For the Public Good: The Influential Role of State Funding and Policy in Innovation

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Introduction

The discourse over the role of the state in our neo-liberal world is never ending. Healthcare, education, housing, and transportation are all hot button issues in an environment that always seems to be squeezed for every dollar with private interests knocking at the door. Within this discussion is the role of the state with regards to funding technological innovations or the reliance on private industry for financing. Canada attempted to be an innovator by undertaking the development of the Avro Arrow for the Canadian Military. However, the government scrapped the project in 1959 after considering multiple factors. The goal of this paper is to explore the development and the subsequent cancellation of the Avro Arrow program within the wider umbrella of discourse over state projects and its critiques. Broadly, I discuss the need for public funding for technological innovation to support developing technology and the integrity of institutions. I argue that the Avro Arrow program is not symptomatic of a larger issue in relation to the role of the state in technology development. Rather, the outcomes of the Avro Arrow project were successful in its development goals, but lacked the foresight into the state of defense across North America. Furthermore, both the state and private entities have a role in the development of technology, but the neo-liberal conception that innovation comes solely through private means is false concluding with a successful state example of innovation.

An Overview: The Avro Arrow, Canada's Technological Dream in the Name of Defense

In 1948, the Canadian government began to explore the path of developing a new fighter jet to replace its CF-100s (Story and Isinger, 2007, p. 1027). Its plans outlined by the Royal Canadian Air Force (RCAF) included the need for a plane that could hit a "combat speed of Mach 1.5, at a combat altitude of 50,000 feet and a combat radius of 200 nautical miles. (Story

and Isinger, 2007, p.1028). Cold War tensions were rising and the increased aggression by the Soviet Union through its detonation of a nuclear weapon demanded new security solutions for Canada and its ally, the United States (Story and Isinger, 2007, p. 1035). Strategically, the United States wanted Canada to invest in an early warning system on the 55th parallel through the use of radar technology and demonstrated no need for Canadian aircraft (Story and Isinger, 2007, p.1035). Nevertheless, Canada continued on its development path for the Avro Arrow and invested $26.9 million into its creation and subsequent prototypes (Story and Isinger, 2007, p.1040). The government began to realize that there were major shortcomings in the development of the Avro Arrow, not with the plane itself, but in the technical experience of its staff and the needs of the global community (Story and Isinger, 2007). Finally, in 1959, Prime Minister John Diefenbaker terminated the project (Story and Isinger, 2007).

Analyzing the Failure of the Avro Arrow: Fundamental Issue with State Funding or Mere Short-sightedness?

Clipping the Arrow's wings in its development was not due to the inability for government to develop cutting edge defense technology. In fact, the plane was a technological marvel of its time (Story and Isinger, 2007). However, government short-sightedness and the reality of the actual needs of Canada brought it down. In the Cold War, Canada's job was to alert its U.S neighbours of an impending attack (Story and Isinger, 2007, p.1035). In its grand dream, the Royal Canadian Air Force pursued the Arrow not for its strategic placement in national defense, but for its technological superiority (Story and Isinger, 2007, p.1046). Blinded by its capabilities, the Canadian government soon realized that its own pilots did not have the experience nor the training to fly such an advanced aircraft (Story and Isinger, 2007, p. 1046). Furthermore, the U.S would never buy a product from Canada as it would eventually identify

that it could build such an aircraft using its own R&D processes (Story and Isinger, 2007, p.1045).

The story of the Avro Arrow should be framed not as a failure of the state to fund and develop a massive R&D project. Rather, the shuttering of the project was due to the inability to find a fit within national defense and our role in international security. The state does have a role in the development of technology. Through this, it has demonstrated the ability to do so in partnership with a private organization. The A.V. Roe, the manufacture of the plane was not a Crown Corporation. Government was able to work and partner with private companies showing that private organizations have a role in technology development as well. I conclude that state governments are not solely responsible for the development of technology; as private corporations are a tool to deliver new innovations.

Opponents to this argument would say that the government needed to have a business argument for developing such a large project out of the taxpayers' coffers and therefore was a failure. Subsequently, they may also argue that private corporations can be the sole funders of technological research and advancement. In response, I believe in the separation of technological development and mass production. If the state was unable to develop technology, then the state would have no place in the field. However, because they were able to do so with the help of A.V. Roe, the state has some role in the development of technology, but not necessarily in the marketability of such a product. In this case, the failure to succeed in the market is not a testament to the advanced design of the plane.

The Role of the State in Technology Development

The state has the ability to go where the private sector is unwilling to go. Mazzucato (2011), discusses the role of venture capital in R&D. In her book, she defines venture capital as

"a type of private equity capital focused on early-stage, high potential, growth companies (Mazzucato, 2011, p. 39). In the early stages of innovation, the risk is high and therefore private investors are nervous to invest (Mazzucato, 2011, p.39). Mazzucato (2011) concludes through U.S government data that "government has played a leading role not only in the early research… but also in the commercial viability stage" (p. 41). Between 20-25% of total funding has come from government (Mazzucato, 2011, p. 41).

