CONCLUSION

Conclusion: International Political Economy—The Reverse Salient of Innovation Theory

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Abstract

This conclusion attempts to answer three sets of questions regarding our experiment in cross-field collaboration: What did we find and were these findings cohesive? What did our findings add to the debate? What are the implications of our findings, and, more importantly, what's next? It suggests that politics have become a "reverse salient" in innovation theory. Specifically, innovation scholars have yet to devise a theory that fully incorporates distributive politics and their security and competitiveness implications into a general explanation of technological change. This gap is holding back progress in fields that depend on innovation as an explanatory variable. It should therefore be made a priority for innovation scholars across the social sciences.

KEY WORDS: national innovation rates, technological trajectories, reverse salient

This conclusion attempts to answer three sets of questions regarding our experiment in cross-field collaboration: What did we find? Were these findings cohesive? What are the implications of these findings and, more importantly, what's next?

Before answering these questions, consider first the diversity of research approaches employed in this project (Table 1). The scholars contributing to this collection addressed the political economy of innovation in different geographic regions, production sectors, and industries, and did so at different levels of analysis using a wide cross-section of quantitative and qualitative methods.

Despite this wide range of scholarly traditions, the degree of convergence across our research is striking. Four of the articles show that R&D activities are not being internationalized as thoroughly as predicted by the globalization literature. First, Cohen, Di Minin, Motoyama, and Palmberg show that "important" R&D is kept domestic, while regular R&D is carried out more internationally. Ketokivi and Ali-Yrkkö then find that as products and their manufacturing processes become more complicated, and, as product cycles accelerate, firms tend to locate R&D together with manufacturing. Dunning and Lundan then take a global approach, using patent analysis to show that corporate innovative activities are more dispersed than ever before. However, the internationalization of R&D lags behind the internationalization of manufacturing. Dunning and Lundan thus agree with Cohen and others, and Ketokivi and Ali-Yrkkö that the more sophisticated the R&D, the more it tends to stay domestic. Together, these three articles suggest that the globalization literature may be accurately reporting the internationalization of less sophisticated or knowledge-intensive manufacturing, but not well distinguishing it from the more knowledge-intensive manufacturing to which much "important" R&D is tied.

Dossani and Kenney then shift their focus away from manufacturing, and instead concentrate on services. Here they find a somewhat different dynamic. While the higher valued-added service sector is spreading to India, the main vehicles here are not the developed country multinational companies (MNCs), but Indian firms and

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Table 1. Lists of Research Approaches Employed

Geographic Foci	Sectors	Industries	Units of Analysis	Quantitative Methods	Qualitative Methods
United States	Manufacturing	Automobile	Country	Basic statistics	Appreciative description
Brazil	Services	Telecom	Sector	Ordered logit	Analytical case
Finland		Information technology	Industry	Panel	Illustrative case
Sweden		Biotechnology	Firm		Historical ethnography
Japan			Patent		Cross-case comparative
Singapore					Within-case comparative
South Korea					
Thailand					
India					
Israel					
Global					

entrepreneurs. Certainly, foreign MNCs provide a source of investment, but the story in India is one of domestic forces driving innovation, not the centrifugal pressures of international trade and production. In sum, then, these four articles found that innovation is indeed going global, just not to the extent that many pundits extol (or warn).

Of course, each of the above research teams investigated innovation at the level of the firm, therefore, the next three articles explored the degree to which national versus international political variables and institutions affect technological change. They find that both domestic and international variables matter in that they *influence*, but they do not necessarily *determine*, the pace and trajectory of technological change.

Specifically, Cowhey, Aronson, and Richards find that American political institutions, specifically political decentralization and electoral systems, strongly shaped the trajectory of the global information and communications technology (ICT) infrastructure. At first, these findings by Cowhey and others appear to contradict a prior contribution to this journal in which Taylor (2007) analyzed data on patents, science, and engineering publications, and high-technology exports to show that political decentralization does not determine national innovation rates. In this special edition, Taylor revisits this data to reveal a more nuanced interpretation. That is, Taylor (2007) and this edition's Cowhey, Aronson and Richards article seem to be testing different extremes of the same hypotheses and converging on similar conclusions: domestic political institutions influence but do not determine national innovation rates. In his current contribution, Taylor also controls for international linkages (trade, foreign direct investment, and educational exchanges), and produces similar findings: they influence but do not determine innovation at the national level.

What then determines national innovation rates? Doner, Hicken, and Ritchie begin this investigation by looking at the fundamental political conditions that determine a country's ability to sustain interest in allocating resources toward and accept the disruptions caused by technological progress. Like Cowhey and others, Doner and others find that domestic institutions and policies strongly affect technological trajectories and that the quantity of veto players shape these institutions and policies. However, at the root of Doner and others' argument lie external

threats to state survival, and the domestic resources available for the state to draw upon to counter these threats. Doner and others appear to be in good company here, as similar findings have been reached by Solingen (2007), Acemoglu and Robinson (2006), and Bowman (2002), and are hinted at in Breznitz (2007).

