

Contents

<i>Preface</i>	<i>v</i>
<i>Abbreviations</i>	<i>xi</i>
<i>List of Tables</i>	<i>xiii</i>
<i>List of Figures</i>	<i>xv</i>
1 Introduction	1
1.1 The Topic	2
1.1.1 Research and development	2
1.1.2 R&D and growth in the Soviet/Russian context	4
1.2 The Study	6
1.2.1 Major objectives	6
1.2.2 Organization of the book	8
2 Research and Development and Economic Theory	11
2.1 Characteristics of R&D: The Theory	12
2.2 Characteristics of R&D: The Empirical Evidence	21
3 Technological Development, Growth, and R&D Management in the USSR	31
3.1 Technological Development, Growth, and R&D Management	32
3.1.1 Technological development	32
3.1.2 Growth and development	33
3.1.3 Research and development management: Does it make a difference?	36
3.2 R&D in the Soviet Centrally Planned Economy	39
3.2.1 An introduction to the Soviet Union	39

3.2.2	An introduction to Soviet science and technology	50
3.2.3	The R&D sector in the Soviet Union: Science and Soviet-style socialism	54
3.2.4	Actors in Soviet R&D policy	60
3.2.5	Science, research, development, and technology before 1985	66
3.2.6	Science, research, development, and technology after 1985	70
4	Inputs to the Soviet R&D Sector	83
4.1	Education	83
4.1.1	General education and literacy: The foundation for a scientific culture	84
4.1.2	Enrollment in higher education	87
4.1.3	Higher education and fields of study	93
4.1.4	Functions and status of higher education and its role in R&D	95
4.2	R&D Personnel	99
4.2.1	Total numbers of scientists and engineers	100
4.2.2	Scientists and engineers as a percentage of the labor force	102
4.2.3	The role, status, and activities of scientists and engineers	106
4.3	R&D Financing	113
4.3.1	Funding R&D activities	114
4.3.2	GERD as a percentage of GNP: A comparison	118
4.3.3	Sources and character of R&D funding	123
5	Internationalization of Research and Technology	135
5.1	International Research and Development	138
5.1.1	Foreign direct investment as a measure of R&D internationalization	138
5.1.2	Involvement in international scientific activities	141
5.1.3	Transnational corporations and R&D	148
5.2	International Development of Technology	154
5.2.1	Technology agreements	157
5.2.2	Transfer of technology	162
5.2.3	Joint ventures and TNCs in technology transfer	170

6	The Burdens of Abundance: R&D, Technological Change, Resource Allocation, and Productivity	177
6.1	The Burdens of Abundance	180
6.2	Natural Resources	184
6.2.1	Fuel resources	184
6.2.2	Nonfuel resources	187
6.2.3	Techno-economic efficiencies	190
6.3	Human Resources	193
6.3.1	Employment and labor productivity	193
6.3.2	Labor productivity and the R&D sector	198
7	R&D Management in the Transition: From the Soviet Union to Russia	211
7.1	Rejoining the World	213
7.1.1	From the scientific perspective	213
7.1.2	From the enterprise perspective	216
7.1.3	The international aspect	218
7.2	The Role of R&D in Russian-style Growth	221
7.3	Prospects and Prescriptions for R&D Management and Technological Advance in the Transition to a Market Economy and Beyond	224
7.3.1	Reform, transition, and R&D	224
7.3.2	The survivability of R&D	228
7.3.3	(Pre-)Conditions for successfully restructuring R&D	228
7.3.4	Areas for restructuring R&D	230
8	Summary and Conclusions	235
8.1	Summary of Major Points	235
8.2	Concluding Remarks	239
	References	245