

A REVIEW OF
*SCIENCE, TECHNOLOGY
& GOVERNMENT*
BY MURRAY N. ROTHBARD
LUDGWIG VON MISES INSTITUTE,
EE.UU 2015, 52 PAGES)

PATRICK REIMERS

Abstract: In 1959, the US-American economist, political theorist and philosopher Murray N. Rothbard wrote «Science Technology & Government», logically analysing the lack of innovation, transparency, cost effectiveness and moral justification of centralized public research & development structures. Rothbard explains why centrally steered science is often of no value for citizens and consumers, causing unjustifiable costs and being less creative and dynamic than private research programs.

I
INTRODUCTION

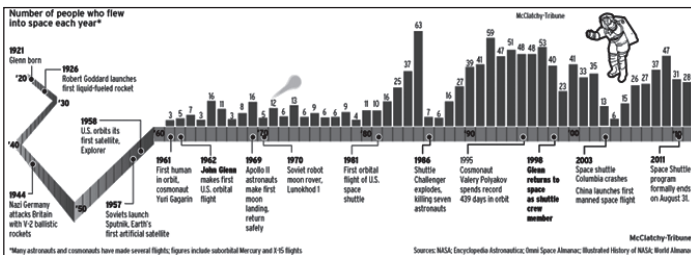
In this previously unpublished manuscript, Murray N. Rothbard critically evaluates the ideas of «big government supporters» and their enthusiasm for public control of Research & Development in all areas of the so called «hard sciences». Whereas critics of the free market like John K. Galbraith argue that scientific research and development require government planning and control, Rothbard's analysis intends to distinguish between the different types of science, while strongly emphasising that all non-military scientific research as well as R&D projects shall be in private hands, fully run by the market. Moreover, Rothbard explains the major challenges of centrally steered public R&D structures, focusing on the corresponding relevant questions which a centralized public system can never properly respond to: *What parts of research & de-*

velopment «must always» be controlled by the government and why? Which research projects are «absolutely crucial and mandatory»? Which amounts of investments are «reasonable and sufficient» for mentioned «crucial» R&D projects? Which science areas must, «for society’s good», be publically steered, and which projects should be given research grants? Overall, Rothbard believes, whenever the allocation of scarce resources must be planned, no centralized public coordination could ever be as efficient as the free market, unburdened by government interventionism. Consequently, Rothbard states that science best advances under the free market and the best action a government may take, is to get out of the way of science. Murray Rothbard (1926-1995) argues that economically and socially beneficial scientific innovation better derive from independent thinkers, working within a free market economy, while the state usually distorts science, often leading to unnecessarily costly ‘innovations’ which are irrelevant for citizens and consumers.

II ANALYSING A BOOK FROM 1959 ON «SCIENCE & TECHNOLOGY»

1. The historical context

Rothbard’s book was written in 1959 and must therefore, 57 seven years later, be read and understood in its historic context¹:



¹ «NASA Omni Space Almanac».

In 1926, only 33 years before Rothbard's book was written, Robert Goddard, launched the first liquid-fuel rocket. Only in 1957, shortly before Murray N. Rothbard started writing his book, the former Soviet Union launched «Sputnik I», the first artificial Earth satellite which needed 100 minutes to complete one orbit. A few weeks later, the Soviets launched Sputnik II, carrying a much heavier payload that included «a passenger»: a dog called Laika. One year later, in 1958, the United States launched its first satellite, the 30.8-pound «*Explorer 1*». Later that year, the U.S. Congress authorizes formation of the *National Aeronautics and Space Administration* (NASA). Then in 1959, the Soviet Union's «Luna 3» probe flew past the Moon, taking the first pictures of its far side. Thus, Rothbard's book was written at a time in which science and research related to spacecraft was part of the Cold War between the socialist Soviet Union and the US government. At that point in time, due to the achievements of *Explorer-1*, the Soviets seemed to slightly dominate the Space Research competition between the two global powers.²

However, shortly after Rothbard's official finalization of *Science, Technology & Government*, US-American dominance in regards to spacecraft research became more evident: In 1968, *Apollo 8* flew to the Moon and with it, humans first escaped the Earth's gravity and saw Earth from lunar orbit. Then, in 1969, the US-American Neil Armstrong became the first person to walk on the Moon. And in 1975, NASA launched two Mars space probes, each consisting of an orbiter and a lander. Finally, in 1989, 30 years after Rothbard's book, the Berlin Wall started to be torn down, leading to the end of the Iron Curtain, also caused by a bankrupt Soviet apparatus whose decline was intensified by the arms race and the space race between the two mentioned world powers.

