

# Analyzing the Effectiveness of State-Guided Innovation



Rodney H. Yerger Jr

**Abstract** A crucial debate exists over the effectiveness of government-guided innovation efforts, which recently through economist Mariana Mazzucato's arguments for an entrepreneurial state that encourages the public sector's active role in technological change and value creation, is considerably shaping global policy. This essay addresses a key assertion by Mazzucato that the government is the boldest innovator accountable for the greatest value in society. Through use case analysis, I argue that Mazzucato's claims of the state providing mission-oriented directionality that drives technology development do not survive the scrutiny of the Supply-Chain Fallacy, the belief that every item in a line of production or chain of events is necessary and causal. I do find occasions of public sector innovation success in the development of military technologies, particularly during times of war, which can have beneficial spillover effects. However, I show that the potentiality of such successes in a persistent peacetime environment is limited by the viability of the public sector entrepreneur.

**Keywords** Public goods · Entrepreneurship · Innovation · Political economy

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R. H. Yerger Jr (✉)  
Department of Economics, George Mason University, Fairfax, VA, USA  
e-mail: [ryerger@gmu.edu](mailto:ryerger@gmu.edu)

## Introduction

A cardinal rule of economic development holds that real income growth stems from increases in real productivity, which in turn results from improvements in physical capital, human capital, and governing institutions. At the cornerstone of these improvements lies the concept of technological innovation. While institutions play a critical part, there exists a lack of clarity over the specifics of the institutional functions and their impact on incentive alignment that most effectively drive technology advancement. Specifically, a crucial debate exists over the effectiveness of state-guided innovation efforts.

The traditional notion of government's involvement in economic matters, at least within the domain of the democratic free world, comprises the role of addressing market failures. This view of a more static function for the state has been reinforced over time given the disastrous economic consequences suffered by those countries that have adopted socialist governance mechanisms to institute centralized industrial planning. Yet, a strong and vocal counterview endures that governments throughout the Western world should take a more dynamic approach away from bureaucratic stagnation and towards a strategic structuring that promotes agility and flexibility to promote and foster innovation.

The most prolific advocate in recent times for state-guided innovation is Mariana Mazzucato, an economist whose work on the study of the entrepreneurial state, which entails the public sector's active role in technological change and value creation, is considerably shaping global policy. Indeed, her calls for a mission-oriented approach to innovation has influenced elements of recent United States' (US) public policy agendas such as the Green New Deal and the Biden administration's Build Back Better plan. Mazzucato not only argues that the driving force behind innovation is state investment but also proffers a rethinking of the state to alleviate institutional constraints to innovation through the transformation of the government civil service and their respective organizations toward the role of value creators (Mazzucato 2015a, 2021a, 2021b, 2022).

This essay addresses a key argument promoted by advocates of the entrepreneurial state: that government is the boldest innovator accountable for the greatest value to society. According to Mazzucato (2015b, pp. 134–135), “most of the radical, revolutionary innovation that have fueled the dynamics of capitalism—from railroads to the Internet, to modern-day nanotechnology and pharmaceuticals—trace the most courageous, early, and capital-intensive ‘entrepreneurial’ investments back to the State. Such radical innovations did not exist before the State envisaged and developed them...” I critically examine the theoretical underpinnings of Mazzucato's worldview as well as relevant counter-positions. I emphasize that many of Mazzucato's assertions of the state providing mission-oriented directionality that drives technology development do not survive the scrutiny of the Supply-Chain Fallacy, the belief that every item in a line of production or chain of events is necessary or causal. I explore two use cases of successful technology advancement, touch screen technology and the Global Position System (GPS), to assess the validity

of Mazzucato's declarations that these underlying technologies for the iPhone are exemplars of state-guided innovation. Additionally, I detail observations resulting from my use case analysis to include ascertaining the potentiality of government-led creative destruction in a peacetime environment and assessing the viability of the public sector entrepreneur.

