 1997). Micro-enterprises have a turnover that is less than the Value Added Tax (VAT) registration of R 150,000 (US\$ 21,428.6) per annum. Their gross assets are less than R 100,000 (US\$ 14,285.7) and usually lack formal registration. Examples of micro-enterprises include *spaza-shops* (a small informal café located in a township selling items that are in everyday demand), minibus-taxis and home-based producers. Micro entrepreneurs often have only rudimentary business skills or training. Nevertheless, it is often assumed that they will make the transition into viable formal small businesses (ibid.). The problems faced by micro-enterprises in South Africa relate to access to finance, particularly lack of credit and working capital; lack of access to markets and too many competitors; and dearth of information to help them graduate into small enterprises (Nobanda 1998; Republic of South Africa 1997). Following micro-enterprises are very small enterprises which employ fewer than 10 paid employees, except in mining, electricity, manufacturing, and construction sectors where the figure is set at 20 employees. Their gross assets excluding fixed property range from R 150,000 to R 500,000 (US\$ 21,428.6 to US\$ 71,428.6) depending on the industry. These enterprises operate in the formal market and have access to technology that they require.

The SME category constitutes the formal SMME economy (Nobanda 1998: 23). It is in this category that innovation policy could be more productive and thus contribute to international competitiveness of the sector. The group of 'small enterprises' refers to those SMMEs that employ not more than 50 employees (Republic of South Africa 1997). Their gross assets excluding fixed property range from R 2 million to R 4.5 million (US\$ 285,714.28 to US\$ 642,857.14) depending on the industry. They are generally more established than very small enterprises and exhibit more complex business practices. Most often they outgrow direct supervision of the owner-entrepreneur and require a secondary co-ordinating mechanism in the form of professional management. For the small enterprises to grow into medium-scale sector accumulation of resources and appropriate incentives for

enterprise expansion are required. In terms of the nature of support interventions, ‘small enterprises need an individualized package of technical assistance, training, and credit resources’ (Republic of South Africa 1997: 8). Small enterprises constitute the bulk of the established business. By contrast, medium enterprises have a maximum number of 100 employees, except for the mining, electricity, manufacturing, and construction sub-sectors where the employment ceiling is 200 employees (*ibid.*: 9). That is to say, medium enterprises have between 51 to 200 employees and a turnover of R 5 million (US\$ 714,285.7) per annum. Their gross assets excluding fixed assets range between R 2 million and R 18 million (US\$ 285,714.28 to US\$ 2,571,428.5), depending on the industry. These enterprises are often characterised by the decentralisation of power to an additional layer of management. Although medium enterprises are still managed by the owner, the management structure tends to be more complex. Often the decentralisation of power to an additional management layer and the division of labour is the difference between small and medium-sized enterprises.

In terms of technology, SMMEs can be categorised into high-tech, medium-tech and low-tech firms (see Table 6.4).

**Table 6.4:** *Classification of Industries by Technology Intensity*

<i>Technology Intensity</i>	<i>Industry</i>
High-tech	Aerospace, Computers, Office Machinery, Electronics-communications, Pharmaceuticals
Medium High-tech	Scientific Instruments, Motor Vehicles, Electrical Machinery, Chemicals
Medium Low-tech	Rubber and Plastic Products, Shipbuilding, Fabricated Metal Products, Petroleum Refining, Ferrous Metals
Low-tech	Paper, Printing, Textile and Clothing, Food, Beverages and Tobacco, Wood Products

*Source:* Hatzichronoglou (1997), in Smith (2008).

The idea of classifying industries on the basis of technology intensity has a long and complex intellectual history. It draws on the ideas concerning such disparate issues as the history of industrialisation, the scientific war effort of the World War II, modern business organisation, and the scientific and technological conflicts of the Cold War (Smith 2008). In its most recent form, it rests on the statistical taxonomy of manufacturing industries developed in the mid-1980s

at the Organisation for Economic Co-operation and Development (OECD). The OECD discussed a range of ways in which the technology industries might be quantified including research and development (R&D) spending, patenting frequency and the employment of highly-skilled people (engineers and scientists). These indicators are highly correlated with each other. Thus, a distinction is made between industries in terms of R&D intensities only. Those, such as Information and Communication Technology (ICT) or pharmaceuticals, spending more than 4 per cent of turnover on R&D are classified as high-technology; between 1 and 4 per cent of their turnover, such as vehicles or chemicals, as medium-tech; and less than 1 per cent, such as textiles and food classified as low-tech industries (*ibid.*). This classification has been accepted among both academics and policy makers and has been used to distinguish between high- and low-tech industries and as a way of identifying knowledge-intensive industries. A firm would thus be considered high-tech if one of its primary assets was the possession of advanced technological knowledge used to develop new products or processes (Cordes et al. 1999). Firms have been considered high-tech on the basis of the extent of technology embodied in products and production processes; the determination that certain types of firms produce disproportionately more innovative outputs than others; and relative expenditure on innovative inputs, such as scientific and technical workers and especially R&D. A good case can be made that those that make regular use of new technologies to produce their goods or deliver their services should also be considered as part of the high-tech sector economy in addition to firms that develop such technologies (*ibid.*). They can be seen as drivers of economic growth, important sites of innovation and key bearers of the knowledge economy. Low- and medium-tech industries include manufacturing, property, social and community services, fuels, food and beverages (Smith 2008). With the exception of the higher education sector, none of the major activities that make up the services sector are significant R&D performers. While they may consistently innovate, they often do not base their innovations on R&D results. More specifically, their innovations are often driven by incremental product change rather than by application or commercialisation of R&D. Nevertheless, technological upgrading remains essential in these firms and the linkages between industry and the knowledge infrastructure require attention. Indeed these firms can be competitive in the long run and can also form a potential basis for continued



growth. Given that a large proportion of employment is also derived from the low- and medium-tech sector, this economic sector remains crucial to policy development.

Family businesses are recognised as a significant and universal form of business organisation, and in these family members are directly involved in the ownership and, sometimes, functioning (Ping 2004). What we can, however, observe is that the leadership and management positions tend to be filled by family and close relatives. That is to say, ownership and management control tend to be in the hands of the family members who are usually the founding members or successors (*ibid.*). The centralisation of leadership tends to discourage other employees from taking responsibility and initiatives in the enterprise. Equally important is the limitation of succession planning in the enterprise.