² Time line of the Space Race, NASA / Wikipedia.

III THE INEFFICIENCY OF STATISM

Not only in 1959 but also in 2016, governments still play a major role in the production of scientific knowledge, even in most sectors of US & European economies. This centralization of research and development activities, steered by governments and financed by the corresponding tax payers, is still seen as normal and unavoidable by most citizens.

One argument is that the free market would not provide sufficient incentives to encourage necessary scientific research, in particular on «basic research», which ultimately labels the market as being inefficient, not being able to focus on the «public good». Consequently it is unavoidable that the government intervenes by funding *worthy* scientific projects via mandatory taxation of individuals & businesses.

Rothbard asks us to take a step back, analysing whether or not science should be steered and sponsored by the State, if state-sponsored science is the best and most efficient way to conduct scientific research for society. Rothbard points out that «state-sponsored» scientific research is *per se* problematic as public funding is by nature a socialist-style production process, ultimately leading to the economic and socio-cultural problems caused by any socialist system:

In a socialist system, the allocation and use of means of production will always be less effective than the free market, and it must ultimately fail as there is no rational, valid means of economic calculation to allocate scarce resources efficiently, as in previous works already explained by Ludwig von Mises & F.A. Hayek.³ Knowledge must never be artificially concentrated into a single entity at the hierarchical top, but it should be naturally distributed within society and used effectively by free market participants. Consequently, central government never has rational means of figuring out *which type* of research needs to be done, or *how many* resources (necessary Budget, number of researchers and amount of time required) to commit. No central government can define what

³ von Mises *Human Action*, von Hayek *The Fatal Conceit*.

the optimal level of research is. Consequently, Rothbard believes, only a free enterprise economy can insure a smooth, rational distribution and allocation of productive resources. One may add that up until now, it has not been possible for governments to actually prove a direct correlation between public R&D investments and a country's GDP development, neither in the USA nor in Europe.

1. Free minds vs Politicization of Science

In particular regarding space research, common myth is that large scale and long-term scientific research can only be handled through publicly-funded and state controlled projects, as private companies would neither have the capacities nor the «idealist» approach to handle such sensitive projects properly. However, the general two main problems of publicly-funded research is that there is no transparent price system signalling market participants on how to invest resources efficiently, and that government is the ultimate controller of what is researched. Rothbard argues that government will rarely be a «neutral party» mostly being interested in a «certain outcome» of researches. The advancements of science are hampered by publicly-funded & state-controlled research processes as this always leads to the politicization of science and R&D, such as government control of the research directions and outcomes. Consequently, publicly financed science is unduly governed by political considerations. Freedom is the best way to optimize efficiency and scientific advantage and the more the US government relies on coercive and statist methods, the more it operates against the initial ideas of the US' founding fathers.

2. Property Rights & Patents

Moreover, Rothbard states that Property Rights issues would actually have to arise for all publicly-funded science projects: Since all tax payers are funding these researches, one could discuss who should actually own and profit from the studies' outcome: «the society», «the tax payers», «the researchers», or «the government»?

Also, in science the Property Rights issues are even intensified by intellectual property laws, specifically patents. Moreover, Rothbard argues that in the current environment, for many «patent holders» securing patents often becomes more relevant than doing further related innovative work. Individual property rights and patents can also be achieved using tax payer's money for state-controlled research projects. Thus, current harsh patent laws then hamper often necessary further innovations and limit real competition.⁴

3. Morals, Religion & General Acceptance of Researches

Rothbard criticizes agenda-based research, as the government is essentially determining what sort of science should get done. Government can use science as a basis for fear and ultimately for control over its citizens. Thus, e.g. restrictions on individual rights but certainly also new or higher taxes can be justified based on the outcome of public research.

Even if state-controlled science is providing certain new knowledge (e.g. by NASA), there is no way to actually calculate the exact benefit of these outcomes for the individual citizen, as value is subjective, and as there is no transparency nor means on economic calculation to consider and compare potential alternative ways of research. Still, due to the publicly-funded & state-controlled set-up, all tax payers are obliged to finance such projects.

