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Assessing the Role of the Federal Government in the Development of New Products, Industries, and Companies: Case Study Evidence since World War II

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Contents

1	Introduction	3
2	Identifying Major Federally-Funded Innovations	5
3	General Purpose Technologies	8
4	Innovations: Information Technology	10
4.1	Semiconductors	11
4.2	Transistors	13
4.3	Integrated circuits	13
4.4	The internet	17
4.5	The world wide web	18
4.6	Internet browsers	19
4.7	Google search engine	19
5	Other Computing Innovations	21
5.1	Smartphones	21
5.2	Supercomputers	23
5.3	Artificial intelligence	25
5.4	Speech recognition	26
5.5	Big data	27
5.6	Nanotechnology	30

6	Innovations: Health Care	33
6.1	Magnetic resonance imaging (MRI)	33
6.2	HIV/AIDS drugs	34
6.3	Advanced prosthetics	35
6.4	Human genome sequencing	37
6.5	Biotechnology	38
7	Agriculture, Food	41
7.1	Lactose-free milk	41
7.2	Disposable diapers	42
7.3	Document and restoration methods	42
8	Mathematics and Economics	44
8.1	Reverse auctions and auction theory	44
8.2	Kidney matching program	46
8.3	Oral contraceptives	47
9	Innovations: Transportation and Space	49
9.1	GPS	49
9.2	Civilian aviation	51
9.3	Anti-icing formulas	53
10	Innovations: Electronics	55
10.1	Accelerometers	55
11	Innovations: Energy	59
11.1	Nuclear power	59
11.2	Hydraulic fracturing (fracking)	61
11.3	LED lighting	62
11.4	Smart lighting	63
11.5	Commercial wind power	64
11.6	Solar energy	67
11.7	Battery manufacturing	68
11.8	Gas turbines	70

12 Miscellaneous	71
12.1 Fire research	71
12.2 Virtual reality	73
12.3 Conclusions	76
References	79
Author Biographies	89

Assessing the Role of the Federal Government in the Development of New Products, Industries, and Companies: Case Study Evidence since World War II

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ABSTRACT

Based on case studies of 40 major innovations in the post-World War II period, we assess the role of the federal government in the development of new products, industries, and companies. To guide our selection of major innovations, we identify general purpose technologies (GPTs) that were established during this period. GPTs generate substantial positive spillovers and have broad economic and social effects. Given that universities and federal/national labs conduct the overwhelming majority of federally-funded research and have also been heavily involved in the development of GPTs, we focus on the role of these institutions in our analysis of technological diffusion. Two key stylized facts emerge from our analysis. The first is that many innovations with significant commercial applications were initially developed

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and adopted by military and space agencies (e.g., nuclear energy, electronics, computers and the Internet, airplanes, laser technology, biotechnology, and pharmacogenomics). The second is that the role of the federal/national labs in technology development and technology transfer may be understated, given that university technology transfer has generated much more attention in academia and the popular press.

1

Introduction

The purpose of this monograph is to assess the role of the federal government in the development of major innovations. We do so in a purely descriptive manner. Specifically, we identify and describe major products, industries, and firms resulting from U.S. government funding of research in the years since World War II (WWII). As noted by Ruttan (2006), military and space R&D during WWII and in the cold-war period in the aftermath of that global conflict, played an important role in the development of numerous civilian technologies, such as nuclear energy, electronics, computers and the Internet, artificial intelligence, lasers, and the development of jet aircraft. It is well known that during WWII and the famous “Manhattan Project” the Los Alamos and Oak Ridge National Laboratories played a key role in the development of the atom bomb and nuclear energy. What is less well known is the role of the federal and national labs in the development of such key technologies as radar, lithium-ion batteries, and computers.

For example, the first electronic digital computer, ENIAC, was developed at the Ordnance Ballistic Research Laboratory of the U.S. Army, working with research from the Moore School of Engineering at the University of Pennsylvania (Burks and Burks, 1981). After WWII,

established the National Science Foundation, which was created to fund basic research in science and engineering. Additional federal investment in science and technology ensued during the Eisenhower and Kennedy administrations with a strong emphasis on the space program (e.g., Project Mercury).

The evidence clearly shows that these investments in military and space R&D ultimately had numerous significant commercial applications. President Nixon launched a War on Cancer and dramatically increased federal funding for biomedical research. After an energy crisis, President Carter launched research programs for renewable energy sources, such as solar energy and fission. Another milestone was the creation of the Department of Energy during the Carter Administration. President Reagan significantly increased expenditures on defense R&D, as part of his Star Wars/Strategic Defense Initiative (Feldman *et al.*, 2002). Congress also weighed in by enacting two landmark bipartisan pieces of legislation relating to technology transfer of federally-funded innovations: (1) the Bayh-Dole Act in 1980, which applied mainly to universities and (2): the Stevenson-Wydler Act in the same year, which sought to streamline technology transfer from federal laboratories to industry. Other legislation followed that established technology transfer offices at federal labs and Cooperative Research and Development Agreements (CRADAs) between firms and federal labs (i.e., the Federal Technology Transfer Act of 1986).

This monograph is organized as follows. First, we outline our strategy for identifying major products, industries, and companies resulting from government funding in the years since WWII. This requires us to define the concept of a general purpose technology (GPT). We conclude with a description of 40 innovations that have had a major impact on our economy and society. Our description of these innovations contains fairly-detailed explanations of how these products were developed and how they made their way from lab to market. The outcomes of these federal investments in technology are quite impressive, both in terms of their economic and social impacts.

Author Biographies

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