Enterprising families generate new and additional economic activity and build long-term value across generations. The outcome of such activities is trans-generational entrepreneurship and wealth that is created in the family. It is possible to examine the impact of family businesses in both local economy and on regional development, including the constraints that hinder their development. In terms of promotion, there is no specific policy instrument that seeks to exclusively promote this form of enterprise. They are thus treated like all other SMMEs. Due to the short history of SMME promotion and research, studies on family businesses are still lagging behind. Overall, there is a need to explore this form of SMME organisation within the South African context.

The governments assists SMMEs for various reasons including their remarkable capacity to absorb labour albeit largely unskilled. More importantly, they are also promoted due to their capacity to absorb new technologies and innovations. The support approach in the first 10n years of democracy, however, treated SMMEs as a homogenous group and the SMME support was mainly supply-driven (Republic of South Africa 2005).

The Department of Trade and Industry (DTI) is the policy coordinating body with a particular role of creating an environment conducive for SMME development and promotion. However, it is not the only organisation playing this critical role within the NSI as the Department of Science and Technology (DST) contributes to SMME promotion through the promotion of an innovation policy that encourages universities to contribute to industrial innovations and

technology transfer. In particular, the DTI aims to generate research that produces credible statistical information about SMMEs, focus on improving technical and business skills and create new structures to provide access to funding for micro-enterprises. The actual delivery of SMME support services is left to the organisations that are closer to the target group. It is believed that such proximity will ensure a demand-led and much more focused approach. That is to say, the DTI focuses on addressing the macro environment leaving the actual delivery of support services to local structures, such as local government municipalities and specific small business support institutions, such as offices of the Small Enterprise Development Agency (SEDA), to deal with real needs. The actual delivery of SMME services is thus linked to local economic development planning activities occurring at local level.

Historically, two disconnected and parallel economies have existed in South Africa. They are characterised by an ever widening economic gap. On the one hand, there are entrepreneurs engaged in formal businesses who are fully equipped to understand and engage the mechanisms of the market, including competence-building, technological innovations. On the other hand, are the survivalist entrepreneurs mostly from poor and disadvantaged communities who have had no access to markets and are therefore ill-equipped to establish employment-creating opportunities through their SMMEs. These entrepreneurs would jump at the first opportunity of formal employment. Further, these enterprises generally operate in fragmented markets and have to compete with highly sophisticated and well-organised counterparts in the formal sector. Most SMMEs are found in the second economy which is more informal. It is evident that a different approach is required to help these enterprises survive and grow and consequently produce sustainable jobs. That is, a new *modus operandi* is required which would lead to their competitiveness and therefore more focused inclusion in the NSI.

The majority of SMMEs in South Africa were started by previously disadvantaged individuals who tend to have less resources at their disposal, little or no savings, modest or no access to finance, negligible amount of or no valuable investment in terms of property. Small and medium-sized enterprises thus encounter a number of hindrances in terms of capital, personnel, technology, and management (Li 2010). As a result, South African SMMEs are less innovative than their

counterparts elsewhere in the developed world and some developing countries; the majority of South African SMMEs are not engines of economic growth but play a role in poverty alleviation. They are not internationally competitive due to a number of factors. There is little or no mobility of workers, negligible competence-building occurring in the firms or none, few skilled and competent workers, and technology transfer that leads to improved quality of existing products rather than generation of new technologies; and linkages between them and the universities do not lead to improvements and transformations in the whole system or sector. Such linkages often occur in one faculty rather than on inter-faculty arrangements which would encourage more knowledge flows. These are all factors that are crucial to the improvement of systems of innovation and the analysis of SMMEs in the NSI.

In post-apartheid South Africa, SMMEs are acknowledged for their significant role in the achievement of social (poverty alleviation), economic (employment creation, increased incomes, economic growth) and political (black economic empowerment) objectives (Philip 2001; Republic of South Africa 1998). While South Africa's SMMEs are acknowledged by local policy makers for their contribution to addressing poverty and creation of employment in the face of a shrinking public sector and the private formal economy, the conditions facing these entrepreneurs make survival itself a miracle (Steel 1994). The challenge facing policy makers in South Africa is to turn the miracle of survival into one of growth (*ibid.*). A first step towards achieving this is to accept that though the country's entrepreneurs can be agents of change and growth, they cannot achieve this objective alone. More specifically, their role in the NSI needs some analysis.

## SMMEs and National System of Innovation

South Africa began using the systems of innovation framework to organise its public resources in research, development science and technology only in the 1990s (Maharajh and Motala 2008). In defining its ambit of influence, the Department of Arts, Culture, Science and Technology published its influential White Paper on Science and Technology in 1996 (DACST 1996). This established the broad parameters and orientation of the now reframed NSI.

The South African economy is undergoing rapid transformation from its origins as a primarily resource-driven complex towards a form that seeks to become increasingly knowledge-based (Maharajh and Motala 2008). This transition is being undertaken within a context of rapid insertion into the global political economy whilst simultaneously seeking to redress the inherited inefficiencies and associated legacies of apartheid capitalism. A significant demand in this evolution is for large numbers of highly skilled and technically competent human resources. It is expected that the transformation of the South African economy will increase productivity, enhance national competitiveness and contribute to generally improving the quality of individual lives.

The challenge of creating relevant and appropriate knowledge-based economic and social strategies which will seamlessly ensure the application of science-led innovation as a driving force in the transformation of the national economy has however not been fully met. Further, critical questions arise when understanding what kind of technological capability exists in the country which can be focused upon as a unique comparative advantage in the quest for an accelerated pace of technological change.

The SMME sector — through innovation — has potential to stimulate endogenous growth, while employment is a natural consequence of bigger and innovative SMMEs expanding into larger businesses. Thus policy formulation should focus on supporting and fostering innovation in order to ensure greater probability of survival with employment becoming a positive consequence. There are a number of reasons why innovation has become important. First, technology is changing at a fast pace; product life cycles have become shorter; customers are increasingly more demanding (Mutaga n.d.). Thus, innovation and innovation policy are central to SMME success. More importantly, SMMEs have to increase their innovation capacity if they want to grow into sustainable companies. This will address their high mortality rate as well as their failure to grow into bigger businesses.