## The Debate

In *The Entrepreneurial State: Debunking Public vs. Private Sector Myths*, Mazzucato (2015a) attempts to show via several use cases that the public sector is best equipped to make investments that provide critical directionality for technological growth and innovation, to include in areas "defined by high capital intensity and high technological and market risk" that "tend to be avoided by the private sector. . ." (Mazzucato 2015a, p. 29). Throughout her demonstration of public sector innovation successes, Mazzucato credits the state's role in each stage of the research and development (R&D) process, and the examples she touts almost entirely emphasize the post-World War II era of state-guided R&D. Importantly, World War II altered the landscape of public sector innovation by pushing the United States into government-funded defense research. Not only did these efforts lead to spectacular successes in military innovation, none more so than the Manhattan Project, but also justified the continuation of large-scale government investment for innovation following the war. Thus, Mazzucato (2015a, pp. 80–84) focuses on model public sector organizations that were established during this vast shift in R&D funding, like the National Aeronautics and Space Agency (NASA) and the Defense Advanced Research Projects Agency (DARPA), which she credits with creating the initial manifestations of what would become the modern day internet.

In *The Myth of the Entrepreneurial State* (2020), Deirdre McCloskey and Alberto Mingardi capture a critical issue with Mazzucato's reasoning in that the credit she allocates to state action fails to consider economic substitutes. By ignoring "private substitutes as counterfactuals," Mazzucato can leverage the state's increased involvement in innovation affairs as evidence of causality for an accomplishment (McCloskey and Mingardi 2020, p. 196). This Supply-Chain Fallacy addresses the fact that we are conditioned to a world where public funding is omnipresent and has exponentially increased throughout the course of the twentieth and early twenty-first centuries. It is likely impossible to trace the origins of a human accomplishment without finding some relevant government-funded pre-event. However, in accepting these conditions, one should still question the opportunity costs of each pre-event as well as assess the potential crowding out of private investment from so many government-funded endeavors. Furthermore, even if such analysis passes the opportunity cost and economic substitution test, what credit does the state warrant for contributing to a chain of events considering its ubiquitous involvement in society? As McCloskey and Mingardi (2020, pp. 107–108) cleverly point out, while innovation can stem from a cumulative effect, it is not common practice to overly credit

every private sector tinkerer or agent along the path leading to each innovation, such as crediting the inventor of the piano for a beautiful concerto or even crediting the composer's parents.

The Supply-Chain Fallacy underscores state action over human action in inducing innovation, which McCloskey and Mingardi compare to the flawed reasoning in combining the fixed-coefficient inputs of the neoclassical production function to yield routine output. Instead, McCloskey and Mingardi argue that the causal force behind innovation is human creativity, which they claim is ignored in Mazzucato's view of entrepreneurship. Nevertheless, Mazzucato's push for a mission-oriented approach to innovation involves nuance that warrants further elaboration on the relationship between entrepreneurship and R&D investment.

A private sector view of innovation stresses the profit motive coupled with market demand for new products and processes as important factors that spur creative activity. At the cornerstone of this coupling process is Israel Kirzner's theory of entrepreneurship, which involves alertness to unnoticed profit opportunities. R&D investment can be a fruitful activity within the innovation process but should be aligned to entrepreneurial profit opportunities. Holcombe (1998, p. 53) summarizes: "Research and development expenditures are not the cause of entrepreneurial opportunities, they are the result of entrepreneurial opportunities."

However, Mazzucato (2015a, p. 43) also acknowledges the vital importance of entrepreneurship (the root word is in the title of her book!) by stressing that successful innovation relies on "feedback loops between markets and technology, applications, and science." Moreover, she recognizes the "serendipity and uncertainty that characterize the innovation process" yet argues that innovation should be driven by "long-term strategies and targeted investments" (p. 43 and p. 65). These elements that comprise Mazzucato's worldview of innovation connote a government that takes extreme risks, picks winners and losers, and invests not to increase demand à la Keynesian economics, but to increase the capacity of innovation by attempting to engage in a state-guided version of creative destruction.

A significant difference in Mazzucato's view of entrepreneurship is the agent involved: the public sector entrepreneur. Holcombe (1998, pp. 58–59) convincingly argues that when entrepreneurship is recognized as the key to innovation, then "emphasis should be placed on market institutions" to ensure success. However, regarding public sector entrepreneurship, the concept of demand can encompass a broader meaning that captures the notion of necessity, which according to the proverb, serves as the mother of invention. Importantly, Godin and Lane (2013, pp. 26–31) stress that ideally the concept of demand should reflect societal or national interest-based "need," which concerns decisions made in the public domain and has a clear tie to military innovation during times of war. Need is a more nebulous concept than economic demand and has been largely ignored in empirical research. Despite its murkiness, previous studies have been conducted on how to efficiently make R&D decisions based on military objectives or needs. Understanding and attempting to respond to societal needs could shape state-guided innovation efforts, which depends on government agents providing directionality through entrepreneurial action.

