

Pandemic Politics within a System of Entangled Political Economy

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Abstract

This essay uses entangled political economy to explore how concerns over Covid-19 have influenced conduct within the public square. Entangled political economy represents a merging of ideas that Frank Knight (1933) and Harold Lasswell (1936) set forth to indicate that politics and economics dealt with the same societal material. We explore the relationship between entanglement and public reason within a context of Michael Polanyi's (1962) conceptualization of a Republic of Science. The point of our paper is not to offer some critique of particular policy measures but to advance our understanding of how democratic societies operate in stressful times.

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It seems patently clear that Covid-19 presents some difficult problems of public health regarding a sometimes-lethal contagious disease that spreads through personal interaction. Times of crisis like that which many people think Covid-19 presents surely amplifies the challenges that policy formation presents to democratic societies. Our interest in this paper, however, lies not in selecting among different policies that people have proposed to combat the pandemic. Rather, we explore the properties of different organizational arrangements through which contestation among political, economic, and scientific entities influence the emergence of societal outcomes. To do this, we adopt the approach of entangled political economy which Wagner (2016) summarizes. Entangled political economy contrasts with the standard notion of additive political economy. With additive political economy, political action is independent of economic action as is entailed in the presumption that political action

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offsets market failures. In contrast, with entangled political activity there is continual interaction between political and economic entities, sometimes to mutual advantage and sometimes not, but politics and economics do not represent distinct realms of activity in any case.

At the core of our analysis lies recognition of the wisdom of Frank Knight's oft-made remark that our most severe problem with knowledge does not lie in what we don't know but rather lies in what we know that isn't true. There might well be one best response to Covid-19, but there is no universal agreement about what that response might be. Many people claim to know what's best, and not all of them can be right. In the face of such systemic ignorance, there is no effective option to relying on processes of social contestation to winnow down the possibilities. Hence, we focus on contestation within a policy-making processes that entails interaction among political, economic, and scientific entities. That contestation, moreover, cuts across different linguistic communities. The scientific community mostly uses languages grounded in concepts and categories of such fields as molecular biology, epidemiology, virology, and statistics. The commercial or economic community mostly works with languages grounded in revenue, costs, and profits. The political community mostly works with languages grounded in public perception and the reduction of technical categories and concepts to those that seem intuitively reasonable or plausible.

The social process of contestation thus resembles a three-ring circus where activity in the main political ring is shaped by activities undertaken within the commercial and scientific rings, and with that shaping running in both directions. We examine the societal impact of Covid-19 from the perspective of entangled political economy which construes societies as dense and complex ecologies of interacting enterprises. The framework of entangled political economy is built on recognition of the dispersed nature of knowledge. Within this analytical framework, policy is not so much an object of choice by some ruling coalition as it is an emergent outcome of interaction among interested participants as shaped through an organizationally structured process of political competition (Podemska-Mikluch 2014).

The framework of entangled political economy recalls the formulations by two scholarly giants associated with the University of Chicago in the 1930 s, Frank H. Knight (1933) and Harold D. Lasswell (1936), each of whom articulated nearly congruent visions of the domains of economics and politics, and with nearly a century later this vision now carrying the label entangled political economy. In *The Economic Organization*, Knight (1933) explained that any society will have to address the same set of questions: what will be produced, how it will be produced, and how much of that output different people will receive. In very small societies, these decisions might be made explicitly through some procedure of collective choice. In large societies, such explicit choice is impossible. Nonetheless, those three sets of decisions will be necessary in even the largest of societies. Knight's point was simply that the making of such decisions was present in the very operation of the society, even though there might be innumerable processes for reaching such decisions. For Lasswell (1936),

politics addressed questions of who gets what, when they get it, and how they get it. It's plain to see that what Wagner (2016) describes as entangled political economy is congruent with Knight's and Lasswell's formulations of the problems that are common to all societies.

Furthermore, entangled political economy suggests that both market and political entities are similar in being led by leaders who seek to be successful at what they do. One significant difference between political and market enterprises is that there exists a market for ownership shares in market enterprises which means that those enterprises will command market value. This contrast between the two categories of enterprise influences the types of interaction that occur between those enterprises. All the same, what we denote as policy outcomes emerge through processes of contestation across the three rings. How the outcomes of that contestation might measure up against some imagined standard of societal welfare is something about which many people might have opinion, only there is no god-like vantage point like Mount Olympus from which correct or true judgment might be rendered.

We open the paper with an overview of the role the concept of public goods and public reason has played in advancing lines of demarcation between political and commercial activity. We then contrast this effort at demarcation with the efforts of Elinor Ostrom (1990) and her associates to explain how people often are able to overcome the public goods problems they face without resorting to some arbitrary imposition of power to resolve theoretical impasses. Following this, we contrast the assembly of knowledge within an idealized setting of a Republic of Science (Polanyi 1951; 1962) with recognition that science and politics are inescapably entangled in settings like that which Covid-19 presents. We close by reflecting on how ideas from entangled political economy might alter the contributions social sciences might make to political processes.

1. Public Goods and Public Reason within the Contrasting Frameworks of Political Economy

The distinction between private and public goods has been a central fault line along which additive political economy has developed since the middle of the 20th century when Paul Samuelson (1954, 1955) advanced his widely cited distinction where the presence of a public good within a community is equally available to all members of that community. In contrast, private goods are available only to the consumer. Besides their disjunctive definitions, public goods presented problems of social organization that did not characterize private goods. Private goods presented few problems of social organization because people could be excluded from consuming the good if they did not pay for it. True, the access people have to private goods depends on their income or wealth, which might raise issues of equity or justice, but not technical problems of societal organization.

It is different for public goods. Once a public good is produced, any person within the relevant geographical territory can consume the good without having to pay for it. Such goods are unlikely to be provided through ordinary market arrangements when producers cannot withhold the good from those who don't pay. Whether crowdfunding generates the same level of support as public goods theories envision is unknowable. All the same, it is clear that crowdfunding succeeds in supporting many activities that have public goods characteristics.