The government has introduced a number of initiatives to foster a culture of entrepreneurship and promote SMME development. An important policy instrument that is increasingly used relates to SMME clusters which are defined as concentrations of competing and related firms, bringing together both the firms producing final goods and their suppliers and contractors, which constitute the so-called supporting and related firms (Nel and Makuwaza 2001). Clustering attracts the

economic infrastructure of an industry, such as specialised business services, human capital and knowledge producing and disseminating institutions. More importantly, clusters have the ability to influence the skills base of the region. The essence of industry clusters lies in their ability to develop relationships through strategic partnerships between companies, customers, suppliers, research and education institutions, and the wider business community. It is believed that logically such relationships will lead to a number of benefits, such as improved company performance, increased establishment of new businesses, better innovation, and an ability to attract more R&D investment. In a cluster, firms co-operate at industry level and compete at firm level. It is thus believed that clustering has the potential to improve performance and competitiveness of firms. However, a critical question worth asking is whether clusters lead to improvements in the whole system of innovation. In South Africa, clusters have generally not led to the expected improvements in the system in national, regional and local systems of innovation.

South Africa's policy regarding clustering is focused at two levels — sectoral and spatial. At spatial level, which is more linked to regional systems of innovation, the focus is linked to the re-insertion of South Africa into the global economy which has resulted in critical changes in the macroeconomic context (Crush and Rogerson 2001). In particular, the birth of a democratic state resulted in significant policy shifts that have been designed to 'remake' new post-apartheid geographies or generally regional systems of innovation. More specifically, during 1995–96 the Spatial Development Initiatives (SDI) programme was conceived and launched in South Africa as an important component for restructuring the post-apartheid space economy (Palmer et al. 2002; Rogerson 2002a). In many respects, the SDI programme can be understood as an element of 'top-down' spatial planning.

It is argued that in terms of planning within the developing world, the South African case is of particular interest with enormous policy changes taking place as a result of the transition to democracy (Rogerson 2002a). For over 40 years, beginning from the 1950s to 1994, the apartheid state introduced a series of programmes aimed at shifting spatial patterns of investment away from the metropolitan areas into several designated peripheral growth centres situated in the former Bantustans.<sup>1</sup>

It is argued that 'the primary sectoral focus of this apartheid spatial engineering was upon changing the geographical patterns of

manufacturing investment and of implementing programmes for industrial decentralization' (Rogerson 2002b: 325). At the centre of this spatial planning programme was the implementation of a vigorous growth centre strategy. The region was thus becoming an economic policy focus giving some recognition to the importance of regional scale as well as local resources in stimulating innovation capability and competitiveness of firms and regions. The origin of the concept of regional innovation systems lies in two bodies of theory and research, namely systems of innovation — built on evolutionary theories of economic and technological change that conceptualise innovation as an developing and social process — and regional science and its focus on explaining the socio-institutional environment where innovation emerges. From a regional perspective, innovation is localised and locally embedded. The main reason for developing targeted policies within the regional systems framework is to concentrate on improving capabilities and performance of local firms while simultaneously improving their business environment. The conception of region as a locus of innovation is partly based on the success of regionally-concentrated networks of SMEs and industrial districts. Innovation is thus understood as a fundamentally geographical process and innovation capabilities as being sustained through regional communities that share common knowledge bases. It is generally conceded that the innovative performance of regions improves when firms are encouraged to become better innovators by interacting both with various support organisations and firms within the region. The institutional characteristics of the region, its knowledge transfer systems and individual strategy, and performance of firms can thus represent important basic conditions and stimuli in promoting innovation activities.

The advent of a South African democratic state resulted in significant policy changes. The South African government launched a major programme of SDIs as an important element of the new macroeconomic environment in South Africa (Ashley and Ntshona 2002; Bourgooin 2002; Rogerson 2002a). The key principle of the SDI is the move away from the protected and isolated approach to economic development, towards international competitiveness, regional co-operation and a more diversified ownership base (CIMEC 1997: 2). This principle is seen as important particularly in light of the international economic trends towards regionalism and globalisation. The emphasis on targeting specific economic sectors and particular geographic regions is viewed as particularly appropriate given the shift

in South Africa's trade policy and national industrial strategy from one predominantly focusing on import-substitution manufacturing to a new outward orientation through international competitiveness (Crush and Rogerson 2001; Rogerson 2002a). The SDI programme attempts, therefore, to overcome the spatial legacy of apartheid through the redistribution of economic activities and infrastructure which were distorted by political agendas thereby leaving many areas neglected. 'Yet SDIs had to be more than a historical corrective' (Crush and Rogerson 2001: 87). The identification and promotion of specific regions was not an abstract exercise but occurred within the context and constraints of the existing space economy (*ibid.*). Furthermore, the SDI programme is an attempt to move economic activities away from a narrow focus on import substitution and domestic markets, towards the production for global markets. However, what this strategy missed was the understanding of the organisations and institutions that are critical in the regional systems of innovation.

The sectoral focus deals with improving the performance and competitiveness of specific sectors, such as manufacturing, and ultimately economic growth. The majority of cluster initiatives both at spatial and sectoral levels are still at early stages and most focus on large industries such as the motor industry. The motor industry cluster in the Eastern Cape Province was established in 1997, where it forms the backbone of the industrial base. More importantly, the industrial base has linkages to the textile industry. The SMMEs are seen as beneficiaries of multiple effects of clustering rather than primary beneficiaries of the clustering policy. This policy focus robs the SMMEs of their potential contribution in driving economic growth both at local and regional levels and it is not clear how the policy could lead to transformations in the whole sector or region. It is important for South Africa to enhance its policy framework regarding SMME innovation, which includes clustering, in order to improve SMME productivity and pay attention to all possible and emerging SMME sectors including the factors that are crucial to regional systems of innovation such as producers of knowledge, organisations that contribute to technology transfer and knowledge flows as well as competence-building. This would, however require provinces and localities as well as R&D organisations to play a critical role in crafting and implementation of such a policy.

