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2025 Nobel Memorial Prize in Economics: Joel Mokyr

Emmanuel S. de Dios*
University of the Philippines

This surveys the main themes found in the work of Joel Mokyr, co-winner[1] of the 2025 Sveriges Riksbank Prize in Economic Science in Memory of Alfred Nobel. A final section reflects on possible lessons for developing countries like the Philippines.

JEL classification: N13, N70, N73, O31, O32, O33
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1. Introduction

When the Nobel Committee for the Prize in Economic Science awarded this year's prize to Joel Mokyr, it noted "how fast technology progresses and how it changes the world around us" [Nobel Committee 2025:1]. What probably impressed the committee was the burst of growth in general-purpose technologies[2] in the late 20th and early 21st centuries—among them computers and digitalization, biotechnology, nanotechnology, and of course that new holy grail, artificial general intelligence. It will seem curious at first, therefore, that the person they chose to award is known not for visionary work about the future, nor even about contemporary technological developments but about a period long past, the era during and preceding the Industrial Revolution, from the 1700s to about the 1880s.

2. A typology of growth

It is precisely the *longue durée*, however, that reveals the uniqueness of the current era compared to what preceded it and is also where its roots can be found.

* Professor Emeritus. Address all correspondence to esdedios@up.edu.ph.

[1] Half of the prize was awarded to Philippe Aghion and Peter Howitt for their work on Schumpeterian growth models (notably Aghion and Howitt [1992]). See the article by Villanueva [2025] in this issue for a discussion.

[2] Lipsey and Carlaw [2005] defined *general-purpose technologies* (an earlier signification of "GPT") as generic technologies that find widespread use, lead to many applications, and have spillover effects, thereby transforming entire economies and societies. Printing, the factory system, and the steam engine are early examples. Mokyr himself alternatively uses the term "macroinvention."

In his first major work on the topic, *The lever of riches* [1990a], Mokyr traces the series of technological developments that have occurred from ancient times (also see Mokyr [1990b]). His application of a typology of growth[3] based on the nature of technological changes underlying it provides a sharp analytical tool for understanding broad swathes of human history: *Smithian growth* is based on specialization, division of labor, and trade. *Solovian growth* is founded on resource expansion and the accumulation of physical (and human) capital. *Schumpeterian growth*, finally, is based on technological progress proper, which feeds on a constant stream of innovations based on the expansion of useful knowledge.[4]

Mokyr shows how the many high points of growth observed in ancient civilizations were based mainly on Smithian factors. The empires of Rome and China were founded on the productivity of regions specializing in certain crops, minerals, and manufactures. However, in the first place, specialization was possible only because these regions were tied to each other by trade, transport, and common legal institutions that facilitated exchange. The Roman road network with the *Pax Romana* that supported it is a well-known example. Growth episodes founded on Smithian elements, however, ultimately meet their limits in diminishing returns at the extensive margin, the limitations of existing transport technology, the weakening span of control as geographical scope increases and conquered peoples become more heterogenous, and of course inevitable Malthusian factors.

Even Solovian growth, which figured prominently in the late 18th century, is ultimately subject to diminishing returns at the (capital- or land-)intensive margin. Examples are canal- and road-building, land-clearing, and the spread of better agricultural techniques. As Solow's model predicts, however, high saving rates and accumulation of physical capital[5] can deliver only a steady state but not increasing growth of per capita income. In contrast the Schumpeterian growth in the principal capitalist countries from the 1850s onwards was based on a stream of ideas and technological innovations that fed on itself and sustained continuous growth and investment. As Mokyr [2017:4] summarizes in a later work:

> If economic growth before the Industrial Revolution, such as it was, was largely driven by trade, more effective markets, and improved allocations of resources, growth in the modern era has been increasingly driven by the expansion of what was known in the Enlightenment as 'useful knowledge'.

The unique explosion of Schumpeterian growth in Europe from the late 18th century onward, therefore, represents the Great Explicandum for economic

[3] These distinctions were earlier made by William Parker [1984], but Mokyr systematized and formally applied these terms to the widest swathes of human history.

[4] Elements of these types of growth—Smithian, Solovian, and Schumpeterian—of course always exist simultaneously but the analytical task is determining which kind is characteristic for a certain period.