Samuelson left his theory of public goods with a form of impossibility result: no mechanism existed through which consumers would reveal their preferences for public goods, so the only option for their provision was through governmental action that entailed some degree of arbitrariness. In contrast, James Buchanan (1968) set forth a framework where public goods could be provided through complex transactional and organizational relationships. While Buchanan succeeded in sketching such transactional models, he did not succeed in providing any strong sense that his construction was anything but a theoretical sketch. In contrast, Elinor Ostrom (1990) reports on research she and teams of researchers she assembled throughout the world were able to show how some of the principles of entangled political economy were at work in overcoming public goods problems. Through the numerous efforts Ostrom sponsored across a wide range of situations and places, she showed how groups of people were often able to resolve those public goods problems, illustrating the operation of local self-governance in the process. Ostrom's analytical efforts entailed a unique blend of theoretical awareness and an ability to see how human actions illustrated theoretical categories. The irrigation projects she examined fit the generic template of public goods in that successful completion of the project would provide water for a large number of farmers. In many ways, individual farmers might be tempted to free ride on the efforts of the other farmers. Rather than turn to some outside policing authority, which raises its own problems along such margins as bribery and over-zealous policing, Ostrom explained how the farmers were able to construct their own policing agents to illustrate the social organization of self-governing republics.

Within Ostrom's framework of entangled political economy, farmers were engaged in working together to supply public goods and were organized in such a manner as to monitor one another. Farmers were likewise engaged in the production of private goods as they owned the produce the irrigation helped them to grow on their parcels of land. In his original statement of entanglement in political economy, Wagner (2007) located both public goods and private goods as resident in human nature. Hence, the public-private division was not some artifact of particular forms of social organization but was a feature of human nature. On the one hand, people exhibit varying degrees of fellow-feeling and desires for belonging to entities that exist beyond themselves, and these desires create space for collective activity. On the other hand, people likewise have desires for accomplishment and some modicum of solitude, and these create space for personal or private activity.

While theories of public goods are more formal than substantive because their categories pertain to the subjective states of individuals and not to observable features of reality, it is still surely intuitively reasonable to most people that public health problems, especially of a pandemic intensity, have relevance for the organization of public action in some form. But in what form? This is where concerns of public reason come into play, and with Gaus (2011) providing an exemplary examination of public reason. Public reason seeks to answer questions that are addressed in the presence of controversy. This is the same setting as confronts theories of public goods: a formal model of an efficient outcome confronts individuals whose statements don't congeal into some common outcome. In his examination of Gaus (2011), Michael Munger (2017) explains that concerns of public reason can be used to resolve controversies only by restricting the domain of discourse by invoking what Munger calls a Kantian parliamentarian. In her work, by contrast, Ostrom does not look to some prior restriction on the domain of controversy, for she allows the participants to determine whether or not they will engage in deliberation.

From the perspective of additive political economy, public goods problems suggest the need for government intervention. In contrast, entangled political economy and Ostrom's empirical work both suggest that there are many ways people might structure their interactions so as to assemble the necessary knowledge. Resolution of the problems associated with Covid-19 clearly presents public goods types of problems that require the assembly of knowledge that is distributed across many precincts within a society. The central systemic or institutional issues concern the relationship between scientific inquiry and systems of political economy. Here, we contrast two sets of institutionally governed patterns of human interaction. One set is scientific interaction within what Michael Polanyi (1951; 1962) idealized as a Republic of Science, which operates most effectively when scientists compete with one another for precedence in discovery in the absence of some political authority that directs those efforts. The other set pertains to science within an entangled system of political economy where politics and science unavoidably commingle given the strong public interest in such problems as Covid-19. That comminglement is unavoidable and leaves open the analytical properties of different patterns of comminglement, which is the object this paper examines. The politics and the science of public health are entangled, and with the imperatives contained within that entanglement able to influence the pattern of scientific inquiry due to the attractive pull on scientific attention that politics can exert. This entanglement need not impair the conquest of Covid-19, though it might. Rather it suggests that some participants within the Republic of Science will gain advantage over others in consequence of the gravitational pull politics can exert on science.

2. Public Health, Covid-19, and the Assembly of Technical Knowledge

It is a simple matter to use diagrams or equations to illustrate how such contagious diseases as Covid-19 might entail a public goods type of problem where the aggregate amount of caution exercised within a society is less than the efficient amount described by the theory. The idea behind this claim is that people will exercise caution based on their perceptions of benefit, but those perceptions might not include costs they impose on other people by exposing them to Covid-19. In these models where some public authority is presumed to possess all relevant knowledge and act exclusively on that knowledge, that public authority can overcome the deficient aggregate supply that results from private actions alone. This claim about public goods confronts the same problem that claims about public reason face, namely the invocation of some position of higher authority to restrict the agenda for public discussion. Rather than advancing another claim about public goods and public reason, we restrict ourselves to the examination of the properties of alternative institutional arrangements that bear upon the generation of knowledge about possible claims regarding Covid-19.

Subduing Covid-19, or any other communicable disease, will require the development and assembly of various pieces of technical knowledge. This knowledge will be distributed across a number of scientists who often have related but different types of expertise. In this type of situation, conquest of Covid-19 will involve teams of scientists and engineers working together to develop means of subduing the disease. A key question of social organization concerns the formation and selection of teams when there are a number of candidates from among which a selection can be made. There are different social settings inside of which such selections might be made. Open competition among potential competitors is a process that surely has strong tendencies to select for excellence among those competitors, and yet such competition might be limited all the same as Wagner and Yazigi (2014) explore.

In the *Sociology of Philosophies*, Randall Collins (1998) describes scientists as competing for scarce attention space. Scarcity arises because no scientist can possibly follow everything being done, so scientists focus their attention on areas they think particularly significant. There will be competition among scientists to command attention space, and this competition will typically reflect a variety of what are often called schools of thought. The methodology of scientific research programs (Lakatos 1970; 1976; 1978) recognizes that any program of scientific inquiry will rest on some presuppositions that are unchallenged by participants within a particular research program, and yet participants within other programs will often embrace alternative sets of unquestioned presuppositions. It should be noted in this respect that some set of unquestioned presuppositions are necessary for thinking even to occur.

With respect to the assembly of technical knowledge, this can be an exceedingly complex undertaking, so complex indeed that standard decision procedures may be

unable to yield a best outcome because the identity of that outcome is undecidable, as Chaitin, da Costa, and Doria (2012) explain in their riff on Kurt Gödel's incompleteness theorems. Many problems require an assembly of elements to produce an answer. Suppose an effective treatment will require the assembly of ten elements, and with there being 50 elements that have initial plausibility. To determine the best treatment among the possible compounds that can be assembled is a deceptively complex undertaking which the explosive character of combinatorial arithmetic illustrates. There are more than 10 billion combinations of 10 elements that can be assembled from 50 candidates. The standard model of rational choice starts by listing the options, then develops models to estimate the properties of each option, only after which the best option can be chosen. Suppose a phenomenally speedy lab could estimate the properties of an option with only one hour of work. If so, it would take 10 billion hours of work to do the research necessary to offer a rational appraisal of the options.