In the «existing» political system (back in 1959, and even more so in 2016), it is impossible to assure all public science projects are «generally accepted» by the public, which consequently leads to lobbyism on the one hand, and outcries by large groups of society against certain publicly-funded research programs on the other hand.

Also nowadays, 57 years after Rothbard's book, publicly-financed state-controlled researches on highly emotional topics such as evolutionary biology, stem-cell research or weapons research are significantly dividing society and seem often to be led

⁴ *Patents and Copyrights: Do the Benefits Exceed the Costs?* by Julio H. Cole & *Against Intellectual Property* by N. Stephan Kinsella

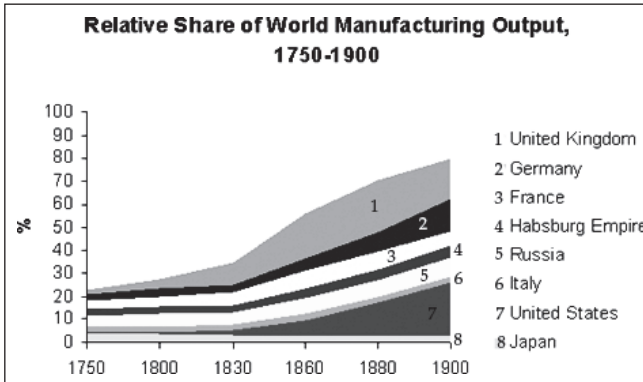
by religious or political views and should, from the author of this review's point of view, be purely financed by private R&D projects

4. Scarcity & the «Shortage of Scientist»

Rothbard states that giving more federal aid to scientific education is an improper way to relieve a potential "shortage" of scientists. All public interventionism distorts the market, also the actual real demand for scientists & science students, which should rather be steered via the free market. Example: by subsidizing science and science students, the number of science students would artificially increase, likely exceeding the real market demand, which on medium term would decrease salaries and career opportunities for scientists, then leading to a decrease and shortage of science students from a long term perspective. Contrarily, on the free market there will never be a real long-term shortage of any needed occupation.

5. Free Independent Thinkers, no Centralized «Administration of Politicized Science»

Science has advanced best, when free, talented individuals used their eagerness to experiment, their enthusiasm and knowledge to exercise their minds independently without any ideological constraints. Many great thinkers and inventors were opposed by government (or by the church) and had to deal with governmental barriers. One may assume that free thinking and creativity of many independent engineers and scientists would have been hampered if they had depended on public support to be competitive against a direct, publicly funded, research competition. Rothbard mentions several crucial inventions which were made during the industrial revolution, many of them by independent engineers, researching without any public supports, nor legal constraints.



Even up to the first half of the 20th century, several major inventions were made by individual free thinkers, independently researching without any public subsidies or public control. In particular in the US and the UK, but also in Germany, numerous basic science and applied science innovations occurred without any state interference. To be fair, the author of this review argues, one must also acknowledge the significant technologic progress made within the past decades which have certainly made research processes in several areas more sophisticated and costly, often requiring significant financial investments. Nowadays, such investments could in several cases not be shouldered anymore by independent free thinkers the way this might have happened in the 19th or even early 20th century. Thus, the (slightly 'romantic) idea of enthusiastic (often obstinate) geniuses, discovering, even by accident, ground breaking scientific findings in their own private labs, must in several research sectors be seen as outdated. Still, Rothbard is fully correct in assuring that objective, efficient, non-ideological, market-driven & consumer-focused science can only be done in a free market by independent researchers.

IV THE GLORIFICATION OF SCIENCE

In general, society often considers science as a synonym for «useful technologic progress leading to economic growth». However,

in his work, Rothbard states that there is no automatic direct correlation between progress in science and economic growth. In other words, inventions and scientific progress do not automatically bring an economic progress to society. This is even more the case for science projects steered and/ or financed by government. The already mentioned, almost natural, politicization of publicly-financed state-controlled science, as well as the incapability of centralized governmental planning to maximize efficiency while satisfying consumer needs, may often lead to the development of goods and services which are of very limited value for society. In particular, this can be said about space research, which has been a prestigious project for US & Sovjet governments during the Cold War, while its actual benefits for the countries' citizens seem relatively limited. Contrarily, through the free price system in a free market, consumers simply signal to scientists, researchers, labourers, capitalists & business men which products and services are more urgently needed. Only a free market is compatible with free choice.