An equally important policy instrument relates to business incubators or science parks which are increasingly becoming instruments

through which SMME promotion occurs. In South Africa, the incubation process is a recent phenomenon and still evolving. Nevertheless, the limited literature in South Africa provides important insights into the nature and workings of business incubators in the country.

Science parks are essential to the promotion of knowledge-base companies which show potential for growth and are a key platform for the implementation of new business ideas. They are also important for providing services to SMME entrepreneurs whose businesses are based on the commercialisation of new technologies, research results and other innovation activities.

The correct positioning of university research as part of the innovation systems is important. This ensures commercial applicability of their research. Apart from promoting the wealth of the locality and region, business incubators promote the culture of innovation. Innovation is critical if firms, localities and regions want to remain competitive. Accordingly, business incubators are central to improving the success rate of start-up SMMEs and in facilitating the development and growth of SMMEs.

The increasing number of business incubators shows that the right kind of business environment is increasingly acknowledged as an important factor contributing to the success of competitive SMMEs and a diversified local economy (Lalkaka 2002). Indeed, technology incubators are emerging as new forms of venture creation and instruments of SMME promotion and enhanced innovation within the small enterprise sector.

The South African situation is characterised by two incubation movements — technology stations programme and business incubators. Both have been established to stimulate economic growth, particularly in the high-technology SMME sector. First, the technology stations programme is a product of the DST policy aimed at strengthening and accelerating the mutually beneficial linkages between universities of technology and SMMEs. In particular, the policy objectives of the department directed towards improving knowledge flows, technology absorption and innovation, thereby improving the competitiveness and innovation capacity of SMMEs in selected sectors of the economy. Accordingly, DST's programme is geared towards establishing and maintaining a sustainable system of technology stations as competent providers of technology transfer and related services. Through this programme the DST wants to



influence the universities of technology to target more research and development outputs towards the needs of the SMMEs.

The technology stations offer technology support and advice to low technology-based SMMEs in order to improve and graduate into high-technology SMMEs (CHE 2008). The specific activities of the technology stations include, *inter alia*, research, development and application of new technologies, technology transfer, troubleshooting, quality advisory service, product development, simulated production units, testing services, and secondment of staff and students (Business Referral and Information Network 2003). Table 6.5 shows the existing technology stations at universities of technology and further demonstrates that these institutions of higher learning are increasingly becoming more responsive to the long-term needs of SMMEs. The creation of new jobs in a knowledge-based economy is thus seen as a decentralised process that can be carried out by small firms and local universities thereby contributing to local economic development and innovation systems.

**Table 6.5:** *Geographical Locations of Technology Stations in South Africa*

<i>Location of Technology Station</i>	<i>Focus</i>	<i>Province</i>
Nelson Mandela Metropolitan University	Automotive Components	Eastern Cape
Central University of Technology	Metals and Manufacturing	Free State
Tshwane University of Technology	Automotive	Gauteng
Tshwane University of Technology	Chemistry and Chemical Engineering	Gauteng
Tshwane University of Technology	Electronics and Electrical Engineering	Gauteng
Vaal University of Technology	Composite Materials	Gauteng
Mangosuthu University of Technology	Chemistry and Chemical Engineering	KwaZulu-Natal
Cape Peninsula University of Technology	Clothing and Textiles Technology	Western Cape

Source: Ndabeni (2008).

The universities of technology provide access to academic research and development results suitable for transfer into SMME application and at the same time attempt to facilitate effective feedback mechanisms of SMME problems into teaching, learning and research through the involvement of students, subject to any intellectual property rights which may be vested in such results. However, there is no evidence to

show that technology stations are fully aligned to the formal teaching and research agenda at these universities. Indeed, knowledge flows continue to occur from universities of technology to SMMEs.

The second element of technology incubation movement concerns technology incubators. The focus of technology incubators is upon the physical facilities and incubation. Their key objectives are economic growth, sustainable employment, technological innovation and technology transfer, and international competitiveness of South African SMMEs. The overall purpose of the programme is improved enterprise performance, profitability and reduced enterprise mortality (Burns 2001). Table 6.6 shows the geographical location of technology incubators in South Africa.

The majority of technology incubators are in Gauteng, the most industrialised province in South Africa. Within the technology incubators, the most advanced business incubator is the Innovation Hub, which focuses on high-technology entrepreneurs and start-up companies at the leading edge of the new economy (Business Referral and Information Network 2003). This initiative was launched in February 2000 and the Innovation Hub as an incubator started operating in December 2000. It is the first internationally accredited science park in Africa and was, in particular, endorsed by the international association of science parks. As an accredited organisation it is part of the association of science parks and benefits through networks and networking, knowledge flows and knowledge sharing, as well as conferences and seminars held by the association. As a high-tech cluster it creates an environment where international businesses can access a regional centre of knowledge creation (Innovation Hub n.d.). Overall, it builds on good practices to create the true essence of a science park while providing a gateway for local businesses to successfully launch into the world of global interconnectivity.

In terms of its sectoral focus, the Innovation Hub is spread across ICT, biosciences, electronics, and advanced materials and manufacturing. The incubator offers a number of services and facilities: variety of office sizes; flexible leases; site security and access control; parking; digital telephone system; data connectivity; post-handling, telefax, and photocopy facilities; reception and secretarial support; canteen facility; meeting rooms and presentation equipment; management advisory and mentoring services; business support services; introduction to business networks and markets; assistance in accessing

**Table 6.6: Geographical Locations of Technology Incubators in South Africa**

<i>Incubator</i>	<i>Focus</i>	<i>Province</i>
Gauteng Software Incubator	Software	Gauteng
Acorn Incubator	Life Science Technologies	Western Cape
Brainworks Incubator	ICT and Electronics	Gauteng
Goli Biotechnology Incubator	Commercialisation of Life Sciences Research, Products, Services, and Technology Platforms	Gauteng
South African Chemical Technology Incubator	Downstream Chemical-Manufacturing SMMEs	Eastern Cape
Timbhale Incubator	Export-based Cut Flower and Nutraceuticals <sup>a</sup>	Mpumalanga
University of Pretoria Technology Incubator	High-technology	Gauteng
Innovation Hub	High-technology and Start-up Companies at the Leading Edge of the New Economy	Gauteng
Mpumalanga Stainless Steel Initiative	Manufacturing	Mpumalanga
KwaZulu-Natal Innovation Support Centre	Technology Commercialisation, Skills Development	KwaZulu-Natal
Zenzele Technology Demonstration Centre	Small-scale Mining	Gauteng

*Source:* Ndabeni (2008).