With a fuller understanding of what entails the entrepreneurial state, I next shift focus to an analysis of particular cases of public sector innovation touted by Mazzucato regarding the iPhone and its underpinnings by state-guided technologies: “every technology that makes the iPhone ‘smart’ (i.e., the Internet, GPS, touch screen display, and Siri) was publicly funded directly” (Mazzucato et al. 2015, p. 122). McCloskey and Mingardi (2020, pp. 71–74) confront one such case of purported state-guided innovation, the Internet, and effectively demonstrate that although this achievement partially resulted from military spillover benefits, this was an unintended consequence having no relation to a long-term strategy. In fact, McCloskey and Mingardi cite that any mission-oriented directionality involved in this case were considerations by the Air Force in the 1960s for decentralized communications grids, research that was subsequently terminated by the Department of Defense. Based on this assessment, credit given to public sector efforts regarding the internet innovation might classify under what Kirzner (1985) refers to as the “wholly superfluous discovery process.” In this scenario, government research and investment has altered entrepreneurial actions, but these actions and their associated outcomes cannot be anticipated due to the inability of public sector agents operating with imperfect information to perceive profit opportunities. The next section explores in detail additional novel innovations connected to the iPhone to assess their alignment with Mazzucato’s vision.

## Use Case Analysis

### *Use Case #1: Touch Screen Technology*

The origins of touch screen technology can be traced back to the 1960s with the creation of the first finger-controlled touchscreen by Eric Arthur (E.A.) Johnson while employed at a British government defense agency called Royal Radar Establishment. Johnson’s creation could only handle one touch at a time and was not pressure sensitive. The resistant touch screen that responded to pressure sensitivity was invented by Samuel Hurst in the 1970s at the University of Kentucky, while studying atomic physics. Hurst commercialized the technology through his start-up company despite the university’s view that the technology had little application outside of a laboratory. Early work on multi-touch technology occurred in the 1980s in various private and public research labs, the biggest advancement took place at Bell Labs, which created the first transparent multi-touch screen overlay (Ion 2013; History-Computer n.d.). However, the truly revolutionary technology advancement in this arena started in 1999 with Wayne Westerman’s doctoral dissertation at the University of Delaware on multi-touch scrolling and gesturing via hand tracking and finger identification, which would become key features of the future iPhone (Westerman 1999). Soon thereafter, Westerman and his professor John Elias formed the company FingerWorks to develop their groundbreaking technology until Apple acquired them in 2005 (Ion 2013).

While tracing the history of touch screen technology development, Mazzucato (2015a) credits the state's role in each stage of the process, most visibly when she maligns FingerWorks' accomplishments because of the government grants provided to Westerman during his dissertation research at a public university. If Mazzucato wants to convincingly argue for the successes of public sector innovation, especially as directed by a mission-oriented approach, then her claims regarding FingerWorks are truly a stretch.

In the case of touch screen technology, Mazzucato's reasoning is a clear illustration of the Supply-Chain Fallacy. Many of the state-funded pre-events can classify as basic research. Johnson's finger-controlled touchscreen was eventually adopted for air traffic controllers, and so some degree of national interest demand might come into play. However, the primary advancements in this field from Hurst and Westerman occurred through individual entrepreneurial instinct and alertness to profit opportunities, which succeeded via the key linkage of attending to consumer demands. Mazzucato's argument fails to provide convincing evidence that the advent of touch screen technology was precipitated by government mission-oriented directionality, and by ascribing so much causality to government-funded pre-events, she seems to contradict her own view that innovation is serendipitous and unpredictable.