However, one may also add that enterprises often «create the need» for new products, which had previously neither been requested nor even considered by consumers, e.g. Smart Phones. The «alert entrepreneur», as at a later stage better defined by the economist Israel Kirzner, will detect profitable market niches.⁵

V

INDUSTRIAL R&D: INCREASED MARGINS & BETTER BRAND IMAGE FOR «FIRST MOVERS»

Industrial R&D is mainly conducted to enhance production processes, reducing costs and product times, while also enhancing products regarding their design and quality, or by inventing completely new products and services. R&D is of major relevance for most industrial companies, to be ahead of competitors, being the «first mover» in the market that will benefit financially from launching new state-of-the art products with initially significant

⁵ *Competition and Entrepreneurship* by Israel M. Kirzner

profit margins. A free market will allow more competition and ultimately demand more innovation and more R&D investments by industrial companies. One may argue that in the future, companies should more clearly promote their R&D investments, using them for PR campaigns, considering high R&D expenditures also as a «commitment with society». Consequently, just like donating funds to charity is used for PR purposes, also being the market leader in research & development could be seen as a «Corporate Social Responsibility», which might attract and convince conscious «socially responsible» consumers.

VI THE CURRENT SITUATION: THE PUBLIC US RESEARCH BUDGET

1. R&D and Basic Research Spending in the U.S.

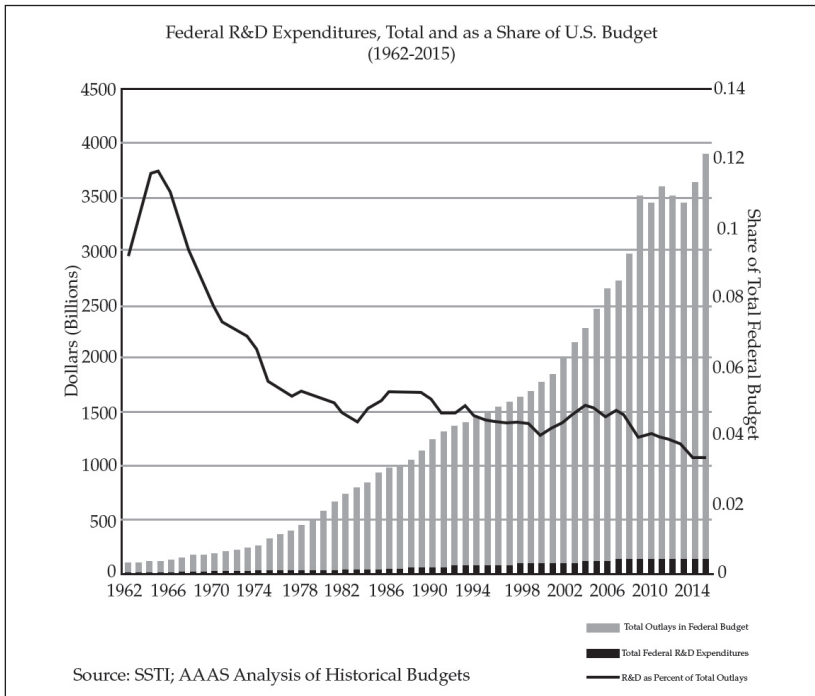
Rothbard's work, written in 1959, asked for a significant decrease of public R&D investments. On several aspects, Rothbard proved to be far ahead of the times, demonstrating his analytic abilities. However, in 2016, one may say that two trends could potentially cause serious challenges to the USA's long term competitiveness regarding science & technology, in particular related to space research: The increased competition from China, which in October 2016 celebrated the successful docking of the spacecraft «Shenzhou-11» with their «Tiangong-2» space module, versus a stagnant or even decreasing public *R&D-to-GDP ratio* in the USA.⁶ According to data from the American Association for the Advancement of Science (AAAS), in the \$3.7 trillion 2015 USA's Federal Budget, \$131 billion were dedicated to research and development (R&D) spending—roughly 3.4 percent.