Needless to say, no one will engage in a truly rational appraisal of the options. Decisions will necessarily be taken with far less than the full information envisioned by the template of rational action, or in the simple public goods framework. This type of combinatorial space will not be explored fully but instead will be sampled. At this point our analysis butts against competing frameworks for the organization of scientific inquiry, which we examine in the next two sections. There, we will contrast a framework of an idealized Republic of Science that Michael Polanyi (1951; 1962) sets forth, and with Gordon Tullock (1966) elaborating Polanyi's framework against a framework of entangled political economy (Wagner 2016; 2012). The Republic of Science presents an idealized vision of scientific inquiry as reflecting polycentric and not monocentric principles of social organization. In contrast, political imperatives enter into a Republic of Science within an entangled system of political economy, though to what effect surely depends on context regarding the strength of the gravitational pulls among politics, commerce, and science.

3. The Assembly of Knowledge within a Republic of Science

While our principal interest in this paper is to explore the impact on scientific inquiry regarding Covid-19 within our system of entangled political economy, it will be helpful to start by exploring the organization of inquiry without political participation. That is, we here present a perspective on scientific inquiry that is congruent with the vision of additive political economy. In this respect, Michael Polanyi (1951, 1962) formed the image of a Republic of Science. Within this image, the organization of scientific activity occurs in polycentric fashion without any direction or supervision by some political authority. In Polanyi's idealized form, scientific inquiry is organized through market-like interactions among interested participants. Even though scientific research might entail the formation of large teams of scientists, transactions and in-

teractions among scientists are consensual or dyadic, to recall Podemska-Mikluch and Wagner's (2013) analysis of different frameworks for collective action.

Especially notable in this respect is Richard Epstein's (1995) explanation of how the simple private law rules of property and contract can facilitate the creation of enormously complex transactions and organizations. Increasing complexity in no way requires replacement of the time-honored principles of discussion and agreement by arrangements whereby experts supervise contracts and organizations in an increasingly complex world, for experts of any type do not know all that is necessary in any case (Koppl 2018). The private law principles of property and contract can enable the formation of highly complex organizations and contracts without that complexity requiring participation from regulatory authorities. Sure, as the number of people who participate in commercial enterprises increases, people create more complex organizational forms. All the same, those more complex arrangements will reflect the consensual relationships among participants that reside at the core of the private law principles of property and contract. In no way does increased organizational and contractual complexity call for increased political and bureaucratic supervision by replacing the dyadic relationships of private ordering with the triadic relationships of public ordering.

The Republic of Science operates largely outside of public view. Within the Republic of Science, discussion among scientists is the typical mode through which science develops. To be sure, discussion may sometimes fail to achieve agreement among the participants. Under such circumstances, old teams may fragment and new teams form. All the same, the Republic of Science reflects the methodology of scientific research programs (Lakatos 1970;1976; 1978) where there is competition among research programs, and through time the attractiveness of different research programs changes similar to what Thomas Kuhn (1962) describes as paradigm shifts. All research programs have a hard core of propositions or beliefs that are held in common by members of a program or school, and which provide a platform on which the scientists develop their thought. These hard cores are not subject to examination, for they are what enable thought to proceed; without a platform that constitutes an analytical point of departure, there can be no thought. Economics, for instance, has a variety of hard cores. One hard core holds that observations pertain to states of equilibrium. Within that hard core, one set of programs holds that those states are Pareto efficient, making it impossible to increase the well-being of one person without making at least one other person worse off. Another set of research programs hold that equilibrium states are Pareto inefficient, which creates potential space for governmental action to make some people better off without making other people worse off. Still other research programs deny that observations pertain to states of equilibrium and assert instead the primacy of evolutionary change or emergent dynamics over the comparative statics of equilibrium theories (Devereaux and Wagner 2020).

In his *Intelligence and Democratic Action*, Frank Knight (1960) makes a crucial distinction between discussion and debate as contrasting forms of communication.

The Republic of Science operates primarily through discussion. Debate there may be, but it is debate inside a research program, and with that debate centered on different hypotheses regarding the advance of a research program that the participants agree in wanting to advance, but operate within an uncertain reality that invariably will lead to initial differences of opinion that nonetheless can be reconciled through discussion among the participants. Discussion is the mode of discourse within the dyadic scheme of political economy that characterizes the Republic of Science. Perhaps the key point about discussion is that there is no audience to which the discussants play: the discussants are their own audience.

Debate is an entirely different social process. Debate follows the mode of triadic political economy where some group seeks to form a dominant coalition after the fashion of Bruno Latour's (2005) network-based theory of social change where the data of society are not truly data because they pertain to social actions that often center on contesting and changing that very data. Perhaps most significantly, debate draws its significance from the presence of an audience. Indeed, it's difficult to recognize debate without there being an audience who will stand in judgment of the outcome. Data on death rates, for instance, are marshaled to capture support for political programs, and not to discern patterns of causation. Where a Republic of Science operates through dyadic transactions and discussion, science within an entangled system of political economy will acquire elements of triadic transactions and with debate being part of the process by which winning coalitions are assembled. In light of this distinction between an idealized Republic of Science and an entangled system of political economy, questions regarding what differences entanglement might make for the conduct of scientific inquiry, including Covid-19, spring into the analytical foreground.

4. The Assembly of Knowledge within an Entangled System of Political Economy

The Polanyi-Tullock conception of the Republic of Science, elaborated by Caldwell (2008), is an idealization of an open system of scientific inquiry where any political presence is limited to the standard liberal conceptions of securing the social order that the participants themselves have created. The actions of scientists create an order that emerges through interactions among those scientists, with politics serving to protect that emergent order and not to influence it. As an idealization, the Republic of Science concept offers both an explanation of the diverse paths of inquiry within the Republic of Science and a normative vision of what might be called the truth-seeking properties of the Republic of Science. With respect to claims about truth-seeking, it is not that individual scientists are motivated by a single-minded devotion to truth seeking but the point rather is that the scientific process itself works continually in the direction of incorrect explanations giving way to correct explanations.

The practices and processes of a Republic of Science are subject to political influence within a system of entangled political economy. How that influence might be exercised and to what extent depends very much on context, both scientific and political. Entanglement does not entail any assertion that scientists modify their theories and findings in response to politically expressed desires. The point is rather that political expressions of desired policy can influence the paths of inquiry that scientists select. It's possible that public beneficence could result from some instances of entanglement, but this beneficence is not a universal feature of entanglement because politically supported monopolization of particular lines of inquiry is also possible. Context matters, and Covid-19 presents just one context among many.