*Note:* <sup>a</sup>Freshly cut flowers which are destined for export markets and plants that may have applications in the pharmaceutical industry.

technical expertise, and venture capital or finance; participation in high-tech cluster; and market visibility by means of corporate advertising (Innovation Hub 2006).

At the heart of the support environment for technology incubation movement are government departments (DTI and DST), institutions of higher learning and donor support from the European Union. The National Research Foundation (NRF) and Council for Scientific and Industrial Research (CSIR) are involved in the implementation of technology incubators. The geographical proximity to universities is aimed at enabling the tenants to have easy access to technical facilities, students, faculty members, research labs, and libraries (Kumar and Kumar 1997). Finally, it allows for favourable infrastructure and the optimum utilisation of intellectual capital as well as scientific research for industrial purposes. Overall, the number of technology stations and technology incubators discloses the importance of knowledge sharing and technology transfer between the universities and SMMEs. These business development instruments are proving to be cost effective ways of helping to start technology-based enterprises.

More importantly, the geographical proximity and sectoral relations of enterprises enable them to share information and gain easy access to suppliers, traders and customers (McCormick 1998; Pedersen 1998). In many cases the enterprises involved in clustering, facilitate the common provision of services and establishment of associations (Sverrisson 2000). Indeed, the capacity to adapt in a rapidly changing world is a prerequisite for competitiveness and such capacity cannot be achieved by small entrepreneurs acting as individuals (Schmitz 1993). Enterprise clusters should, therefore, enhance co-operation on common problems and issues of common concern and lead to joint action and collective efficiency as well as transformations of the particular sector.

It can be expected that linking SMMEs together within clusters should raise the quality of final products and ultimately allow the entire cluster to prosper. While the primary responsibility for joint action lies with the concerned enterprises, assistance from government or donor agencies can make a difference especially in cases where the cluster consists entirely of small enterprises. The interventions may be substantive or facilitative offering direct inputs such as training, credit, technology transfer, or may facilitate potential networks (Livingstone 1997; McCormick 1998).

## Policy Learning: Gender and SMME Development

The issue of marginalisation of women is a topical issue in South Africa both for political and socioeconomic reasons. It is believed that by overcoming this problem the country can greatly achieve the objectives of broadening participation in the mainstream economy. Further, it is believed that women's enterprises have the ability to reduce inequalities both in terms of gender and race.

Women's economic empowerment is an integral part of the broader economic policy agenda of government. Due to historical reasons relating to disempowerment of women and their traditional roles in society, they tend to dominate the micro-enterprises of the SMME economy. This is due to the lack of access to resources that would enable them to start more profitable enterprises. The majority of them tend to operate out of the home and are concentrated in a relatively narrow range of activities, such as beer brewing, knitting, dressmaking, crocheting, and retail trading. These enterprises generate the lowest returns because they operate on the fringes of the major economic sectors. That is to say, the marginalisation of women's enterprises in the general economy tends to mirror the same in society. Again, they tend to serve purely local, and often very small, markets (Ndabeni 2005). The overall situation of women tends to be a result of their unequal access to education, resources, training, information on markets and technologies, and access to sources of business finance.

Women in South Africa constitute the majority of the population. According to Statistics South Africa (2011), there were 26,581,769 women as compared to 25,188,791 men. Typically, the SMME growth and development strategy should therefore position them as core contributors and participants in the SMME economy. However, traditional gender bias largely excludes them; for example, in the mining sector they are largely excluded from recruitment and enterprise opportunities. Their participation can, however, be enhanced through expanding opportunities in the mining industry and thus building women's formal participation, entrepreneurship and skills development. In particular, competence-building as well as knowledge and technology transfer could lead to improvements in women's enterprises and transformation of the sector.

Women's enterprises should be among those contributing to the growth of the South African economy. However, the challenge lies in developing a structured programme that will enable them to identify technologies relevant to the development needs of their enterprises. Women need technology solutions that can enable them to become creative and innovative when developing their business products. Science and technology are believed to be the major mechanisms for increasing innovation, competitiveness and economic value of these enterprises. It is further believed that technology can be a catalyst of growth for SMEs and may facilitate expansion to new markets (Thurasamy et al. 2009). Consequently, the government established a programme, namely Technology for Women in Business (TWIB), which is a national initiative of the DTI, started in 1998. It is managed by the DTI's Gender and Women Empowerment Unit and implemented in partnership with the CSIR as its main technology partner. The TWIB operates in partnership with the Department of Arts and Culture, the Department of Science and Technology, the Department of Minerals and Energy, the Department of Communications, and DTI's Small Enterprise Development Agency. Non-governmental organisations (NGOs), donors and SMME advisory centres also participate in the initiative. Apart from the DTI, only the Department of Minerals and Energy has been active in the TWIB. Its contribution has been in the facilitation of the activities of TWIB in mining, oil and gas, electricity and energy, and jewellery.

In particular, the TWIB promotes women's understanding and use of technology in industrial settings. The programme is aimed at contributing to the general improvement of the quality of women enterprises and technological learning. However, one of the constraints relates to the large geographical spread and sectors of women enterprises as well as their different developmental stages. The implementation of the programme from the top has its weaknesses as it misses the regional and local differences. Thus, the use of regional systems of innovation in the analysis of the programme could provide useful insights to improve the whole innovation policy.