Since 1956, *basic research* (defined as research «aimed to improve scientific theories») has increased as a share of total US public research and development expenditures, while *development* has de-

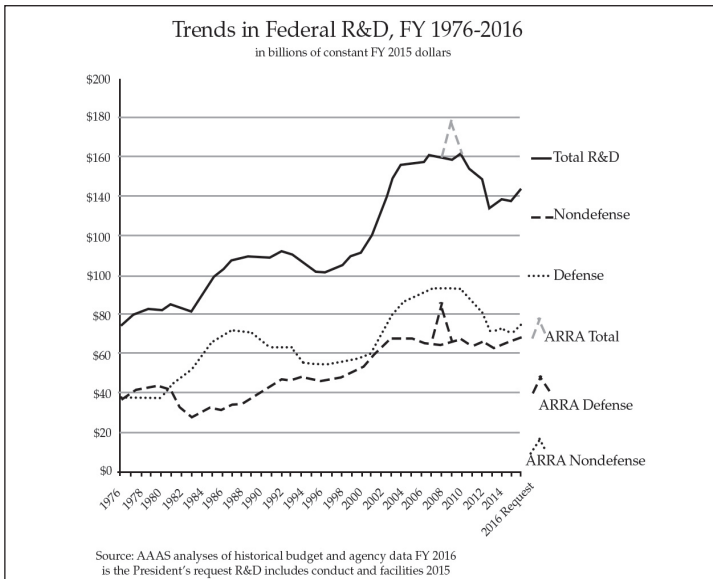
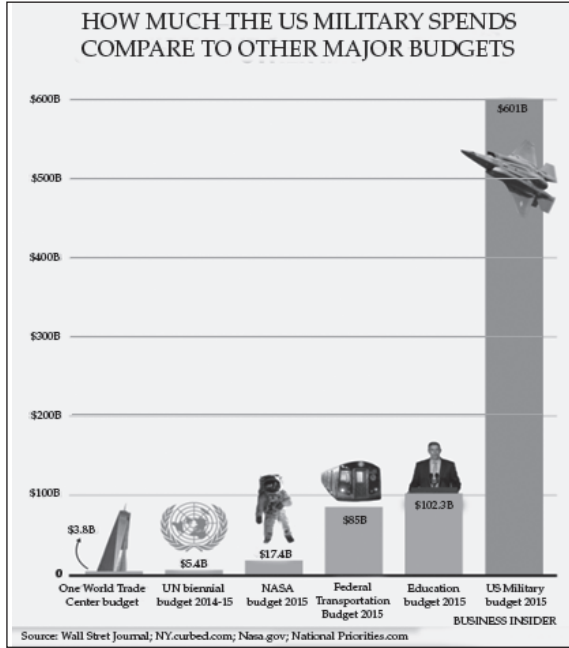
⁶ NASA Spaceflight: Shenzhou 11 docking with Tiangong2: <https://www.nasa.gov/spaceflight.com>.

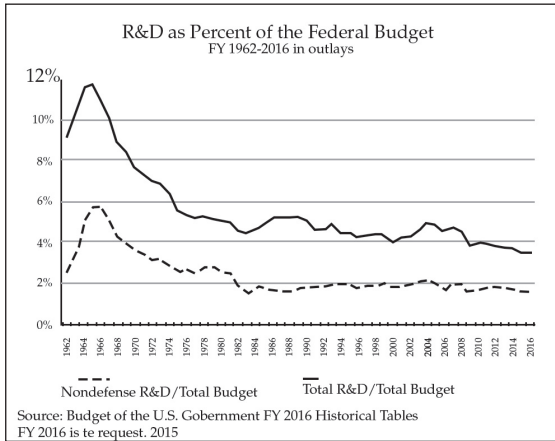
creased in share. Although US federal spending on research and development has not kept up with total annual federal spending, federal spending for «basic research» has increased over time, both in terms of total dollars and as a share of total federal R&D spending. Despite this, the vast majority of federal R&D spending is still focused on «applied research and development».⁷

Private research, in particular by industrial companies, remains stable but could be significantly higher if the R&D market was not completely distorted by public interventionism caused by mentioned publicly-funded research programs, outdated laws on Intellectual Property and patents, as well as by abusive public regulations and taxations, hampering private companies and independent science in general.



⁷ SSTI & AAAS researches on US Federal Budget spendings (web sites).