[5] One might properly include even the accumulation of human capital.

historians, Mokyr included. In particular, the "Great Divergence" (Pomeranz's term), i.e., how and why Europe, beginning with Britain, managed to overtake China—which until as late as 1400 was more technologically advanced—is a question that has preoccupied economists and continues to be debated. Mokyr called China's loss of technological superiority "the greatest enigma in the history of technology" and he constantly returns to the topic in his writing (Mokyr [1990: Ch. 9]; Mokyr [2017: Chs. 16 and 17]). Various alternative explanations have been proposed that point to Europe's advantages over China,[6] notably the former's access to resources through its colonies [Pomeranz 2001], its political and legal institutions [North and Thomas 1975], its peculiar geography and political fragmentation [Jones 1981], and others.

3. Propositional and prescriptive knowledge

While not denying the relevance of these external conditioning factors, Mokyr regards them as neither necessary nor sufficient. He instead focuses his attention on the central variable, which is the internal development of technology itself. In *The gifts of Athena* [2002], Mokyr argues that the rate of technological advancement depends on the scale and intensity of interaction between two parts of useful knowledge, namely knowledge that is prescriptive ("know-how") and that which is propositional ("know-what"). While one might today use the terms "science" and "technology" to distinguish these two, Mokyr in 2002 was careful not to use these terms as if these were two separate spheres. Both types of knowledge may be contained *within* technology itself.[7] Moreover, in history, some propositional knowledge, while predictive and based on observation, might not even strictly be considered "science" but rather embedded causal systems that are mythological or religious.[8]

Mokyr demonstrates that the remarkable interaction and reciprocal reinforcement between prescriptive and propositional knowledge in Europe between 1750 and 1840—the *anni mirabiles*—were decisive in launching the Industrial Revolution proper. This period was distinguished from others by the broad range of major innovations that occurred across a wide range of industries, including power (e.g., Watt's steam engine), metallurgy (e.g., Cort's puddling and

[6] Or, conversely, authors might emphasize China's various liabilities relative to Europe (e.g., its centralized political structures and lack of interstate political competition, the nontechnological bent of its intelligentsia, its labor-abundant endowment that may have discouraged labor-saving innovations, as well as the features of Confucianism that emphasized tradition and stability).

[7] Or, alternatively, known workable techniques, which are observed regularities of nature, may be part of propositional knowledge itself. An example is the well-known ancient fishers' knowledge that herring runs coincide with lunar cycles.

[8] An example is the ancient Egyptian priests' mythological but practically useful explanation of the timing of the annual flood of the Nile as Isis weeping over the death of Osiris. The rising of the star Sirius was astronomically observed as a reliable predictor of the Nile flood. But this single observational regularity needed to be absorbed into a larger causal system, which in this case was mythology or religion, not science.

rolling process), textiles (e.g., the spinning jenny, the cotton gin), and precision machinery (e.g., Maudslay's lathe).

The Industrial Revolution curiously first took hold in Britain, where few of the innovators of the time even had formal training in science or engineering per se [Mokyr 2009:117]. Rather they were mostly practical people—entrepreneurs and craftsmen immersed in the world of work and commerce and able to observe the concrete problems confronting specific industries and self-taught in engineering know-how. What was crucial according to Mokyr, however, was that such men had access to the body of propositional knowledge of their time (*episteme*) as well as a pragmatic mentality to try and apply it. This was exemplified by James Watt (of steam engine fame).

As a maker of mathematical instruments at Glasgow University, Watt was by no means a scientist, yet he was aware of the relevant physical laws scientists worked with (e.g., regulation of vacuums and steam pressure) and the experimental methods they used to achieve and refine their results. He also sought the company and advice of scientists like Joseph Priestley. Hence, even nonspecialists enjoyed low "access costs" to the body of propositional knowledge, which was available through personal contact, general publications, manuals and pamphlets, private correspondence, and exchange through formal and informal social associations—even if not directly through specialized education.

Britain's head start over the rest of Europe at this time lay in the large number and higher literacy of its skilled craftsmen and mechanics in the commercial sector. A less hierarchical and unequal social structure than on the Continent allowed for easier social mixing and intellectual exchange between natural scientists and industrialists.[9] "Above all", Mokyr [2002:65] writes, "Britain was the country in which the gap between those who engaged in propositional knowledge and those who applied it to production may already have been the narrowest by 1700, and it was becoming narrower over the eighteenth century."

