

Chapter 8

Summary and Conclusions

8.1 Summary of Major Points

The purpose of this study is to conduct an up-to-date review and international comparison of the structure, organization, management, and performance of the Soviet research and development sector, subsequently deducing the potential and form of its remnants in Russia's transition to a market economy and bid to rejoin the global mainstream scientific and economic communities. This is a substantial task by any means, but a rewarding one. Rewarding in that the results reveal the ominous size and significant devotion of Soviet planners to promote R&D, despite their inefficient use of it. Russia, the largest successor republic of the former Union, is heir to most of these voluminous resources accumulated over the decades, though also to the administrative burdens. The potential for a progressive future looks positive if accompanied by appropriate management reforms.

In Chapter 2, the importance of research and development for economic growth is reviewed from the theoretical and empirical perspective. Findings have shown that little doubt remains with respect to the fact that R&D is one key source of economic growth. The discussion also reveals that, in theory, under more or less free market economic conditions the incentives to both competitive and monopoly industries to undertake R&D are less than the potential social benefits. Consequently this causes a tendency to underinvest in a purely market economy, and portrays a socially managed or planned economy as more capable of achieving the optimal (meaning most profitable and least wasteful to maximize social benefits) level of returns for society using the optimal level of investment in R&D.

In addition, the theory of market structure has led some experts to hypothesize that only large firms with large profit potential, high market

shares in large secure markets, and the possibility of achieving economies of scale in their R&D departments will engage in the risky operation and financing of R&D and that too many firms doing research may generate unnecessary repetition and a low productivity research process at the industry level. But centrally planned economies have been dominated by immense, vertically integrated firms. Thus, by such theoretical rationale, the planned societies should have reached far superior levels of economic growth, development, and living standards than those nations with more market-oriented economies. These theoretical suggestions, however, have *not* been verified by reality; the course of history, particularly recent decades, has *actually proved the contrary* with respect to the Soviet Union.

Chapter 3 explicates the links between R&D and technological development and growth in the Soviet context. After describing the participation and status of the Soviet Union in the world economic and technological community, the chapter continues with an introduction to Soviet science and technology as it was. The review indicates that Soviet-style socialism has proved to be incompatible with rapid technological innovation. A number of characteristics are listed as evidence, including:

1. Firms had to make a considerable effort to overcome supply difficulties.
2. Process innovations dominated over product innovations.
3. Financial incentives for research, development, and implementation were small, if not negative.
4. Enterprises' priorities were more inclined to emphasize the quantity rather than the quality of output.
5. There has been a long time lag between invention and innovation; subsequent diffusion was also slow.

A closer analysis of the structure and management of the R&D sector reveals long-standing ideological foundations and a severe mismatch between the established institutions of the Soviet science community and the need for technological change and accompanying factors. The Soviets themselves recognized the need for change, but the introduction of any alterations under the old regime led to more complications, inefficiencies, and inequalities rather than less.

Chapter 4 provides an account and international comparison of the inputs into the R&D sector under seven decades of Soviet leadership, and clearly shows the magnitude of the R&D sector and its significance with respect to the total global scientific resources. Statistics indicate that the general *educationalization* of the Soviet Union took place within a fairly limited period of time, allowing the nation to subsequently draw on a strong educational base. The commitment to considerable and consistent financing