Entanglement is a network-based concept in which the nodes that carry action within the Republic of Science have direct connections with the nodes associated with politics. By itself, entanglement is a purely formal concept and so lacks substance or context. The connections between scientific and political activity may exert little influence over scientific inquiry or they may exert a lot; moreover, that influence might be relatively uniform throughout the domain of connection, as illustrated by evolutionary biology during the time of the Soviet Union, or it might be dense within some areas and sparse in other areas.

Within an entangled system, moreover, political actors might be small players and so exert little independent influence, but they can also be what Roger Koppl (2002) describes as Big Players. For Koppl, Big Players do not operate by the same rules and principles as ordinary players, which allows those players potentially to exert significant influence over the course of science. Within a related line of analysis, Koppl (2018) explains how the use of scientific expertise can be shaped and warped through political competition where expertise acts not as neutral information but part of an effort consciously to direct human activity along particular lines and away from other lines.

The implications of entanglement for the organization of scientific inquiry depend on the extent of public interest in various avenues of scientific inquiry. In areas where public interest in scientific findings is absent or even just miniscule, we may plausibly expect the principles of the Republic of Science to prevail. Only when a public interest in those findings can be provoked would we plausibly expect to find significant entanglement between science and politics. Covid-19 is certainly one of those areas of strong public interest in the findings of science. Despite entanglement between science and politics with respect to Covid-19, the domain over which that entanglement prevails is a limited part of the territory of scientific inquiry. Huge domains of inquiry lie beyond the interest and competence of the general public and hence not directly subject to political influence.

Science and politics operate at different levels within the territory where science and politics are entangled. Suppose we model the relation between science and politics in vertical fashion. Most scientific activity occupies the lower levels of activity. These are the levels where hypotheses about causal processes are formed and experiments

are conducted. These levels are occupied by such scientific specialties as molecular biology, virology, and statistics. The ability even to communicate in any detail is limited to people deeply versed in those fields of inquiry. No public interest resides in those scientific fields and in the organizational processes through which those scientists operate. The contact between those scientists and politics, if there is any contact at all, would be limited to such things as the renewal of research grants and the preparation of brief statements for public information officers.

Most contact between science and politics occurs within the upper levels of the conceptual building where science and politics meet. The competition for power and office is an ineradicable feature of our democratic system. While efforts are made from time to time to influence and shape some of the contours of that competition, as illustrated by occasional efforts to limit spending on political campaigns, the existence of competition for office is an inexorable feature of the overall attractiveness of holding political office. When more people aspire to hold office than the number of offices available, competition for office will manifest in some fashion. Efforts to control outward expressions of that competition, as through limiting campaign contributions, will induce candidates and supporters to find new avenues of competition, as illustrated by the development of Political Action Committees.

While the competition for power and office is built into our democratic system and can be neither denied or suppressed, an understanding of the operating features of that irrepressible competitive process might make it possible to withstand the worst effects of the entanglement of science and politics. When science attracts public and political attention, that attention will not be directed at the technical details of discussions among scientists. To the contrary, that attention will be directed at what is sometimes called “actionable knowledge.” Actionable knowledge, moreover, is knowledge that allows a political speaker to place his or her programs in a favorable light with respect to the audience he or she is seeking to influence. Unavoidably in this situation, what had been discussion among scientists converts into a debate between representatives of political programs carried out before public forums of non-expert observers who understand the language of politicians better than the language of scientists.

The transmutation of discussion among scientists into debate between politicians played out before a non-expert audience creates a form of clash between what are effectively two distinct cultures. Participants within the Republic of Science operate inside a culture of inquiry, and with that discussion following the norms and standards of open discussion directed at seeking answers to particular questions. The culture generated by the entanglement between science and politics generates a distinctly different culture that turns on securing advantage before an inexpert public. Success within the Republic of Science is answered within the laboratory. Success within an entangled political economy is answered at the ballot box. To assert the presence of two distinct cultural processes is not to assert some ineradicable antagonism between them. At times they might converge. Political advantage sometimes might reside on

the side of scientific truthfulness. It's only that there seems to be nothing inherent in the nature of things that supports this general consilience.

As already noted, the combinatorial character of many choices means that truly rational action is often impossible because only a subset of options will be examined before a choice is made. It is tempting to claim that the resulting truncated choice is nonetheless made from among the most significant options. Within the Republic of Science, this outcome seems plausible to the extent that the intuitive hunches of scientists generally operate to winnow unexamined options in a truthful direction, even though this property of intuition is not certain without undertaking the inquiry. To what extent the imperatives of political competition intrude into the Republic of Science will surely depend on the political appraisal of the options. Topics of high public interest will surely be more susceptible to political intrusion than topics where public interest is small or non-existent. The extent of political intrusion, however, will also depend on the associated commercial interests that are in play. In some cases, the intrusion of politics into the Republic of Science can exert large effects on the balance sheets of different enterprises. In the presence of entanglement between politics and commerce, the options that will be explored will be narrowed. How much they will be narrowed and to what effect cannot be determined specifically because such determination would require examination of the options that were truncated by the intrusion of politics into the Republic of Science.

There is no objective, easily available information that would allow for the selection of the most socially valuable scientific undertakings, as against particular answers emerging out of particularly structured processes. The idealized Republic of Science is envisioned as working similarly to an openly competitive market. In those spheres of science that are of little or no interest to the general public, it seems reasonable to think that the scientific process works similarly to what is envisioned by the model of the Republic of Science. The assembly of knowledge would emerge out of the process of interactions among the scientists. What is regarded as Truth at any moment would be a systemic quality of a Republic of Science and not a property of particular identifiable scientists. No single scientist could replicate the selections made through the process of interactions among scientists. A similar situation exists with respect to the support of nascent enterprises by venture capitalists. With respect to venture capitalists, there is no unambiguous metric by which superior enterprises can be identified in advance. To the contrary, venture capitalists support multiple enterprises with full awareness that the majority of them will fail, for it is the process itself that selects for superiority over inferiority.

The choice to support numerous enterprises is necessitated by investors' inability to distinguish between viable and infeasible ideas. By embracing the market process, the investor is freed from the burden of actually selecting the winner. In fact, no one is in charge of selecting the winner. The winner, or multiple winners, are selected through the bottom-up, emergent process of innovation. As Gatti *et al.* note: "Technological change is not something *we do*; rather, it happens *to us*" (2020, 117).