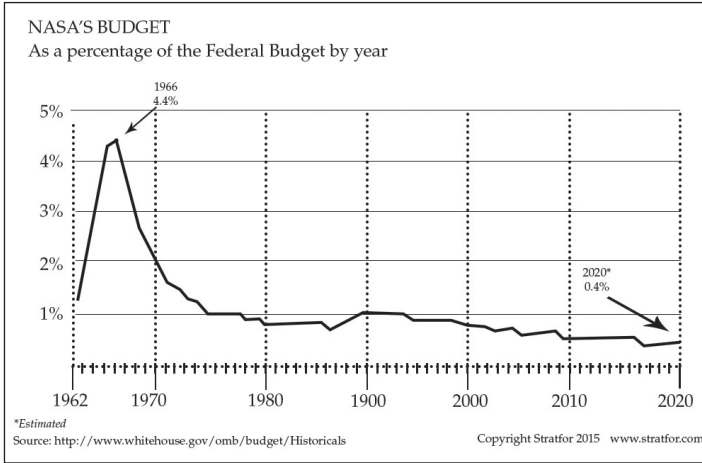


2. Public Defence & Space Science: Decreasing Share of Federal Budget for US Space Research

In his book, Rothbard criticized the US government for having had a virtual monopoly of defence policy. Rothbard said that private R&D, contracted for with government funds would be much more efficient than direct government research. Thus, in the military sphere, government should function only as a consumer, not as a producer, purchasing equipment and research made by private firms. Only when it comes to military research, Rothbard sees a justification for not fully privatizing science, all non-military research areas should be in the hands of private enterprises & individuals.

By 2016, state financing of space budgets, especially in the United States and Europe, has come under increased pressure following the end of the «Space Race» during the era of the Cold War, the following collapse of the Soviet Union, and most recently the global financial crisis. Financial restrictions for high-profile missions may lead NASA and other Western state-led space programs to scale back or limit their activity. On the other hand, China has been making a more concerted effort to expand its space science programs in combination with more immediate commercial and military applications. Whereas in 1966, during the Cold War's *space race* on *who sends a man to the moon first*, the annual expenses for

NASA made up 4.4% of the total annual US Federal Budget, since the year 2000, it was constantly below 1% of the Federal Budget and it is expected to decrease to only 0.4% by 2020.⁸



3. Economic benefits of space research

Even though one can critically argue that the actual added value of space research from an economic, environmental or socio-cultural perspective has hardly justified its tremendous costs, we must also point out some of the innovations it has achieved. For example, planetary and inter-planetary research missions have been the starting point for the development of several «everyday technologies», later used by companies or citizens, such as the Voyager 1 space probe which travelled in interstellar space, requiring the development of more sophisticated and reliable communications, which then contributed to ground breaking developments in GPS technology and satellite phones. Moreover, understanding carbon dioxide on Venus has important implications for climate change research on Earth. Going forward, for example, NASA announced to launch the OSIRIS mission to bring back regolith samples from an asteroid, contributing to our knowledge about the formation of the solar system and to a greater understanding of near-Earth ob-

⁸ US Whitehouse data on Budget spending.

jects. In addition, space programs have been relevant for computer science and other technologies as NASA has taken a keen interest in the applications of quantum mechanics in areas such as communication and, perhaps most importantly, quantum computing. Also, New Horizon, NASA's mission to Pluto, must be acknowledged, showing that space science missions can be important to the advancement of science and technology here on Earth.⁹

VII THE FUTURE: FURTHER PRIVATIZATION OF RESEARCH & DEVELOPMENT

1. Space Research

For the future, there shall certainly be room for the private sector to have a stronger impact in space research. It may be that in the future, companies such as SpaceX will eventually launch space science missions out of the Earth-Moon system to then focus on their goal of launching missions to Mars. Reducing the current cost of access to space would also make financing from more traditional academic sources, such as grants from corporations and non-profits, more feasible. However, considering the current legal scenario, decades may pass before a non-government institution will be able to set-up and finance a major space mission like a flyby of Pluto. In the meantime, it shall become more common that astronomers are tasked to identify the concrete purposes and benefits of their previous and planned missions, also communicating those to potential investors. Still, there is room for compartmentalized innovation, as for example, some private companies and even start-ups, have begun testing spacesuits for commercial sale. It will be very challenging to tackle the complete privatization of space research which will, realistically speaking, still be controlled by individual States (mainly China and the USA) or confederations of states, but co-operations with private companies and more transparent tender process for public «Space Research Tenders» must be achieved and do seem realistic.

⁹ NASA: Spending & achievements: <https://www.nasa.gov/>.

2. Industrial & Academic R&D («Non-Military nor Space-Research Related»)

In the past years, the consortium model of several companies pooling financial and human resources for shared research projects has become more successful. Several joint ventures have been founded, proving that cooperation on corporate level is working in the real business world. Also consortium models for contracted research have a huge potential to become more relevant: several industrial companies may organize in common committees to contract external R&D experts to run specific science & innovation projects for them. Thus, outside consultants and independent research organizations can be requested to support industrial research.