It is acknowledged that the programme is designed to help women entrepreneurs move from the sidelines of the economy to the mainstream and the focus is on all levels of business, from micro-enterprises through to medium enterprises. The main technology policy objectives of the initiative include creating awareness about the need for women in business to access technology and the benefits that this

can bring in assisting them to grow their businesses. Typically, the programme's activities include identifying the technological needs of women entrepreneurs and linkages between women's enterprises and technology service providers, and exposing women to international trends in science and technology. The programme also gives annual awards to those women who manage to enhance their businesses by using more advanced technologies. The awards are aimed at acknowledging, rewarding and encouraging women to strive for even greater achievements. The winners of the awards become role models and a source of inspiration to young women entrepreneurs. The programme as a whole seeks to unlock constraints to enterprise innovation, growth and competitiveness in the local and global markets. It accelerates the empowerment of women through access to technology and competence-building to enable them to embrace and use innovative technologies.

The TWIB identifies and profiles women-owned enterprises for possible access to technology, training and market opportunities; facilitates access to relevant technologies that could be exploited to increase effectiveness and eliminate inefficiencies in current operations; aids access to technology finance programmes; and helps with access to competence-building and support in technology-related areas. The mandate of the TWIB also extends to programmes that encourage and mainstream girls into engineering, science, entrepreneurship, and technology by enhancing and facilitating knowledge flows relating to relevant and educational information, career opportunities, and academic and extramural learning programmes. The focus areas emphasise the importance of education and knowledge transfer and also that of developing skills and expertise needed by women entrepreneurs in order to successfully participate in the innovation system and further diversify their products and sustain their businesses.

The TWIB's priority sectors are agriculture and agro-processing; construction; clothing and textile; arts, crafts and tourism; mining, minerals and energy; and ICT. Large companies that contribute to SMME technology support are also recognised. It also aims to bridge the gap between procurement requirements on the one hand, and inefficiencies of SMMEs in terms of supplying the required goods on the other. Finally, the programme is also expected to bridge the knowledge divide and encourage the application of technology solutions by women in business (TWIB n.d.). Overall, promotion of women's enterprises could help them achieve economic independence and, enhance their self-esteem.

## The Challenge of SMME Public Policy

The promotion of SMMEs remains an important priority for the government of South Africa. With the advent of a new democratic era in 1994, the government has taken measures to ensure that small business development becomes a key policy focus. In 1995 the 'White Paper on National Strategy for the Development and Promotion of Small Business in South Africa' was formulated (Republic of South Africa 1995). It was the first time that a comprehensive policy and strategy on small business development was formulated in the country (*ibid.*). The strategy sought to address a number of factors: creating an enabling legal framework; streamlining regulatory conditions; providing training in entrepreneurship, skills and management; improving industrial relations and labour environment; encouraging joint ventures; capacity-building and institutional strengthening; facilitating access to information and advice, marketing and procurement, finance, affordable physical infrastructure, and appropriate technology; and introducing differential taxation and other financial incentives (*ibid.*). In other words, a sliding scale is used in the taxation of SMMEs with those with higher income paying a higher tax than those whose income is low. The sliding scale starts from zero and the maximum is 30 per cent.

In 2005, following the 'Review of Ten Years of Small Business Support in South Africa 1994–2004' (Republic of South Africa 2004), an 'Integrated Strategy on the Promotion of Entrepreneurship and Small Enterprises' (Republic of South Africa 2005) was released. The strategy is based on three strategic actions: (a) increasing supply for financial and non-financial support services, (b) creating demand for small enterprise products and services, and (c) reducing regulatory constraints.

The 'Review of Ten Years of Small Business Support in South Africa 1994–2004' (Republic of South Africa 2004) identified the issues that require attention. The great diversity of small enterprises and their needs require greater recognition, that is, a sectoral approach to SMME analysis could provide helpful insights and thereby introduce sectorally-led boundaries in the analysis of SMMEs in NSI. Greater knowledge and understanding is required across the full range of support suppliers and the support each one provides as well as to whom and under what conditions. Access to support services needs to be comparable in urban and rural areas and greater balance is required between the cost, reach and impact of support interventions



particularly where public funds are concerned. Many support programmes only tackle the symptoms of deeper problems thereby preventing a more systemic approach to those structural issues, like access to finance for black entrepreneurs. Lack of clarity about the roles and responsibilities of different levels of public-sector organisations makes their efforts uncoordinated and less effective and thorough and regular monitoring and evaluation of the evolving support processes has been inadequate (Republic of South Africa 2005). Overall, the integrated strategy sets the framework and outlines principles underlying government support and public-sector programme development.

It must be acknowledged that SMME promotion is a shared competency and cuts across a range of policy areas and government departments. The DTI co-ordinates these initiatives and is supported by its agencies, SEDA for non-financial support services and Khula Enterprise Finance for small and medium enterprise finance. Particular attention has been given to youth, women and people with disabilities; areas with high unemployment; growth sectors such as tourism; and other forms of enterprises such as co-operatives. The commitment to fostering entrepreneurship and promoting SMMEs goes beyond the government and its institutions and includes other actors in the NSI, such as universities, large corporations and NGOs (ibid.). Overall, the policy environment is characterised by the focus on addressing constraints that affect the growth of the SMME sector.

### *The challenge of finance*

It is argued that whether to create a new business or expand an existing one, entrepreneurs of all sizes and types need financial resources to stay competitive and grow (Buckley and Rynhart 2011). More importantly, lack of finance is the biggest obstacle to innovation (Li and Ye 2011). Typically, the majority of SMMEs do not have funds for research and development and equally do not have enough funds to carry out technical innovation (Li and Ye 2011). Consequently, it is worth noting that the success of SMMEs is critical to the transformation of the economy from one that benefited few in the past to one that benefits the majority of the population. The sector is a critical means through which ownership of productive assets can be redistributed. However, limitations in terms of access to finance to start and expand SMMEs undermine this policy objective. In other words, SMEs tend to have difficulties accessing debt finance from

commercial banks (Olufunso et al. 2010). Part of the problem lies in the fact that SMMEs are very heterogeneous and this poses various financing problems. For example, an SMME with a turnover of over R 5 million (US\$ 714,285.7) per annum can have access to debt financing in the form of bank credit; the other one with a turnover of R 150,000 (US\$ 21,428.6) per annum remains crucially dependent on loan finance or equity from friends or family (Falkena et al. n.d.). While SMME entrepreneurs use their personal finance, they require debt finance once they expand and establish business records. Lack of sufficient capital and credit is often a major handicap to the development of the SMME sector, especially in early stages.