Some projects might turn out to not be viable due to technological limitations, others run into marketing challenges, yet others might be destroyed by a newly introduced competitive alternative or altered market conditions. In any case, the successful ideas are selected through the process, not through the decision of an investor. As Cowen and Tabarrok note, it is often far easier to “evaluate excellence after an achievement is completed rather than before the research starts” (2016, 244). The selection – the answer to the Knight-Lasswell question – is made through the bottom up, emergent process, and with the passing of time being a crucial component that is necessary for meaningful learning (O’Driscoll and Rizzo 2015).

While scientific and market selections unfold in a similar manner within the idealized vision of a Republic of Science, the situation can change within an entangled system of political economy because those at whom political messages are directed have more restricted attention spans than those at whom messages among scientists or venture capitalists are directed. For scientists and venture capitalists, a good deal of the messaging is highly technical. For politicians and their supporters, the messaging must be easily digestible with relatively little effort to attract an audience with neither interest in nor knowledge to work through complex messages. Political processes pull out the convenient, most easily digestible elements of a message, leaving everything else behind. For political enterprises to be successful, they must project the appearance of competence and confidence, and they must do so promptly, before their competitors. Hence, political enterprises are most interested in scientific findings that can be easily aligned with their political goals. This situation does not imply that the imperatives of political competition will clash with those of scientific inquiry, but it does mean that the two modes of competition are not necessarily congruent. The degree of congruence between the findings that emerge in scientific laboratories and the images that resonate most strongly with political audiences is an open question that cannot be settled by assumption or by resort to analytical convenience.

5. Why Does Entanglement Intensify During a Crisis?

One could argue that the general public should be wary of entanglement between science and politics. While we might not understand science, we understand that selection of science through politics is likely to distort science. That seems to be a generally held sentiment and is surely exemplified in the extreme by the Soviet embrace of the inheritance of cultural characteristics. General American sentiment seems to accept the value of scientific pluralism. Yet that same sentiment seems to move toward an intensified entanglement between science and politics at the time of crisis. Indeed, Robert Higgs (1987) is a treatise on the ability of times of crisis to exert lasting effects on subsequent social organization, in contrast to a model where social life returns to normal after a crisis has passed, and with Smith, Yandle, and Wagner (2011) illustrating this feature of entanglement with respect to TARP (Troubled Asset

Relief Program) in the 2000 s and the National Recovery Act in the 1930 s. In other words, crises seem to exert permanent effects on social organization. Why?

One possibility is that times of crisis increase a general desire for certainty within the structures within which life is lived. Throughout history, humanity has turned to centralized explanations and centralized solutions when new threats have occurred. In this respect, Mitchel Resnick (1997) coined the concept “centralized mindset” to characterize a widespread tendency to attribute orderly patterns of activity to ordering agents when that order is a systemic property of interaction among agents without any centralizing agents. This centralized mindset might be a reason why there is increased confluence of science and politics during times of crisis.

Another possible explanation for an intensified entanglement between science and politics during a crisis might stem from the perception of the impending threat as being some homogenous entity. The homogeneity of the perceived threat should reduce the practice of political expediency that operates generally in pluralistic fashion. It seems plausible that in the face of a major existential threat, reasonable human sentiments would favor the strategy that is best for the generic survival of humanity. In practice, however, we face uncertainty not only as to the best strategy to select for survival but also as to the severity and the heterogeneity of the threat. In this respect, political figures would seem to have a strong incentive to exacerbate perceptions of severity.

A third possibility stems from the unavoidable monopolization that can come with political influence. Where a Republic of Science might keep multiple options alive, the insertion of politics might foreclose many of those options through the supply of tax-financed research. To the extent this happens, other research programs are reduced and possibly even eliminated. There is no way we can know the counterfactual findings and programs that never materialized because of the political selection of a winning program before that verdict had emerged from within the Republic of Science. There is no way to demonstrate or measure the value of what was displaced by the political selection of some program prior to the emergence of that program from within the Republic of Science.

6. From Abstract Theory to Context and Practice

Within the Republic of Science, many scientists are continually engaged with the processes and mechanisms by which viruses grow and mutate and spread. What brought Covid-19 into public attention was surely the dramatic report issued by the World Health Organization that claimed that about three percent of people who contracted the virus subsequently died. This death rate is about 100 times the death rate associated with the seasonal flu against which much of the population is vaccinated each year. Moreover, there was no known vaccine effective against Covid-19. This initial set of circumstances provides the setting of the proverbial stage for the drama that began and continues to unfold.

Within a simple model of the Republic of Science, it is doubtful if the appearance of Covid-19 would have generated drama as against attracting scientific curiosity. That a virus of unsurpassed lethality has been reported would surely attract a good deal of scientific curiosity, some of that curiosity devoted to exploring the accuracy of the reports and other of that curiosity devoted to probing the qualities of the virus and inquiring into methods by which the virus might be killed. The appearance of Covid-19 would surely change the scientific landscape by inducing changes in the patterns and topics of scientific inquiry. That appearance would just as surely have induced changes in pharmaceutical research aimed at developing vaccines. The exact character of those induced changes is an emergent feature of interaction among scientists and engineers in forming judgments about the commercial potential of redirecting some effort toward Covid-19.

But the public interest generated by the terrifying initial reports certainly prepared the way for political reflections of concern along with the establishment of political programs to assure people that help is on the way. All the same, the political activities that might place a supporting politician in a good light would seem to be independent of the pattern of activities that would take place within a Republic of Science. For a politician to be able to deliver on his or her promises will require significant diminution in reports of the severity of Covid-19. For this reason, politicians will want to support remedies and actions that lower the measured severity of the virus, and quickly and on a time scale that would conform more to an election cycle than to the research patterns within a Republic of Science.

The severity of Covid-19 can be broadcast only through statistics. That usage, moreover is not some mechanical presentation of data but rather necessarily involves procedures of grouping, sorting, and classifying that finally result in the presentation of the data that form the images (Boulding 1956) from which people form their impressions. From different ways of grouping, sorting, and classifying what are called data, different sensory impressions will almost surely be formed, which Darrell Huff (1954) explained pithily in his examination of how statistics can be shaped to generate different impressions. Consider for a moment the formation of public impressions of the lethality of Covid-19, recognizing that it is those impressions that govern the intensity of the mutual attractiveness between politics and science. Perhaps the first thing that should be noted is that members of the general public have no option but to take statistics on death rates at face value. To report that the death rate from Covid-19 is 100 times the death rate of the seasonal flu is a truly attention-arresting and frightening statistic that would surely evoke strong support for efforts to hold that virus at bay.

