Gregory Tassey:
The Technology Imperative.
Edward Elgar: Cheltenham, UK, and Massachussets, USA, 2007. xiv + 329 pp.

Gregory Tassey's work is a critical and informed book on the importance of technology to the economic growth. The Senior Economist for the US National Institute of Standards and Technology takes a serious effort to analyze the technological change from an economic viewpoint with similarity to the work of economic historian Nathan Rosenberg.

The work has a tripartite structure—with eleven chapter—in which the main argument is developed by using a recurrent and cyclical line of argument. In the first part, Tassey depicts the "economics of decline" with a great deal of statistical data. In the second part, Tassey enlarges on R&D in the modern economy in order to explain the key characteristics of his economic model. The last three summarising chapters of the third part are dedicated to "technology-based political economy". Tassey anchors his book to one positive thesis and four negative critics. The positive thesis that he formulates as the "technology imperative" is the following: "the high-income economy must be the high-tech economy because (i) technology drives productivity growth, which in turn, drives output and income growth, and (ii) long-term competitive advantage requires renewal of technology-based assets" (p. 3). Nevertheless, according to Tassey, this imperative is being rejected or minimized by the US analysts and policy makers, which may lead to a loss of its world economic leadership.

According to Tassey, the changing global economic situation and its threat to the USA reside in the following four points. First, there is a "globalization of technology" due to a process of global economic convergence of emerging economies in Asia (China, Japan, India, Thailand, etc.) and in Europe. These countries are catching up to the USA. Second, the trends of US decline have been downplayed by many policy makers who are named as "apostles of denial" by Tassey. Third, even those who recognize the decrease in the US competitiveness reject to act for preventing the threat because of the dominance of traditional and out-of-date economic models. Finally, Tassey reports a lack of analytical tools for technology-based economic growth policy which would allow detecting market failures.

The above set of arguments displays a sinister image of the US economic future: "the United States is increasingly not competing. Its small and geographically-concentrated high-tech sector, its under-skilled labor force relative to current and especially future requirements and its lack of a capable STID [Science, Technology, Innovation and Diffusion of Technology] policy analysis capability are conspiring to allow global convergence to erode domestic economic

growth and the potential to increase the standard of living for its citizens" (p. 306). According to Tassey, the question is whether the USA wants "to compete or not to compete". If the choice is to compete, the author is ready to present the keys of the required "public-private technology-based growth paradigm". The core of book is dedicated to depict this model.

On the basis of the analysis of the book, Tassey summarizes five policy lessons. First, the high-income economy must be the high-tech economy, which requires high R&D intensity. Second, R&D funding strategies in large countries or blocks of smaller countries must diversify beyond IT and biotechnology, which necessitates portfolio management. Third, technologies evolve in cycles, which calls for dynamic policy management. Tassey contrasts his model with the so-called black-box models of technology common in economics. As a result, he depicts a multi-element and life cycle -based model of technology that is more complex than black-box models because the model reflects the multiple interrelations among the components of the technological system (e.g., among infratechnologies, generic and proprietary technologies) and takes account on issues concerning timing and requirements since basic research and generic technologies require more time and funding to develop than the market-based development of existing technologies.

The fourth policy lesson is that technology-based competitiveness is a public-private problem in essence. Therefore, it requires cooperative public-private planning, research, infrastructure investment and market development. Tassey argues that the traditional economic focus on private-industry sector investments is outdated. The long-term competitiveness requires continuous public investments in order to make advances in basic science and generic technologies and to overcome the risk of emergence of new technologies. Moreover, there are elements of the technological system (infrastructures, standards and protocols), which are quasi-public-goods and, therefore, suffer from underinvestment in the private sector. The economic growth depends more and more on public investments that are required for supporting time-consuming and risky funding of basic research, generic technologies and infratechnologies. Fifth, technology-based growth policy must be improved, which, in consequence, requires resources and integration of STID with other economic policy areas. This requires new analytical models, data and methodological development for identification of needs, design and implementation of appropriate programs, as well as for measuring the results.

Although Tassey mainly addresses the US economic policy, his analyses could be applied to European or Asian policies as well. European and Asian countries – according to Tassey – are increasingly aware of the global changing economic situation and they are undertaking new models of economic policy (similar to the above mentioned five lessons) and catching up to the USA, while the USA resists the change due to the "installed-base" effect typical to the leader whose economy is declining.

From the point of view of STS, Tassey's economic and policy-oriented work provokes the following reflections. Tassey's book shows technology as the *cause* of change of global economic situation compelling countries to undertake concrete policy actions to improve com-

petitiveness. Similar to many economic studies, Tassey's conception of the relationships between technology and society is deterministic. Throughout the book, Tassey frequently repeats deterministic statements about the character of technological change. Although Tassey avoids black-boxing technology, his conception of technological change is not informed by the theoretical contributions of sociology, history and philosophy of technology. This is unfortunate, since Tassey maintains the view on technology as applied science, and his model explicitly expresses a linear dimension: basic research leads to generic technology research that is followed by applied research with the commercial prototype and, in the end, by the product development with the market introduction. Finally, Tassey's book does not address the poorest countries or policies for helping the South where most of the humanity live in poverty and without any type of technology.

At any rate, the reading of Tassey's work is important for economists who want to know the current technological requirements for economic growth and what kind of economic policy is needed for improving competitiveness. The book is also illuminating for STS scholars due to the profusion of data and empirical analysis.

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