Proposed Paper: "A Life-Cycle Policy Model Targeting Technological Innovation and Economic Growth"

Category: Public Policies for the Provision of Innovation Incentives

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Rationale: Innovation policy in the United States has suffered from several major barriers:

(1) *A failure to accurately conceptualize the public and private elements of the typical industrial technology.*

Specifically, a "black-box" conceptual model industrial technology has dominated public support of technology development for commercial purposes. That is, technology has been viewed as a homogeneous and largely private good. Economic growth policy therefore assumed that the profit motive would evoke a socially efficient amount of private investment in innovation. At most, the government role in supporting technology development for commercialization purposes has been limited to a tax credit for industrial R&D.

Only when the R&D is directed toward a social goal, such as national defense, space exploration, clean energy or health, is more comprehensive policy structure employed. Thus, the U.S. has had a bimodal innovation policy structure, which is only being slowly modified to respond to the pressures of global competition.

The result is that when government funds new technology development to meet a social objective, the R&D portfolios are optimized to meet the social objective, as opposed to economic growth. That is, while government support of innovation to achieve such social objectives does create growth, the resulting economic impact (in terms of both amount and type of technology) is not optimal because R&D portfolio selection is not driven by profit maximization objectives.

Conventional growth policy has assumed that the new technology platforms created by federally funded mission-oriented R&D will spillover into other commercial markets not related to the social objective. Small broad-based federal programs exist, but they are inadequate in scope and size.

(2) *The technology-based economic development (TBED) process for creating economic growth strategies is, in fact, quite complicated and involves a range of both public and private assets.*

The indirect and simplistic TBED policy approach summarized above denies the increasingly complex process of creating and maintaining a complex set of both public and private technology-related economic assets. The increasingly outdated approach summarized in (1) worked reasonably well when the U.S. was the dominant technology-based economy.

However, the relentless expansion of global R&D (two dollars are now spent by the rest of the world on R&D for every dollar spent by the U.S.), is resulting in the spread of innovative capability across a growing number of economies, which is increasingly taking away market shares from domestic firms.

(3) *To address this complex public-private asset structure of modern technology based growth, as well as the dynamic (cyclical) nature of the development, maturation, and eventual decline of individual technology assets, a dynamic, multi-asset TBED growth model is required. Such model must address investment in both public and private assets.*

Unfortunately, the lack of an institutionalized innovation policy framework for stimulating economic growth has prevented significant advancement in the needed policy structure. While mission-oriented R&D agencies such as DoD, NASA, DoE, and NIH have internal management functions for their R&D portfolios, attempts to create a government-wide policy mechanism has largely failed. For example, while the Federal Reserve Board has hundreds of economists analyzing reams of data to support monetary policy, the only attempt at an institutionalized innovation policy function was the Technology Administration (TA), created by the Stevenson-Wydler Technology Innovation Act of 1980. As of 1988, it consisted of NIST and NTIS operating agencies and also had a small Office of Technology Policy, but with no funding. The TA, including the OTP, was abolished by the America COMPETES Act of 2007.

Proposed Paper: The paper will

(1) Present and discuss a conceptual model of the modern technology, emphasizing the several public and private elements of a technology and their development sequence. Each element will be characterized in terms of the varying degrees and nature of the its public-good content with implications for specific government policies and timing of their use.

(2) Relate each technology element to the appropriate subset of policy instruments reflecting the unique underinvestment phenomena associated with that element. The interaction of these elements over a technology's life cycle will be characterized to show impacts on overall policy productivity.

(3) Different categories of policies that provide incentives for private-sector investment and those that directly target public-good elements (technical infrastructure) will be distinguished and from each other, but also be integrated into a comprehensive TBED model. The different management challenges associated with each of the two types of input and their interactions for technology development and commercialization will be characterized. Examples will be provided.

(4) The evolving trends in state-level trend in TBED policy instruments will be described.

Budget

Direct labor: $20,000

Sample Relevant Publications:

"A Technology-Based Growth Policy," *ISSUES in Science and Technology* (Winter 2017)

"The Technology Element Model and Path-Dependent Growth," *Economics of Innovation and New Technology* 25:5,6 (July/September, 2016)

"Competing in Advanced Manufacturing: The Need for Improved Growth Models and Policies," *Journal of Economic Perspectives* 28:1 (Winter, 2014)

"Technology Life Cycles," in D. Campbell and E. Caryannis, eds., *The Encyclopedia of Creativity, Invention, Innovation, and Entrepreneurship*. New York/Heidelberg: Springer (2013)

"Beyond the Business Cycle: The Need for a Technology-Based Growth Strategy," *Science and Public Policy 40:3* (2013)