Mainstream banking models do not seem to have the capability and flexibility required to finance SMMEs. Detailed financial records are not usually kept by SMMEs thereby making it difficult for the banks to assess their accounting records (Olufunso et al. 2010). They are more geared towards financing established businesses rather than the SMME sector, which was not a priority economic sector during the apartheid. SMMEs require varying sizes of loans, which calls for the introduction of a variety of financial institutions in South Africa to respond to peculiarities in the SMME environment.

In contributing to the solution in terms of access to finance, the government established Khula Enterprise Finance as a wholesale financial institution to support SMMEs that need access to finance, primarily through the provision of wholesale finance or guarantees to retail financial intermediaries which in turn finance the SMMEs. Khula-start is an entry-level programme that provides group loans to survivalist and/or micro-enterprises. The loans in this scheme are provided through a range of intermediary organisations called Micro Credit Organisations (MCOs). Such loans are primarily aimed at first-time borrowers who need small amounts of money to maintain their dependents through 'survivalist' economic activities. Larger loans are provided by Retail Finance Intermediaries (RFIs) through micro-lending programmes. The average loan size varies between group loans of R 600 (US\$ 85.71) to individual loans of up to R 500,000.00 (US\$ 71,428.57). Third, Khula's Credit Guarantee Scheme is aimed at assisting the more established entrepreneurs who wish to acquire or expand their businesses through a bank loan but are not in a position to provide the necessary security or collateral (Republic of South Africa 2000).

It has been observed that there has been a gap between policy objectives and actual implementation of policy in SMME financing, which means that Khula has not been very successful in the implementation of policy. First, Khula allowed RFIs that were inexperienced in terms of SMME lending to proceed due to the need to make an impact on the target market. Second, it failed to scrutinise the weak lending methodologies of certain RFIs. Third, outreach targets encouraged RFIs to chase volumes rather than quality. Fourth, inadequate capacity-building before and after loan implementation and disbursement was observed. Fifth, more emphasis was placed on 'international best practice' without being sufficiently cognisant of South African conditions (Republic of South Africa 2000: 49). Finally, the choice to use commercial banks to implement the loan guarantee scheme by Khula was a flaw as many commercial banks lacked the necessary technical skills and knowledge to lend to the SMME sector. As a result, majority of SMMEs find it difficult to access loans from commercial banks because they still insist on collateral. This situation poses insurmountable problems for the landless, the poor and women while lengthy and cumbersome loan procedures discourage small borrowers and new start-ups (Republic of South Africa 1999). Limited access to equity finance, venture capital and product finance left out many SMMEs. The problem is compounded by the absence of community-based savings or loan institutions, limited finance-oriented NGOs such as credit unions, and lack of established credit delivery mechanisms targeting SMMEs without collateral (Wilson and Ramphela 1989). Overall, the institutional environment of traditional financial institutions is viewed as unfriendly to many SMMEs. As a result, the majority of SMME entrepreneurs tend to rely on their personal savings and other informal lending outlets available in the SMME economy, such as loans from friends and relatives and financial gifts. This situation reinforces the limited range of economic activity occurring in the SMME sector (Philip 2001: 5).

Only a third of all applications for SMME funding are approved (Falkena et al. n.d.). A large number of applications have been declined funding because of the submission of bad business plans and insufficient collateral or records. The number of approved applications is very low when compared to the huge need for finance and more SMMEs may not be applying due to lack of knowledge. Many SMMEs lack skills and business experience and this has an impact on their access to finance.

One of the key challenges facing the government is to expand the geographic coverage of Khula. The other challenge is to increase awareness of the institution and its products. Access to knowledge is important as SMMEs need information about suppliers of financial services including their offerings, and service providers need information about their SMME customers. This observation tends to suggest the importance of bringing in non-financial institutions in the broader provision of finance. These institutions have knowledge of local economic conditions which impact on the success of local enterprises. Credit providers would then be able to use the information to improve their risk assessment. More broadly, SMMEs usually lack information regarding finance charges that the various credit suppliers levy and this hampers their choice and, typically, competition in the financial sector. There is a need for increased transparency in the sector including banks reporting on their SMME lending.

For those SMMEs with acceptable credit history and sufficient collateral, access to finance appears to be satisfactory (*ibid.*). However, for those entrepreneurs mainly from previously disadvantaged communities who tend to have limited collateral or none, or weak credit history, access to funding is limited. While this may suggest a weak banking environment, it also draws attention towards the need for more relevant institutions and increased innovations in order to enhance access to finance for SMMEs. This would increase the range of financial services available to SMME entrepreneurs. More significantly, it would introduce financial institutions that are responsive to the needs of SMMEs. These would include micro-finance institutions that make available very small loans to the entrepreneur to start or expand a micro-enterprise.

Overall, access to capital markets for SMMEs is still a problem in South Africa. This is unlike other SMME financing environments such as Bangladesh which have a rich history of SMME financing. Access to venture capital — which could be viewed as particularly important as a form of long-term investment for start-up SMMEs — is also limited. In this context, venture capital is more than a source of finance since venture capitalists have vested interest in the business and are therefore actively involved in the management of the company, contributing their experience and business knowledge. There is thus a need to encourage more venture capitalists to participate in the SMME sector. SMME entrepreneurs in South Africa often have

limited experience; in giving managerial advice venture capitalists could enhance the success of SMME initiatives including innovation in those enterprises. Increasing the range of financial services available to SMME entrepreneurs would indeed enhance the achievement of policy objectives regarding access to finance.