After 1860 however—during the Second Industrial Revolution—the interaction and feedback between propositional and prescriptive knowledge would become more intensive, explicit, and directed. In this, Britain would gradually cede leadership to France and Germany, which had after all always been in the forefront of expanding propositional knowledge. Unlike in Britain, formal science and engineering education with an applied bent established itself earlier on the Continent (e.g., the French *ecoles*, the German *Akademien* and later *technische Hochschulen*). Nonetheless these countries were, for various reasons (e.g., wars and the military pre-emption of skills), slower in translating or adopting science in industrial technique. Yet most of the science used by British industrialists in the First Industrial Revolution originated in France and Germany. Papin's early

[9] The Lunar Society of Birmingham, for example, was an intimate dinner club with a wider circle of correspondents whose members included industrialists like Watt, Boulton, and Wedgewood as well as scientists like Priestley, Keir, (Erasmus) Darwin, and Small, among others.

experiments with steam pressure and safety valves were the basis of Newcomen's (and later Watt's) steam engine. Lavoisier's oxygen theory was the foundation for the process for producing soda ash. Harrison's maritime chronometer would have been impossible without the balance spring invented by Huygens.

The more intense mutual feedback between science (for we may now be allowed to call it that) and technology was most vivid in the rapid development of Germany's chemical industries. It was Liebig's foundational work in academic organic chemistry that underpinned the creation of the first artificial dyes (Perkin), an important input for the textile industry. But the latter in turn stimulated the theory of chemical structure (Kekulé). Thus, armed with a modern organic chemistry, German firms like Baden Aniline and Soda Factory (BASF), Bayer, Hoechst, and Agfa, which had originally only produced synthetic dyes,[10] then rapidly became multiproduct giants that moved into the production of other industrial chemicals (e.g., ammonia, nitrates, saltpeter), pharmaceuticals, fertilizers, explosives, and photographic chemicals.

Similar trends, though somewhat slower and subdued, appeared in other countries where firms like *Saint Gobain, Schneider, and Compagnie Générale d'Électricité* (CGE) in France and later General Electric, Dupont, and Standard Oil in the US also systematically deployed science in their operations. This explicit collaboration between science and technology was epitomized by the industrial research laboratory that became a major investment of major corporations. Moreover, techniques already in use (e.g., steam engines and steelmaking) were re-examined, explained *ex post* on more scientific principles, and made more efficient. Even the venture of individual invention passed into the hands of persons with formal engineering backgrounds (e.g., Benz, Daimler, Tesla, Siemens, Steinmetz, and Nobel himself).

From this point on it was clear that self-sustaining Schumpeterian growth was underway. To borrow a metaphor, if technological progress resembled a car rally, prescriptive knowledge remained the driver. However, it now operated under the steady guidance of a navigator—propositional knowledge. Mokyr [2002: Ch. 3] points out how the same mechanism of mutual feedback between propositional and prescriptive knowledge continues to drive industrial innovation and growth to this day. There is little in principle to differentiate between NVIDIA, Samsung, or Huawei today and the giant German chemical companies of the 1850s in terms of how they innovated and put new products on the market.

4. Industrial enlightenment

Explaining the emergence of Schumpeterian growth as the result of the interaction between science and technology, however, merely pushes back the

[10] The origin of such firms in synthetic dyes is still evident in their names, e.g., BASF (Baden Aniline and Soda Factory) or Agfa (Joint-stock Company for Aniline Production).

question of how and why propositional knowledge in Europe became so extensive and available in the first place. Mokyr's [2002, Ch. 2] answer points to two earlier idiosyncratically pan-European phenomena, namely, the Scientific Revolution (16th to 17th century), and a part of the Age of Enlightenment (late 17th to the 18th century) he calls the "Industrial Enlightenment."