Finally, two papers look to the future. Kushida and Zysman prefigure the next major technology-based political–economic transformation: the services transformation. They predict that this transformation will be so fundamental to economic activity that it will require not just new regulations, but a new policy regime and new markets. They therefore examine some of the fundamental and generalizable political–economic trade-offs that societies confront when facing sustained technological change. Rouvinen and Stankiewicz likewise foreshadow future political–economic trade-offs, but do so regarding potential flaws in the U.S. patent system. They show how improperly designed intellectual property rights threaten not only open science, but also technological progress by obstructing the formation and utilization of "design spaces."

What has this special edition found, then? I would argue that it has three sets of conclusions. First, empirically it has found that (1) innovation is being increasingly internationalized, but not to the extent predicted by the globalization literature; (2) domestic institutions influence but do not determine the rate and direction of inventive activity; (3) international variables, such economic relationships and security concerns, likewise influence technological progress; and (4) the service sector is likely to be the next major battleground for national technological prowess, and hence may provide promising test cases for new hypotheses.

Second, this collaboration has revealed that a diverse set of scholars using diverse methods and data can indeed improve our understanding of the political–economy of technological innovation. Like the proverbial blind men grappling with a strange animal, the separate research traditions contributing to this special edition seem to be holding different parts of the same innovation "elephant." This special edition of *Review of Policy Research* therefore demonstrates the value of bringing together diverse theories, methods, and data for explaining technological change, and their policy implications both for governments and corporations. Hence, this experiment can be interpreted as a call for greater cooperation and common focus among the fragmented science and technology (S&T) scholars within political science and across the social sciences.

Third, this project has outlined the basic contours of what is missing in the theoretical debate over innovation. If we really want to understand technological change, then we must develop a more general theory of the international political economy of technological change. The differences between the contributions to this special edition highlight some of the gaps that need to be filled. For example, Kushida and Zysman see innovation in the ICT sector as driving political–economic tensions, while Cowhey, Aronson, and Richards reverse that line of causality. Taylor sees international linkages as key means by which nations increase their innovation rates, but Dossani and Kenney's study of India fails to confirm this. Both Doner and others and Cowhey and others cast the quantity of veto players as a primary causal variable, but seem to disagree on whether domestic, international, or structural factors drive their behavior. While Cowhey and others emphasize the importance of modularity to innovation and technological change over the five-decade of history

ICT development, Rouvinen and Stankiewicz are concerned about the accessibility of shared intellectual commons.

The combination of harmony and disagreement between the articles presented in this special edition should point research on the politics of technological change in a new direction. For example, consider the range of domestic institutions (patent systems, government structure, regime type, veto players, electoral institutions, and market environments) and international variables (trade, investment, education exchanges, security) cited by the different authors as drivers of technological innovation. None of these factors are ex nihilo, but the result of politics; only Doner, Hicken, and Ritchie's natural resources are an exception. Yet political scientists have not yet made the connection between these proximate causes of innovation, the domestic political bargains from which they originated, and the international context within which these bargains occurred. This includes the international security conditions that affect, perhaps trigger, these domestic political bargains. Future research must investigate these fundamental political deals, the interaction of domestic and international forces, and the relationships between economics and security, which result in differences in national innovation systems and technological trajectories. Specifically, in order to construct a more complete political–economic theory of technological innovation, researchers must address five overlapping and interconnected questions:

- How do domestic and international politics interact to determine what kinds of R&D are held domestically versus performed internationally?
- Do security concerns play a major role in determining the structure of the domestic institutions and international linkages that are the vehicles of technological change?
- How do the distributive costs and benefits of technological change affect the formation and policy preferences of domestic interest groups and dominant coalitions?
- How do different types of threats (domestic versus foreign) to the survival of domestic political elites affect national innovation rates?
- How do international politics affect the design and evolution of national, regional, and/or sectoral systems of innovation?

Put another way, political economy, both international and domestic, appear to constitute a "reverse salient" in the study of technological change. First invoked in innovation scholarship by Thomas Hughes (1983), this is a military term used to refer to a point of weakness in an attack, a lagging component that prevents the rest of the corps from accomplishing their mission. Unless the reverse salient is rectified, the army's progress comes to a standstill. Like an army on the attack, innovation scholarship is threatened with a lagging component. Specifically, we know that politics matters for technological change. The invention and spread of new technologies creates winners and losers, both within and between states, just like any other major distributive economic change (e.g., trade, capital flows). However, we have yet to devise a theory that fully incorporates these distributive politics and their security and competitiveness implications into a general expla-

nation of technological change. Furthermore, studies of economic growth, comparative advantage, developmental states, production theory, and even some aspects of trade theory, all hinge on technological change as an independent variable. This implies that until we can explain technological change as a dependent variable, these lines of research will likewise suffer reverse salients. Therefore, the conception of a political theory of technological change has greater stakes than simply satisfying the intellectual curiosity of a handful of S&T scholars. It will have a major impact on scholarship across political science, economics, and business. It should therefore be made a priority for innovation scholars throughout the social sciences.

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