### *The challenge of markets*

It is argued that access to markets should lead to a sustainable impact on the growth of SMMEs (Barlow 2011). Indeed, lack of demand for SMME products has been highlighted as an important policy concern (Macheke 2002). A majority of SMME entrepreneurs depend entirely on local markets which are often overtraded. In an attempt to catch the eyes of potential buyers, entrepreneurs utilise certain basic types of marketing, such as word of mouth and locating themselves in well-trafficked areas. This observation suggests that rather than the size of the enterprise, it is the isolation of the business enterprise from large markets that is often the core problem. Accordingly, a key challenge is to identify business opportunities for SMME producers outside the local economy. Nonetheless, most small entrepreneurs lack the necessary resources to perform market assessment. The majority of SMME entrepreneurs cannot, therefore, be expected to expand their markets without the marketing assistance of agencies tasked with promoting SMMEs. Marketing assistance may concentrate on product diversification or identification of niche markets for high-value products. This may require sub-sectoral interventions to enable a greater leverage than would otherwise be possible. The sub-sectoral approach emphasises innovation in the production process, focuses on niche markets and customer needs, encourages skills development and innovation, and concentrates on the production of higher value-added products (Philip 2001; Republic of South Africa 2000).

In focusing on the manufacturing sector in Gauteng Province, C. M. Rogerson (1998) identified three potential areas of intervention. First is the encouragement of linkages between the private-sector enterprises and the emerging SMME economy through sub-contracting, which is seen as a means to boost the markets of emerging SMMEs. Capacity development in the form of technological capacity and training needs to be incorporated into the subcontracting arrangements

in order to ensure quality standards since SMME entrepreneurs tend to lack technological capacity. Second is the promotion of networks and linkages between SMMEs themselves. Attention needs to be drawn to constraints of the wider environment, such as absence of infrastructure and of institutional support — a set of factors which are not conducive to the formation of linkages between emerging SMMEs and the large-scale enterprises (Rogerson 1998). Third is the encouragement of the emerging SMME economy through expanded access to government tenders with the public procurement system. Fourth is the importance of understanding how markets work as a prerequisite for designing intervention that focuses on causes rather than symptoms of weak market performance (Barlow 2011). Accordingly, it becomes important to view the poorer and wider SMME sector as an integral part of the wider market (*ibid.*). Equally essential is the need to explore a supportive human resource base as a critical foundation for effective SMME promotion.

### *The challenge of human capital*

Lack of business skills has also been noted as an area of concern. SMME entrepreneurs tend to lack business skills, which in turn constrains their ability to take advantage of business opportunities. In particular, this restricts creativity and innovations, and leads to engagement in low-quality unsustainable SMME activities (Ndabeni 1999). This lack of business skills is not limited to SMME entrepreneurs but extends even to the institutions that are supposed to be assisting SMMEs, and needs to be seen in a broader context of low levels of education and technological capacity among the majority of entrepreneurs (Macheke 2002). This is more evident in the survivalist and micro businesses mainly because the apartheid education was not designed to help blacks pursue entrepreneurial careers but to enter the labour market as employees (Rogerson 1996). To compound this problem, the majority of entrepreneurs have received no formal training courses for their businesses (Rogerson 1996, 1998). As a result, most entrepreneurs in South Africa are poorly equipped to undertake technological innovation (Li and Ye 2011).

Human capital development and competence-building should result in improved production processes and products as well as creation of

new innovative enterprises. Existing programmes in South Africa need to be expanded beyond basic business abilities to include specialised technical skills training and managerial and organisational skills to enable entrepreneurs to plan and manage their businesses successfully. Linkages with universities based on inter-faculty arrangements would enhance these required knowledge flows for competence-building and sector improvements. Emphasis needs to be on developing local capacity in order to ensure long-term sustainability, enhance local economic development and contribute to improvements in local systems of innovation. In implementing human capital development interventions, it would be important to improve access to information and enhanced knowledge flows in the sector.

The provision of information is another important element of SMME development. Information or lack of it is often one of the major pre-requisites that determine the success of a small enterprise (Bourgouin 2002). In order to run a successful business, entrepreneurs require information about sources of supplies, goods and services that people need, prices they can afford for the goods, the gaps in the market in terms of goods and services that are not readily available locally, and sources of equipment and materials.

F. Bourgouin (2000) has identified several shortcomings in the existing provision of information support services. The first concerns the general and theoretical nature of existing services which contrasts with the specific needs of the SMMEs requiring practical solutions. The second relates to the general absence of associations among SMMEs which would make it easier for them to access the necessary knowledge. The introduction of knowledge-led networks among SMMEs is seen as a promising strategy for enhancing access to information. Inter-enterprise co-operation among SMMEs is seen as an important tool for enabling small businesses to strengthen their competitiveness in an increasingly globalising market. For the SMME sector, a collective approach can allow for increased leverage of public resources and other support services. Bourgouin (*ibid.*) suggests collective action can be achieved through sectoral associations, which can represent their membership's interest to service providers, act as a co-ordinating body for their members, gather relevant information and disseminate it to their membership, and undertake market research and bulk purchasing on behalf of their members. Overall, it can be expected that human capital development could facilitate mutual learning, enable collective innovation and facilitate adaptability of enterprises (*ibid.*).

## Conclusion

Since 1995, South Africa has experienced a significant revival of interest in the SMME economy. More specifically, policy frameworks acknowledge the significant role that SMMEs can play in poverty reduction, employment creation and black economic empowerment. Typically, policy instruments include the development of skills through training especially for those who work in the sector. However, skills development should be accompanied by other policy instruments such as the provision of credit, access to markets and enterprise development. These initiatives should be aimed at improving the performance of the sector and its capabilities to employ more workers and transform what are often marginal and survivalist activities into decent forms of work.

The analysis of SMMEs in South Africa's national systems of innovation highlights their significant importance in the national economy. It further points to a need for better understanding of their role in the overall transformation of the economy. In particular, the South African economy is undergoing rapid transformation from its origins as a primarily resources-driven complex towards a form which seeks to become increasingly knowledge-based (Maharajh and Motala 2008). Accordingly, various policy initiatives, such as technology stations and business incubation have been used to enhance entrepreneurial activities, knowledge flows and competence-building to improve the performance of the SMME sector in the overall economy. These also emanate from the acknowledgement that transformations occurring in the national economy point to a significant demand for highly-skilled and technically competent human resources. It is expected that these interventions will increase productivity, enhance national competitiveness and contribute to generally improving the quality of individual lives. Overall, a better understanding of the constraints and drivers of the SMME sector is critical to the improvement of the SMME economy and improved national systems of innovation.



## Note

1. The Bantustans were areas designated according to ethnic groups where Blacks were supposed to reside.



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