To assert that the death rate from Covid-19 is more than twice as high in New Jersey than in New York likewise appears to offer descriptions of incontrovertible facts, similar to declaring that the elevation of Mt. Everest is more than twice the elevation of Mt. Whitney. This comparison of elevation is incontrovertible. But comparisons of death rates, either over time or among places, is not incontrovertible because those rates are human constructions rather than products of scientific instruments. For all

deaths, a certificate of death must be filed, and with “unknown” not being a possible cause of death. Death certificates are filed by the attending physician at the time of death. While there is no good reason to think that attending physicians intentionally report deaths inaccurately, it is also necessary to recognize that physicians are often beleaguered in their work and, moreover, that judgments about causes of death can be difficult and costly to make. When death certificates are checked through subsequent autopsy, the cause of death has often been found to have been misclassified (McGivern *et al.* 2017), with estimates ranging between ten and 53 percent. Kendrey (1995) used autopsy to check the accuracy of death certificates in cases where lung cancer was the certified cause of death. In that study, Kendrey found that the prevalence of lung cancer deaths was overstated because a good number of those deaths were shown upon autopsy to have been metastases from other sites in the body.

Death rates might in some circumstances be relatively objective similar to comparing the elevations of mountain peaks. But in some cases, they can be quite subjective because they entail judgments by attending physicians. While it is surely implausible to assert intentional misreporting, death certificates can still be noisy instruments once the process by which certificates are issued are considered. For a 75-year-old diabetic with fever and emphysema, a death might plausibly be attributed to Covid-19 even though autopsy might lead to a different attribution. While the evidence from autopsy shows a fair amount of misreporting, autopsy is expensive and so is not common. A physician who checks something other than the intuitively obvious Covid-19 box might have some explaining to do that could be avoided by checking the Covid-19 box. In the present climate that seems to border on moderate hysteria, it would surely be costly for a physician to submit a different cause of death. To be sure, we are not asserting that death certificates are grossly in error. Our point rather is that images and impressions are in the forefront of political competition, and commercial competition too for that matter. What are described as data are products of data-generating processes and not results of direct observation, which surely brings into the analytical foreground the properties of different processes for generating what we call data.

While the original claims on behalf of the lethality of Covid-19 were wrong, those claims understandably elicited concern within the population. To create and support a climate of fear can be a reasonable option for political parties. For an incumbent candidate facing a tough election with an uncertain outcome, the emergence of a climate of fear can possibly enhance electoral prospects, providing the virus is controlled prior to the election. This is the essence of the aphorism “never let a good crisis go to waste.” Such a crisis, though, can also be good for challenging parties, in part because it allows for the sharpening of contrasts among the candidates and also because challengers might gain support if the incumbent fails to subdue the virus prior to the election.

In this respect, Robert Higgs (1987) explains how politicians and their supporters have been able sometimes to parlay the appearance of a time of perceived crisis into an

expansion of other political programs that otherwise would not have been possible. With regard to entanglement, Bruce Yandle (1983) developed the useful model of Baptists and bootleggers. In Yandle's framework, the Baptists are the audience for the addresses of politicians. The bootleggers pretty much ignore both Baptists and politicians, and instead fill the commercial interstices the Baptists sermonize about. In this respect, public health entails both speech regarding the material of public interest and action concerned mainly with matters of private interest, as examined by Philipson and Posner (1993) and Tollison and Wagner (1991). Discourse regarding public health follows two channels within these models. One channel speaks to claims of public interest, the Baptist channel. The other channel speaks in subdued tones of private interest, the bootlegger channel.

With respect to politics and Covid-19, such activities as wearing masks, social distancing, and even the closing of some lines of business will surely to some extent reflect rational economic calculation. But equally surely, such mandates will be features of the sermonizing that a good share of the audience perceives as reasonable within the Covid-19 environment. Beneath this public interest sermonizing resides a variety of bootlegger-like activities where private interest find representation. Here, we find the commercial channels activated by the entry of politics into science. For instance, ventilators do not just exist. They must be produced and distributed through some commercial channel. This production and distribution will affect the balance sheets of different producers. Moreover, the closures of businesses might be concentrated on small retailers and with many large ones left free to operate, though perhaps under restricted conditions. The presence of political expressions of interest and concern lead to changes in the economic organization of scientific activity, and those changes will redound differently to different commercial interests, depending on the proximity of those interests to the political process. In this respect, it is well recognized that any set of regulatory activities exerts differential effects on the net worth of different firms.

Public discourse entails a superficial element because political officials are not trying to answer a question. Rather, they are trying to craft an image that resonates with some public audience. Those officials already know what they want, which is to keep sufficient public support on their side. This is a public of non-experts, moreover, who mostly look for intuitively appealing answers without delving into scientific intricacies. Political controversy will revolve around such visible matters as whether or not schools should be closed, or people should wear masks in public, and to do so without getting into details that would require significant and concentrated attention. The salience of those questions, moreover, will surely depend on the perceived lethality of Covid-19. An entangled system of political economy will inject to some degree the imperatives of political competition into the pattern of scientific research along those margins where data can serve as instruments of political competition. Such entanglement between science and politics is probably unavoidable, though it can be mitigated in principle within a federal system of political organization. A truly federal system can accommodate variation in the political imperatives that get inserted

into the Republic of Science along the lines that Michael Polanyi (1951) and Vincent Ostrom (1987) explore regarding the general superiority of polycentric over monocentric political organization. To be sure, the American system has morphed since its founding to such a degree that Michael Greve (2012) characterizes the transformation as having turned upside down what originated as an essentially bottom-to-top constitution. While it's easy to assert the generally beneficial quality of an unencumbered Republic of Science, any such assertion must also wrestle with the current reality of an upside-down constitution.