Moreover, also academic research can be improved without fully depending on public budgets. Science professors and student researchers (individually or as a team) can offer their knowledge to corporates. Moreover, as previously mentioned, companies may also donate money to scientific academic labs, for PR/ image reasons, simultaneously increasing academic science budgets of the corresponding universities.

1. Criticism

As mentioned, a book on *Science & Technology*, written 57 years ago, must always be seen in its historical context. Consequently, Rothbard's analysis is impressive as he foresees several crucial developments, being once again on many topics «ahead of the times». In particular his criticism regarding the hysteria on potential future «technological unemployment» is proving to be fully correct, seeing technological advancements and automation not as a threat, but much more as a useful way to increase standards of living. However, several aspects need to be critically evaluated. For example, stating that the independent engineer or scientist, working as a free thinker by himself in his private lab would still be able to compete on the current R&D market, even regarding inventions related to sophisticated high end products

may nowadays seem slightly outdated. Moreover, paying *market wages for scientist running publicly-financed research* (in other words minimum wages for public projects) could be seen just as critical as to suggest that *any private firm landing on other planets should «own» and exploit the explored land and resources* (which could be seen as a new form of colonialism).

IX CONCLUSION

As any type of socialistic concept, also centralized publicly-funded & state-controlled scientific research is naturally less efficient than the free market. Governmental interventionism on scientific research hampers real competition and free thinking. Rothbard asks governments to stay out of any non-military scientific research projects, as state-control only leads to a distortion as well as to a politicization of the focus and outcome of crucial scientific researches. The free market alone is fully capable of enabling future-oriented companies to efficiently invest into R&D projects, allowing them to invent or optimize those goods and services which are truly relevant for consumers. Moreover, Rothbard criticizes that the existing laws and regulations on property rights and patents are minimizing scientific and technological progress which must therefore be liberalized. Government's role shall be to «remove the shackles that it has imposed on supply and training of scientists». Rothbard also points out that technological progress should be seen as an opportunity to improve people's quality of life. Consequently, the threat of «technological unemployment» is seen as baseless, since technological advancements will create new and more sophisticated jobs, while increasing standards of living.

REFERENCES / BIBLIOGRAPHY

1. Main Source – Book reviewed

Science, Technology & Government. Author Murray N. Rothbard.
Editorial Ludwig von Mises Institute

2. Additional/ Consulting Literature

- Against Intellectual Property*. Author N. Stephan Kinsella. Editorial Journal of Libertarian Studies, 2001, Vol. 15, N°4
- Human Action: A Treatise on Economics*. Author Ludwig von Mises, 1996
- Man, Economy and the State*. Author Murry N. Rothbard Editorial Ludwig von Mises Institute, 2004
- Patents and Copyrights: Do the Benefits Exceed the Costs?*. Author Julio H. Cole Editorial Journal of Libertarian Studies, 2001, Vol. 15, N°4 (<http://www.mises.org>)
- Socialism: An Economic and Sociological Analysis*. Author Ludwig von Mises, 1951
- Socialism: Economic Calculation and Entrepreneurship*. Author Jesus Huerta de Soto, 2010
- The Fatal Conceit: The Errors of Socialism*. Author Friedrich August von Hayek, 1988
- China: the new space superpower*. Reference: The Guardian online: <https://www.theguardian.com/science/2016/aug/28/china-new-space-superpower-lunar-mars-missions>
- Historical Trends in Federal R&D*, from AAAS American Association for the Advancement of Science: <https://www.aaas.org/page/historical-trends-federal-rd>
- NASA Governmental site: Budget request 2016*: http://www.nasa.gov/sites/default/files/files/NASA_FY_2016_Budget_Estimates.pdf
- NASA Spaceflight – Tiangong 2*: <https://www.nasaspaceflight.com/2016/10/shenzhou-11-docks-tiangong-2-latest-chinese-space-station-mission/>
- The Changing Nature of U.S. Basic Research: Trends in Federal Spending*, from SSTI: <http://ssti.org/blog/changing-nature-us-basic-research-trends-federal-spending>
- Timeline of the Space Race*, from Wikipedia: https://en.wikipedia.org/wiki/Timeline_of_the_Space_Race