## *Use Case #2: GPS*

The fascinating story of the GPS innovation starts with the launch of the Sputnik satellite by Russia in 1957. Soon thereafter, two scientists from the Johns Hopkins University Applied Physics Laboratory (APL), William Guier and George Weiffenbach, began tracking Sputnik's signal and figured out a method to determine from a fixed point the satellite's position in orbit. Legend has it that this analysis started casually while on a lunch break. Fellow colleague, Frank McClure, who was working on the challenge of submarine navigation under the direction of his US Navy sponsor, suggested flipping the Guier and Weiffenbach method in order to determine the locations of submarines from a known satellite position. This revised method led to the APL's development of the Navy Navigation Satellite System (NNSS), which was fully operational by 1964 and provided positioning for the US submarine ballistic missile force, a critical Cold War deterrent (Parkinson and Powers 2010a, 2010b).

The modern GPS program was launched in 1973 by the Department of Defense, improving on the accuracy and technologies of the NNSS primarily via the contributions of the Naval Research Laboratory and the Aerospace Corporation, a federally funded research and development center. The first satellite prototype was completed in 1978, and the full complement of 24 satellites was fully operational by 1993. Originally intended for military use, President Ronald Reagan granted civilian use privileges via executive order in the 1980s (Parkinson and Powers 2010a, 2010b). The economic impact from civilian use of GPS is substantial. A

study by RTI International estimates economic benefits totaling USD 1.4 trillion for the US private sector since the 1980s across the industrial sectors that depend on GPS for their daily business activities. Furthermore, the study estimates the impact of losing GPS would cost USD 1 billion per day for the United States (McTigue 2019).

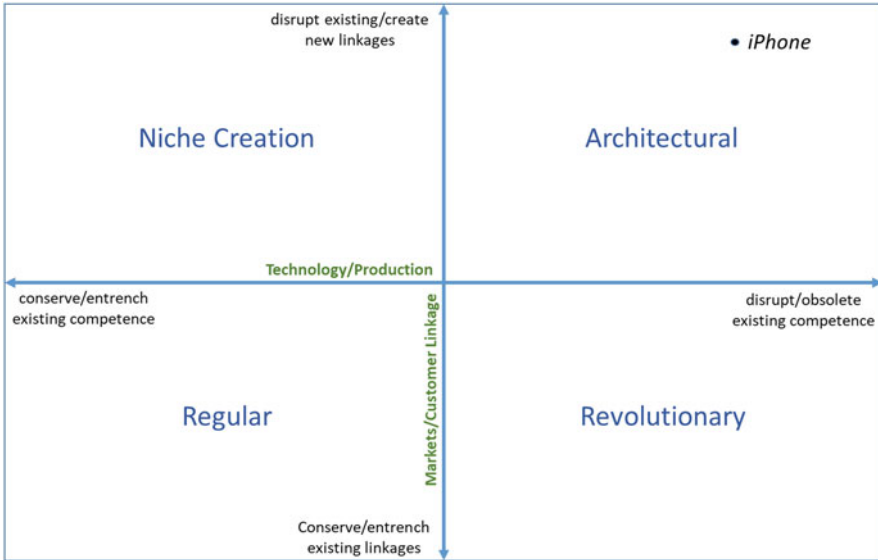
Clearly, the GPS case qualifies as a strong representative of public sector innovation. Even if some credit is appropriately allocated to the private sector for the entrepreneurial success in the diffusion of the technology, the government still provides the critical service of sustaining and improving the system, which is budgeted at over USD 1.5 billion a year (GPS.gov n.d.). The GPS success story provides two important features that warrant further consideration as to their uniqueness and potential for translation to future public sector innovation endeavors.

First, if Mazzucato's vision of a public sector mission-oriented approach to innovation is to win the day, then organizations like the APL would serve as the linchpin of that victory. The tracking of Sputnik's position by Guier and Weiffenbach is a great representation of creative engagement, which captures the curiosity component of basic research that leads to technology-push effects on innovation. Furthermore, the tracking of Sputnik began as a leisure activity similar to the origins of the Wright brothers' flying machine invention. Studies have shown that leisure can foster better innovative thinking in pursuing what is more important to the creator, "shielded from the work time pressures of groupthink and hierarchical decision-making" (Davis et al. 2009, p. 22). Accordingly, if government-funded research labs or university-affiliated research centers can provide the sufficient conditions that allow human creativity to flourish, then this competes well with a major tenant of private sector innovation.