Just as death rate statistics are not a fully accurate reflection of the underlying reality, neither are new case numbers, which is another popular indicator used to directly guide policy response. For example, in Minnesota, 14-day new case rate per 10,000 people is now used to determine whether a school district can reopen to in-person learning, offer hybrid instruction, or must offer distance learning. This approach is based on the false premise that new case numbers are an accurate measure of community spread. True, an increase in new case numbers might mean greater spread of infections but it might also mean increased laboratory testing and increased reporting. With that, focus on new case numbers is likely to lead to unnecessary school closures and overreliance on distance learning, which have already been linked to the widening educational gap and are likely to exacerbate existing inequalities (Lancker and Parolin 2020), at least initially. Explicit focus on new case numbers in guiding school reopening decisions seems especially faulty when we contrast it with research that suggest that school aged children play only a miniscule role in transmissions (Lee and Raszka 2020). Surely, if policy makers were truly interested in making the decision that balanced risks and costs, they would seek out information on the demographic groups most vulnerable to being infected and would focus on how and where transmissions are most likely to occur. The fact that readily available data on the number of laboratory tests performed is not considered in guiding school reopening further supports the hypothesis that politicians are using data to support decisions they have already made, in contrast to using data to make informed choices among options.

New case numbers provide no insight into the severity of an infection. Categorizing cases based on severity would be helpful not only in guiding school reopening decisions, it would contribute to the better understanding of the risks of transmission. In the data reports on new case numbers, however, all the asymptomatic cases are treated as being indistinguishable from patients who were hospitalized or even placed in ICU. We place hurricanes into five categories depending on wind speed. We could do the same with Covid-19, but don't. It is surely reasonable to ask what differences might result if Covid-19 cases were categorized by severity. Two types of non-exclusive possibility come quickly to mind. One possibility is that Covid-19 is often no more severe than the seasonal flu. If so, athletic and theatrical events would likely go on, though with people in high-risk categories staying home. Distinguishing the many asymptomatic cases from the relatively few that are admitted into intensive care would surely diminish the perceived severity of Covid-19 within the general population.

In contrast, limiting description to aggregate figures surely magnifies the perceived severity of Covid-19. In *Systems of Survival*, Jane Jacobs (1992) distinguishes between commercial and guardian moral syndromes. She also explores how what she termed “monstrous moral hybrids” can emerge from commingling of those syndromes wherein people in commerce engage in politics and people in politics engage in commerce, entanglement in other words. There can be no doubt that political and health officials gain influence as the disease is perceived as being more severe and hence seem understandably to be uninterested in dealing with reports of categorized data, even though that data is readily available in many states.

While avoiding data on the severity of the disease might be a matter of political expediency, it is worth noting that any attempt to categorize severity comes with its own challenges. It is subject to the same data generating processes as is the case with the determination of the causes of death. For one, patient experience of severity is quite subjective and to the extent that self-reporting is used in assigning cases into categories, it would be difficult to escape this subjectivity and the interpersonal comparisons it entails. One could argue that the categories could be quite simple, for example: asymptomatic, symptomatic not requiring hospital stay, requiring hospital stay, requiring ICU stay, death. However, even with such simple categories, there is no escaping human judgment in assigning cases into categories. Resulting data might be subject to similar exaggerations as the ones we have discussed above for death rates.

The above examples illustrate misuse of data. Similar stories of misuse can be told about epidemiological models. For example, the now widely used British epidemiological models that were built by the scientists at the Imperial College were meant to serve as illustrations, not to provide predictions. Despite how they have been used, these models cannot actually generate reliable quantitative predictions because their key parameters, such as the effective reproduction number, are unknown and cannot be known until much more data is collected (Anderson *et al.* 2020). Instead, these models do serve well to illustrate the dynamics of the pandemic. In that regard, these models are quite useful as they illustrate with great clarity that pandemics initially take on the hockey stick shape, with little development for a while, followed by a sudden peak, and a possibility of multiple subsequent peaks. There surely is a lot of value in understanding that general shape. But these models were never meant to guide public policy in terms of the expected case numbers because the data needed to generate their predictions simply does not exist. So they cannot be used as a source of predictions for how many people will end up being infected and how soon.

If we are correct in suggesting that politics to some extent misrepresents and misuses science, then the commingling of the two should result in what are later described as mistakes. Two examples of such mistakes can be found in the early recommendations on masks and the intense focus on ventilators. For more than five weeks after community spread was first documented in the US, the Centers for Disease Control and Prevention (CDC) considered public mask-wearing as unnecessary. Likely, if the CDC did not discourage mask wearing, the pandemic would not spread

as quickly as it did. The CDC justifies its decision as motivated by the desire to preserve the masks for health care workers and other key personnel. Whether that was the actual reason or whether this is just a justification we will never know. However, it is clear this mistake stems from the lack of appreciation for human ingenuity. The CDC failed to appreciate how quickly and effectively the market can supply simple masks.

In the early days, the response to the pandemic was sharply focused on the availability of ventilators. There were many alarming opinions suggesting that we had too few ventilators available, and that there was a complete lack of preparedness for the pandemic, severe policy failure, and rampant need to speed up (possibly nationalize) production of ventilators. Interestingly, those advocating for more government involvement advanced two contradictory claims: (1) the government has failed to prepare for the pandemic and (2) more government involvement was needed going forward. What was lost in these calls for the ventilatory overhaul was the question of whether ventilators were actually helpful in combating the disease. As we soon learned, in many cases ventilators made either no difference or even worsened patient outcomes.

7. Conclusions

One might argue that the analysis of the assembly of knowledge within an entangled system of political economy leads to dismal conclusions regarding the gravitational pull that political imperatives can exert on scientific activity. In many respects, however, entanglement is an unavoidable feature of democracy. As such, there might exist margins of action along which it might be possible to withstand the worst effects of the entanglement of science and politics while at the same time increasing our appreciation for pluralistic and polycentric approaches to the material of political economy. Such appreciation might be our best weapon against the whims that can stem from the centralized mindset through promoting a valuable intellectual humility.

References

- Anderson, R. M., T. D. Hollingsworth, R. F. Baggaley, R. Maddren, and C. Vegvari. 2020. "COVID-19 Spread in the UK: The End of the Beginning?" *The Lancet* 396 (10251): 587–90.
- Boulding, K. E. 1956. *The Image: Knowledge in Life and Society*. Ann Arbor: University of Michigan Press.
- Buchanan, J. M. 1968. *The Demand and Supply of Public Goods*. Chicago: Rand McNally.
- Caldwell, B. 2008. "Gordon Tullock's 'The Organization of Inquiry:' A Critical Appraisal." *Public Choice* 135 (1): 23–34.