In the case of the Avro Arrow, the project does not fit Mazzucato's definition of venture capital as A.V. Roe was an established firm producing CF-100s (Story and Isinger, 2007). However, it highlights some key aspects of government funded projects. Government can take risks on innovative projects like the Avro Arrow that not only has benefits for the company involved, but for national interests as well. Beyond this project, the government helps to provide stability to new firms (Mazzucato, 2011). Arguably, government is more interested in having these firms mature compared to private funds that are more interested in making a profit. Mazzucato (2011) points out that venture capital funds are most interested in firms that can reach commercial viability quickly which is seldom possible, therefore public venture capital is more stable.

State vs. Private Project Funding: The World of Academia

At times, academia seems disconnected from the public drifting along in its own universe. However, it is very much connected to the public sphere in terms of research into new technological innovations. Rausser et. al (2008), discusses the role of public and private funding in agricultural research within the land-grant universities of the United States. They conclude that research funded by the private sector within these universities is more interested in short-term benefits over research for the public good (Rausser et. al., 2008, p.1-2). They argue that

public institutions need to have safeguards in place to limit the powers of private funding (Rausser et. al., 2008, p.2). Furthermore, they go on to argue that as funding from public sources is reduced, the private sector has an increasing advantage in bargaining power over the direction of funding (Rausser et. al., 2008, p. 10).

This further demonstrates the need for public funds in technology and innovation to separate the interests of the private sector and the public good. Public funding preserves the integrity of public intuitions that work in the best interest of society over private individuals assuming that the state itself works in the best interest of its people. Therefore, state funded projects still have a role in innovation and research and privately funded research cannot be the sole source of information as it seeks to maximize business benefits.

Furthermore, an article published in *BioScience* discusses the need for the right type of public funding in relation to Canadian infrastructure. Sponberg (2009) points to the need for adequate grant funding coupled with infrastructure funding. In 2009, government invested $4.5 billion in scientific infrastructure. However, “funding was cut by 5% for [Canada’s] three granting agencies” causing outcry from researchers due to the inability to cover operational costs (Sponberg, 2009). Although, scientists cannot come to a consensus on the impact of the cuts, some argue that scientists should take what is given to them and not “bite the hand that feeds them” (Sponberg, 2009). Nevertheless, this identifies a key issue for public funding. While important, it is necessary that funding is rolled out in a manner that is strategic and does not compromise the ability for scientists to carry out research.

A Success Story: China in the World of the Entrepreneurial States

In contrast to the perceived failure of the Avro Arrow is the development of high speed rail by China. Sun (2015) writes about how the state has encouraged the development of the

technology within the country using policy tools. The state allowed for better integration into the new knowledge economy by asking firms to open R&D centers (Sun, 2015, p.648). Through this, the state has set the priority of "building an innovation-based economy" (Sun, 2015, p.648). From 1992-2003, China relied heavily on its own technological assets from within its country to develop its high speed rail technology (Sun, 2015, p.651). After experiencing some issues, China realized that it needed outside technology as the maturity of its own was behind other nations (Sun, 2015, p. 651). From 2004-2007, China started to import technology from more advanced states which resulted in better manufacturing practices, but not innovative ones (Sun, 2015, p. 652). From 2008 to the present, China consolidated resources and allowed for better cross collaboration between its researchers and enterprises (Sun, 2015, p. 652). Today the state, through its local firms, is a leading high speed rail technology producer (Sun, 2015, p. 654). Ultimately, this model of consolidation and innovation within China shows that guided development of an industry and product can lead towards putting a country that was seen as a laggard in technology to the forefront (Sun, 2015). Their technology is able to compete and partner with other innovative companies on the global stage (Sun, 2015, p.654). In relation to previous examples, this shows that the role of the state is not only to fund innovation, but also as a body with policy tools that can encourage organization towards improvement. In contrast, innovations from private entities alone would not have provided China with the level of knowledge needed. This is due to the policies and frameworks implemented by the state allowed for organizations to work closely towards a common goal.

Conclusion

The Avro Arrow is one of many examples of a state project and therefore cannot be used to generalize the ability of a state to produce a quality product or innovate in a field. Moreover,

the state itself is not a sole actor in innovation and requires some level of private interest in the development and innovation of a technology. In this paper I discussed four items: the Avro Arrow project not as a failure of the state to encourage innovation, but a successful project that did not have a place in national defense, the state's relationship with innovation in general, with academia, and China's ability to innovate and deliver a technology that can compete on the world stage. In general, this paper argued that the state is entrepreneurial by supporting developing technologies financially and through policy, that it serves as a check for short-term privately funded research that needs to be carefully balanced, and that states are able to innovate given the right framework. It is clear that the state has a role in the development of new technology and that the process is heavily reliant on the way the state manages its incentives and programs. Only once the public and private spheres are working in unison, can we have a truly innovative society.

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