The well-known Scientific Revolution was the work of a small transnational intellectual elite, a series of personalities from Galileo to Newton. Mokyr [2017: 180ff] describes how, in the process of competing for patronage and seeking transnational prestige,[11] this group of intellectuals formed a virtual scientific community that was collaborative yet competitive. In the process, they laid the foundations of what came to be accepted as a scientific method (measurement, experiment, and reproducibility), a scientific mentality (the expectation of regularity and order in natural phenomena), and a scientific culture (the idea that science can produce practical results and material benefits) [Mokyr 2002: 36-40]. The work of this tacit "Republic of Letters", culminating in Newton's *Principia*, contributed to the creation of an "open science" (Paul David's term), essentially a public good among its members, that crossed national boundaries. For, notwithstanding national divisions and personal rivalries, intellectuals like Huygens, Boyle, Leibniz, Leuwenhoek, Newton, and others exchanged ideas, critiqued, validated, but more importantly made known their theories and observations through correspondence and publications. "[T]he key to Europe's success was its fortunate condition that combined political fragmentation with cultural unity" [Mokyr 2017:215].

While autonomously expanding the body of science, however, interest in the activities of 16th to 17th century scientists and philosophers was confined mainly to their own circles[12] (e.g., universities, invisible colleges, and academic societies) with little connection to the lives of the rest of the population. It took a second period and a further set of personalities to deliver the results of science to society at large and the productive sector in particular. The Enlightenment (from the early 18th to early 19th centuries) was of course a broad movement encompassing ideas that set out to reform laws, social and civil relations, governance, and science, among others. But Mokyr [2002: Ch. 2] focuses on an aspect that had a direct bearing on production technology, a phenomenon he calls the "Industrial Enlightenment."

As part of their efforts to place society on a rational basis, Enlightenment scientists and philosophers took a more intensive interest in technology and made efforts to lower the cost of accessing the results of formal science. The implicit aim was to put into practice (though belatedly) the Baconian ideal [Mokyr 2017: Ch. 7] that the goal of science is the improvement of the human condition and

[11] The Frenchman Descartes, for instance, served rulers of Bohemia and Sweden; the Dane Brahe who worked for the Holy Roman Emperor, as did the German Kepler. Huygens, who was Dutch, was employed by France's Louis XIV. Leibniz served various princes alternately in the Holy Roman Empire.

[12] Among other factors, the *lingua franca* of the Scientific Revolution was Latin, which was inaccessible to the broader population.

that it must therefore communicate with the world of industry and commerce. Along these lines, several Enlightenment scientists put their ideas to practical use through useful product- or process-innovations, e.g., Franklin (lightning rod, bifocals), Chaptal (chaptalisation of wine, improved processes of manufacturing industrial chemicals), Berthollet (bleaching and dye-fixing agents), and Lavoisier (production of gunpowder). The greater thrust of the Industrial Enlightenment, however, was to codify and then popularize scientific knowledge through publications, public lectures, academies, salons, and other venues. The epitome of these efforts was Diderot and D'Alembert's massive encyclopedia [1751 to 1772] of "the sciences, arts, and crafts", which aimed explicitly "to change the common way of thinking" and allow people to seek out information for themselves. The encyclopedia was the work of intellectuals and scientists who now focused their rational lens on all aspects of social life, including the world of work and industry.

It was also significant that the Industrial Enlightenment inherited and maintained not only the Scientific Revolution's methods and mindset but also its pan-European, transnational character, so that useful knowledge, helped along by printing technology, flowed even more easily across national borders. Ultimately, this easy access explains why even a relative laggard in organized science like Britain could momentarily seize the lead in the first Industrial Revolution. Mokyr [2002: 76] insists that "[t]he Industrial Revolution followed from the Industrial Enlightenment, which was not a British but a Western phenomenon. The order in which things happened in Europe, the leadership of Britain, and the much-discussed backwardness of France and the Netherlands were second-order phenomena."

5. Culture and institutions

In *Culture of Growth*, his last major work prior to winning the Nobel, Mokyr takes a deeper dive into the ideas that motivated and sustained the Scientific Revolution, which fed the Industrial Enlightenment and in turn led to the Industrial Revolution. Most significant in terms of subsequent economic impact, he finds, was the idea of "progress" itself [Mokyr 2017: Ch. 14]. The idea that progress in science could make a significant contribution to material progress was by no means self-evident to an earlier era. Opposition from those who benefited from or were comfortable with the status quo obviously needed to be overcome (e.g., only recall the inertia and vested interests that sustained Ptolemy's geocentric theory).