- Chaitin, G., da Costa, N., and Doria, F. 2012. *Gödel's Way: Exploits into an Undecidable World*. London: Taylor & Francis.
- Collins, R. 1998. *The Sociology of Philosophies: A Global Theory of Intellectual Change*. Cambridge, MA: Harvard University Press.
- Cowen, T. and A. Tabarrok. 2016. "A Skeptical View of the National Science Foundation's Role in Economic Research." *Journal of Economic Perspectives* 30 (3): 235–48.
- Devereaux, A. and R. E. Wagner. 2020. "Contrasting Visions for Macroeconomic Theory: DSGE and OEE." *American Economist* 65 (1): 28–50.
- Epstein, R. A. 1995. *Simple Rules for a Complex World*. Cambridge, MA: Harvard University Press.
- Gatti, R., R. Koppl, B.D. Fath, S. Kauffman, W. Hordijk, and R.E. Ulanowicz. 2020. "On the Emergence of Ecological and Economic Niches." *Journal of Bioeconomics* 22 (2): 99–127.
- Gaus, G. 2011. *The Order of Public Reason*. Cambridge: Cambridge University Press.
- Greve, M. S. 2012. *The Upside-Down Constitution*. Cambridge, MA: Harvard University Press.
- Higgs, R. 1987. *Crisis and Leviathan*. New York: Oxford University Press.
- Huff, D. 1954. *How to Lie with Statistics*. New York: W. W. Norton.
- Jacobs, J. 1992. *Systems of Survival*. New York: Random House.
- Kendrey, G., B. Szende, K. Lapis, T. Marton, B. Harigitai, F. J. Roe, and P. N. Lee. 1995. "Misdiagnosis of Lung Cancer in a 2000 Consecutive Autopsy Study in Budapest." *General and Diagnostic Pathology* 142 (3–4): 169–78.
- Knight, F. H. 1933. *The Economic Organization*. Chicago: University of Chicago Press.
- Knight, F. H. 1960. *Intelligence and Democratic Action*. Cambridge, MA: Harvard University Press.
- Koppl, R. 2002. *Big Players and the Economic Theory of Expectations*. New York: Palgrave Macmillan.
- Koppl, R. 2018. *Expert Failure*. Cambridge: Cambridge University Press.
- Kuhn, T. S. 1962. *The Structure of Scientific Revolutions*. Chicago: University of Chicago Press.
- Lakatos, I. 1970. "Falsification and the Methodology of Scientific Research Programs." In *Criticism and the Growth of Knowledge*, edited by I. Lakatos and A. Musgrave, 91–196. Cambridge: Cambridge University Press.
- Lakatos, I. 1976. *Proofs and Refutations*. Cambridge: Cambridge University Press.
- Lakatos, I. 1978. *The Methodology of Scientific Research Programs*. Cambridge: Cambridge University Press.
- Lancker, W. V. and Z. Parolin. 2020. "COVID-19, School Closures, and Child Poverty: A Social Crisis in the Making." *The Lancet Public Health* 5 (5): 243–44.
- Lasswell, H. D. 1936. *Politics: Who Gets What, When, How*. New York: Whittlesey House.
- Latour, B. 2005. *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford: Oxford University Press.

- Lee, B. and W. V. Raszka. 2020. "COVID-19 Transmission and Children: The Child Is Not to Blame." *Pediatrics* 146 (2). doi.org/10.1542/peds.2019-3684.
- McGovern, L., Schulman, L., Carney, J. K., Shapiro, S., and Bundock, E. 2017. "Death Certification Errors and the Effect on Mortality Statistics." *Public Health Reports* 132 (6): 669–75.
- Munger, M. 2017. "Human Agency and Convergence: Gaus's Kantian Parliamentarian." *Review of Austrian Economics* 30 (3): 353–64.
- O'Driscoll, G. P. and M. J. Rizzo. 2015. *Austrian Economics Re-Examined: The Economics of Time and Ignorance*. New York, NY: Routledge.
- Ostrom, E. 1990. *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge: Cambridge University Press.
- Phillipson, T. J. and Posner, R. A. 1993. *Private Choices and Public Health*. Cambridge, MA: Harvard University Press.
- Podemska-Mikluch, M. and R. E. Wagner. 2013. "Dyads, Triads, and the Theory of Exchange: Between Liberty and Coercion." *Review of Austrian Economics* 26 (2): 171–82.
- Podemska-Mikluch, M. 2014. "Public Policy: Object of Choice or Emergent Phenomena? Lessons from the Polish Medical Reimbursement Act." In *Entangled Political Economy, Vol. 18*, edited by S. Horwitz and R. Koppl, 93–110. Bingley: Emerald Group Publishing.
- Polanyi, M. 1951. *The Logic of Liberty*. London: Routledge & Kegan Paul.
- Polanyi, M., J. Ziman, and S. Fuller. 1962. "The Republic of Science: Its Political and Economic Theory." *Minerva* 1 (1): 54–73.
- Resnick, M. 1997. *Turtles, Termites, and Traffic Jams: Explorations in Massively Parallel Microworlds*. Cambridge: MIT Press.
- Samuelson, P. A. 1954. "The Pure Theory of Public Expenditure." *The Review of Economics and Statistics* 36 (4): 387–89.
- Samuelson, P. A. 1955. "Diagrammatic Exposition of a Theory of Public Expenditure." *Review of Economics and Statistics* 37 (4): 350–56.
- Smith, A., B. Yandle, and R. E. Wagner. 2011. "A Theory of Entangled Political Economy, with Application to TARP and NRA." *Public Choice* 148 (1): 45–66.
- Tollison, R. D. and R. E. Wagner. 1991. "Self-Interest, Public Interest, and Public Health." *Public Choice* 69 (3): 323–43.
- Tullock, G. 1966. *The Logic of Inquiry*. Durham, NC: Duke University Press.
- Wagner, R. E. 2007. *Fiscal Sociology and the Theory of Public Finance*. Cheltenham, UK: Edward Elgar.
- Wagner, R. E. 2009. "Property, State, and Entangled Political Economy." In *Markets and Politics: Insights from a Political Economy Perspective*, edited by W. Schafer, A. Schneider, and T. Thomas, 37–49. Marburg: Metropolis.
- Wagner, R. E. 2012. "The Social Construction of Theoretical Landscapes: Some Economics of Economic Theories." *American Journal of Economics and Sociology* 71 (5): 1185–1204.

- Wagner, R. E. 2016. *Politics as a Peculiar Business: Insights from a Theory of Entangled Political Economy*. Cheltenham, UK: Edward Elgar.
- Wagner, R. E. and D. Yazigi. 2014. "Selection through Competition: Elections, Markets, and Political Economy." *Public Choice* 159 (3–4): 503–14.
- Yandle, B. 1983. "Baptists and Bootleggers." *Regulation* 7 (3): 12–6.