The success of GPS also depended on a second critical feature, the military's need for submarine navigation positioning, which provided the directionality to convert a basic research discovery into an applied research mission. Thus, the GPS story in terms of both the discovery and development of new technologies serves as an exemplar for Mazzucato's mission-oriented approach to innovation. Nevertheless, it is important to note that the "need" factor was clearly identifiable in the GPS case as it stemmed from the United States's engagement in the Cold War. This less nebulous version of government demand typifies military innovation.

## *Observations*

My analysis of the two use cases selected to represent successful public sector innovation endeavors reveals several observations worthy of comment. First, I contend that the development of touch screen technologies does not represent a public sector innovation achievement, especially of the Mazzucato style, where government funding provides the mission and direction to guide success. In fact, this technology should classify as a private sector innovation achievement considering that the public sector contributions stem primarily from basic research and the



**Fig. 1** Transilience map for innovation. *Source:* Author's own application of Fig. 1 in Abernathy and Clark (1985)

cumulative effect of innovation. Unfortunately for Mazzucato's argument, many of the state-guided innovation achievements she cites in *The Entrepreneurial State* fall within this category, where her claims do not withstand the Supply-Chain Fallacy.

Furthermore, she biases credit away from private sector contributions. For example, in the case of the iPhone, Mazzucato (2015a, p. 99) asserts that Apple is only an integrator of new technologies, not a developer of them. Yet, according to the noteworthy Abernathy-Clark innovation model, Apple's role in this regard should be deemed the most radical. Figure 1 reproduces the transilience map from the Abernathy-Clark model depicting four quadrants of innovation types as measured by market linkage and technology competence impacts. The iPhone is an example of architectural innovation, plotting high on the y-axis by disrupting existing markets and creating new ones as well as plotting high on the x-axis by disrupting or rendering obsolete existing competencies (Abernathy and Clark 1985). In other words, Apple's launch of the iPhone achieved the very Schumpeterian creative destruction that Mazzucato hopes to accomplish through her mission-oriented approach to innovation.

Second, I submit that the development of GPS does represent a public sector innovation achievement within a mission-oriented directionality construct. The GPS example also showcases government or quasi-governmental organizations fulfilling Mazzucato's vision by both excelling at creative thinking during the basic research phase and effectively executing the mission in the applied research stage. Considering the clarified military need aspect, the question remains, however, as to whether such accomplishments can be replicated in a persistent peacetime environment.



Furthermore, absent military need, can such government directionality produce transformational results given a nonlinear innovation model of various feedback loops between markets, science, and technology?

War and preparing for war has spurred a massive amount of invention and innovation over time; so much in fact, that some economists ponder the likelihood that our current period of relatively persistent peace is a causal force for the recent trend of slow economic growth. Nuclear power, the computer, radar systems, microwave technology, the modern aircraft, and yes, GPS can trace their origins to military-directed efforts as dictated by the needs of war (Cowen 2014). McCloskey and Mingardi (2020, p. 52) acknowledge the spinoff benefits from war, but question the cost in terms of lives lost and destruction reaped upon property and society. Nonetheless, if war is a frequent and necessary evil, assuming a Hobbesian view of human nature, then at least society can exploit its benefits.

War streamlines the government's focus, influencing a more effective decision-making process (Cowen 2014). Still, this typically involves a single pre-defined end for which a mission-oriented approach may yield technological success, which differs from economic success where costs have to be taken into account to determine the best possible use of available resources (Hayek 1935, pp. 3–8). By conflating technological success with economic success, a mission-oriented approach risks rationalizing industrial planning efforts in a persistent peacetime environment where the state's ability to effectively solve the economic problem *or* the technological problem remains in question. In order to assess the effectiveness of state-guided innovation efforts in a persistent peacetime environment, it is critical to analyze the viability of the public sector entrepreneur, who must play a pivotal role in any government-led creative destruction process.

## Public Sector Entrepreneurship

Mazzucato's worldview of a mission-oriented approach to innovation depends on public sector agents and organizations providing directionality through entrepreneurial action. In *Mission Economy: A Moonshot Guide to Changing Capitalism*, Mazzucato (2021a, p. 175) calls for a complete reinvestment in government civil service to transform modern bureaucracies away from the "role of simple market fixer" toward a role as value creator. While there is a strong case for the functionality of public sector entrepreneurs considering the close relation to their private sector counterparts in terms of traits, characteristics, and motivations, a full determination of viability requires an assessment of public sector institutional effects on entrepreneurial behavior.