What needs explaining, therefore, is how and why the new ideas from the Republic of Letters ultimately prevailed. Mokyr [2017: Ch. 10] has some recourse to enumerating favorable circumstances, among which are the already-mentioned political fragmentation of Europe that promoted competition, the success of voyages of discovery, which exposed Europe to other cultures and technologies, and the fragmentation of the Western Church and its de facto flexibility following the Reformation.[13] These conditions were contingent—which meant the outcome was by no means inevitable—but they created openings for thinkers to espouse novel ideas of intellectual and material progress. Mokyr does not emphasize the role of purely economic factors but concedes that the growing prosperity of merchants and tradespeople created a middle stratum that made for an audience interested in ideas of growing its wealth and its own social mobility. Overall, however, the commercial classes did not seem to play a large role in the Scientific Revolution proper, which remained a pursuit of an intellectual elite.

Mokyr instead cites the importance of "cultural entrepreneurs" [Mokyr 2017: Chs. 7 and 8] notably Bacon and Newton. The former, though not a scientist, was the eloquent harbinger of a pragmatic science—essentially advocating work in Pasteur's Quadrant—that sought fundamental understanding as well as practical application. Newton through his work, on the other hand, demonstrated the power of a scientific approach that integrated mathematical reasoning with data and observation. Bacon's persuasive arguments and Newton's example and credibility were crucial in unifying the opinions of intellectuals who came after. With respect to Newton in particular: "Perhaps the most important contribution Newton's work made to the Industrial Enlightenment was the elegance and completeness with which he explained the regularities that had puzzled people for centuries, which instilled in others confidence about the ability of humans to understand nature" [Mokyr 2017: 113].

Mokyr ultimately comes to grips with another major explanation for European growth—one associated with his friend the late Douglass North—namely, institutions. Secure property rights, reliable contract enforcement, law and order, low rent-seeking, and so on, have been recognized by economists both in theory and through evidence as resulting in positive economic outcomes. Mokyr, however, is unwilling to reduce the explanation of the European Miracle to a question of institutions. While the emergence of positive Northian institutions might promote Smithian growth (resulting, say, in more efficient markets and expanding trade) it does not suffice to explain the rapid development of useful knowledge witnessed in the Scientific and ultimately the Industrial Revolution: "The Industrial Revolution does not seem to have been the response to any institutional innovation" [Mokyr 2017:5-6]. There were moreover any number of societies with fairly sound institutions that did *not* experience a self-sustaining wave of scientific discovery and technological innovation (e.g., the Ottoman Empire, or Ming China). This, for Mokyr, points to the autonomous role of culture, particularly among the elite, in explaining the roots of modern economic growth: "What changed in that age (i.e. 1500-1700) was the culture—the beliefs and attitudes of the educated elite toward useful knowledge, how to acquire it, how to distribute it, and what it could do" [Mokyr 2017:142].

[13] Although, it will be remembered, the Reformation itself was an initially backward-looking movement.

Culture, for Mokyr [2017:8], refers to individually held but socially transmitted “beliefs, values, and preferences that affect behavior.” These differ from institutions—whether formal laws or informal norms—which are *external* constraints or incentives society applies to individual behavior, regardless of a person’s beliefs and preferences. While culture and institutions may reinforce each other for good or ill, they remain distinct phenomena, with the former given primacy. A culture consistent with good institutions would reinforce the latter. Where the two diverge, however, institutions would probably be weaker or ineffective. While both may mutually affect each other through time, the autonomous existence of culture also means it can change independently and ultimately induce institutional change.

This is precisely what Mokyr contends happened historically: a change in the culture of the intellectual elite—particularly the belief that expanding useful knowledge was key to material progress and welfare—developed gradually, attained social weight and prestige through its achievements, and finally became accepted by rulers and later used by society at large. It was institutions that ultimately followed, often with government encouragement and support, e.g., formal academies and societies, universities with reformed curricula, polytechnics, trade schools, industrial exhibitions, as well as the patent system—and ultimately of course, the industrial research and development (R&D) lab.