Schnellenbach (2007) argues that government institutions in democratic societies are not conducive to the bold, non-incremental changes envisioned by proponents of Schumpeterian public sector innovation. He cites the existence of both formal and informal institutional constraints; the former consisting of the role of veto players, either through collective action or organizationally, and the latter consisting of voter

behavior, which all serve to resist changes to the status quo or those changes occurring at the margin that drive innovation. These constraints relate to the median voter theorem and are attributed to the desire for political stability.

Schnellenbach (2007) provides empirical evidence demonstrating that significant political/policy changes occur almost solely when the status quo is deemed unsustainable by decision-makers and voting majorities. Therefore, political innovations will primarily “occur in times of crisis and not be implemented with ample foresight by bold public entrepreneurs” (p. 16). Not only is alertness raised during crisis situations, but the need for novel solutions influences rapid, non-incremental change within the public sector sphere as was the case with the success of the GPS. Schnellenbach (2007, p. 12) concludes that at best the public sector agent can act as a Kirznerian entrepreneur responding to “windows of opportunity” where latent demand for novel solutions has manifested; but, importantly, the agent “can do little to influence the emergence of such windows,” and consequently, policy innovations often experience delayed implementation inhibiting their effectiveness.

To mitigate the institutional constraints defined above, Schnellenbach refers to frequent proposals among economists for a reduction in checks and balances (i.e., the number of veto players) within a given system. This involves a tradeoff between a perceived increase in public sector innovation and an increased threat to political stability. The extreme outcome of this solution likely results in political dictatorship; however, from the perspective of micro-level firm theory, decision-making can be improved by reducing transaction costs through the adoption of centralized control governance mechanisms that foster independence, speed, and flexibility in problem-solving (Miller 1992, pp. 77–101). Translating to the public sector, this can be thought of as streamlining and reducing the red tape of bureaucratic agencies so as to increase their agility and creativity, which aligns closely with Mazzucato’s vision of government silos providing mission-oriented directionality to innovation.

Analyzing the effects to entrepreneurial activity within a scenario of dismantled checks and balances requires the consideration of additional institutional constraints inherent in the public domain. Using a combined Austrian-public choice approach as per Boettke and Lopez (2002), I first relax the omniscience assumption of the public sector entrepreneur, which exposes the existence of information problems involved with any central planning endeavor as illustrated by Hayek (1945). The dispersion of knowledge “of the particular circumstances of time and place” makes problematic any involvement by the government in picking winners. Furthermore, from a purely entrepreneurial trait perspective, Kirzner (1982, p. 275) emphasizes market competition as critical to fostering alertness, guiding the economic calculation of “socially worthwhile” innovation via profit and prices that allows the entrepreneur to “push the economy forward in the direction of a possible Nirvana” (Douhan et al. 2007, pp. 217–218). Without this guidance which is revealed via the dynamic and rivalrous market process, directions toward social betterment are unknown. Central planners are instead guided by their judgment or the judgment of their superiors and yet assume a role as perceived experts.

This expert role played by central planners exposes the issue of technical feasibility versus economic feasibility. Given the institutional constraints inherent in the

public sector, the planning expert within a specific domain or industry is not equipped to perform economic calculations. Lavoie (1985, p. 53) highlights this issue by detailing the engineering expert's role in assessing the best use of a commodity such as wood: "This is not an issue about which the engineer has any special expertise. It is not a question to which quantitative measurement of any physical dimension is relevant. It is a question of the relative value of wood in alternative uses." Government planners have no ability to assess the opportunity costs of these alternative uses.

Given the criticality of opportunity costs in the calculation problem, the success of central planning efforts cannot be proven. As Powell (2005, p. 311) elaborates:

We can point to evidence of failures in calculation, because firms demonstrate they should exist as structured by succeeding in the free market despite discouragement by the government or when firms continually subsidized by the government fail to become privately profitable. In both cases feedback from the market indicates a knowledge failure on the part of the planners. Successful planning, however, cannot ever be established by observing that a subsidized firm eventually becomes privately profitable. No market feedback mechanism is in place to show that the gain in the subsidized industry is greater than the opportunity cost of the industry that would have developed in the subsidy's absence.

This holds true for the advent of the GPS, where the opportunity costs of the next best alternatives are unknown. The implication of the calculation problem for public sector entrepreneurs is that personal or political incentives reign supreme due to the absence of residual claimancy; therefore, at a minimum, entrepreneurial discovery will lag behind the private sector (Douhan et al. 2007, p. 218).

Moreover, when the benevolent assumption is next relaxed, public sector entrepreneurial action could result in considerably unfavorable ends. Baumol (1990) first introduced the concept of unproductive and destructive entrepreneurial outcomes as entrepreneurs in general are biased more toward profit rather than innovation. Consequently, if the rules of the game promote higher profit channels via rent-seeking activities, then the level of productive entrepreneurial activity will decline. Holcombe (2002) expanded upon the scope of entrepreneurial consequences by incorporating the public sector entrepreneur and tracing the political profit motivation to two outcome types. The first type is efficiency-enhancing in that collective benefits are supplied or socially and economically worthwhile innovation is generated. The rewards to the public sector entrepreneur politically manifest in a myriad of ways that align with the agent's self-interest to include gains in recognition, power, and compensation.

The second type is via the forcible transfer of wealth from one person(s) to another, where the public sector entrepreneur stands to benefit from the payment of the transfer recipient. Such political profit is a form of predation and occurs via coercion, which is one of the primary attributes of government action that contrasts with private enterprise where transactions are entered into voluntarily. It is important to stress that these unproductive activities are still considered entrepreneurial because they require an alertness to potential rents and then action taken to acquire them (Douhan and Henrekson 2010). Holcombe (2002, pp. 149–150) further alleges that predatory opportunities are typically more profitable than productive ones given

the logic of concentrated benefits and dispersed costs. Public sector entrepreneurs stand to gain more from specific lobbyists and special interest groups than they do from the general public's welfare improvement via productive policies.

In summary, the entrepreneurial signals that enable the state to frequently repeat public innovation successes like the GPS in a persistent peacetime environment are dubious considering the incentives and abilities of the average bureaucrat. Lavoie (1985, p. 201) describes the dangers of government-directed industrial policy as a catastrophic combination of the knowledge problem and the totalitarian problem. The former problem suggests that planners cannot "possibly know which industries ought to be picked in order to enhance industrial growth," while the latter problem dictates "power will instead be wielded in response to political clout rather than careful debate"; and the irony as cited by Lavoie is that these policies are allegedly purposed to minimize the influence of special interests.

## Conclusion

This chapter examined the effectiveness of state-guided innovation by assessing the claim by advocates of the entrepreneurial state that government drives innovation better than the private sector. I find that many assertions of the state serving as the boldest innovator through a mission-oriented approach fail the test of McCloskey's Supply-Chain Fallacy. However, my use case analyses did find occasions of state-guided innovation success, particularly when societal demand is made clearer as witnessed during times of crisis. In order to assess the effectiveness of state-guided innovation efforts in a persistent peacetime environment, I next analyzed the viability of the public sector entrepreneur. I contend that the checks and balances provided by political institutions severely constrain Schumpeterian innovativeness, while information and incentive problems can channel Kirznerian alertness to political profit toward unproductive or destructive ends.

My research has one important implication: advocates and executors of a mission-oriented directionality toward public sector innovation take a pause, or at a minimum, proceed with humility and consider the effectiveness of their approach through an economic lens. Within and across inherently governmental organizations, encouragements to enact a culture of innovation need to account for the lack of residual claimancy and rivalrous competition that place the public sector at a distinct disadvantage. Recognizing the sufficient conditions that allow human creativity to flourish and understanding the impacts of government's influence over entrepreneurship will be critical components in improving the effectiveness of state-guided innovation efforts. At a minimum, increasing the understanding of what fosters innovation is a valuable aim considering that innovation is the key to driving economic growth and development.

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**Rodney H. Yerger, Jr** is a member of the Principal Professional Staff at the Johns Hopkins University – Applied Physics Laboratory. Previously, he served in the U.S. Navy and as a civilian supervisory program analyst on the staff of the Chief of Naval Operations. He holds a PhD in Economics from George Mason University, a Master of Science in Cost Estimating and Analysis from the Naval Postgraduate School, a Master of Business Administration from the University of Maryland, and a Bachelor of Science in Mechanical Engineering from the U.S. Naval Academy.

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