The elite origins of the knowledge revolution and Schumpeterian growth make these phenomena even more remarkable, since neither the intellectuals of the Republic of Letters nor the *philosophes* and scientists of the Industrial Enlightenment were power holders. Nor were the industrialists of the Industrial Revolution even a majority of producers in society. Mokyr adopts Hooke’s metaphor of a “Cortesian army”[14] that managed to prevail despite its small numbers. The success of those *savants* and *fabricants* rested ultimately on the success of their efforts at demonstrating how the application of useful knowledge could produce wealth and well-being. While ideas and inspiration circulated only among a small number, emulation and competition sufficed to draw in the rest of society.

6. Lessons for developing countries?

There are a number of lessons developing countries can hope to draw from Mokyr’s work, notwithstanding that global conditions in the ownership and use of science and technology may have changed since the 19th century.

The key insight clearly remains the need to foster close connections between propositional and prescriptive knowledge if society is to generate a self-sustaining

[14] The metaphor is, of course, unfortunate considering the sordid history of the Spanish conquest of the Americas.

process of innovation. While the contribution of science to commerce and industry is by now universally recognized, making the practical institutional connections between academe and industry remains a challenge in developing countries. The main reason appears structural: most advanced firms in less-developed countries are part of supply-chains of global firms already employing cutting-edge technologies (e.g., chips and semiconductors). This obviates the need for such firms to turn to domestic R&D, whether for product or process innovations.[15] Meanwhile the highest incentives in academe (e.g., in publications and career movements) among many developing countries are often oriented towards contributing to global science, often of a basic nature, a fact exacerbated by the lack of R&D demand from domestic firms to begin with.

Where such circumstances arise, therefore, the mutual feedback between science and technology (i.e., translational research[16]) occurs not in-country but in the developed countries with the most extensive scientific innovation systems. The result is a dis-intermediation of propositional and prescriptive knowledge at the national level. A further complication is that, unlike 19th-century conditions, access costs to advanced technology have become steeper, owing to tighter intellectual property regimes, the inherently tacit nature of actual production practices, and large investments in complementary assets required, which make industrial experiments prohibitive.

Countries that have found a way around these difficulties did so first by doubling down on a policy of openness to the holders of advanced technologies, mainly through the attraction of investments from firms that are global technological leaders. The advantages to such firms in relocating some of their more sophisticated operations has often lain in the presence of a host country's assets that are complementary but cost-advantageous to the firms' operations. These may initially take the form of a skilled labor force, but through time (given the proper policies and incentives), may extend to tapping the country's pool of skilled engineers and technicians, who are then able to access and participate in the more sophisticated technological stages of global value chains. Through various means, ranging from learning-by-doing to sheer imitation and piracy, a country's S&T community may then gradually gain a degree of autonomy, enough to sustain a self-sustaining process of innovation. This certainly explains the start of India's pharmaceuticals, Taiwan's and Korea's chip and electronics industries, and China's modern automotive sector, among others. Albeit in a more roundabout manner, these countries replicated the way Britain's skilled and literate artisans and self-taught engineers accessed the propositional knowledge of their time without themselves being at the forefront of scientific discovery.

[15] For the Philippines, see for example, Mendoza [2024].
[16] As used in medicine, translational research refers to the process using basic research results to produce meaningful applicable results of direct benefit to public health.

The foregoing, however, presupposes the existence of a pool of skilled technicians and engineers that can absorb the latest technology and ultimately acquire agency. Developing countries that have met the most success in this regard appear to have emulated the efforts of France and Germany during the Industrial Revolution to deliberately build up their corps of engineering and technical personnel through trade schools, polytechnics, and technical universities. More recent history has seen similar efforts by developing-country governments to form elite institutes specializing in science and engineering—partially sidestepping the conservatism of their traditional universities. Examples are the Korea Advanced Institute of Science and Technology (1971), the National Taiwan University of Science and Technology (1974), and the Indian Institutes of Technology (from 1951 onwards). Thereafter, of course, even traditional universities fell in line and expanded S&T scholarships and offerings.

But the most basic and daunting question raised by Mokyr's work is whether society possesses (or is ultimately able to develop) a culture that places a premium on the production of useful knowledge (say, as against taking or redistributing wealth). At the aggregate level, progress may of course be measured by R&D spending, or the relative shares of law versus engineering enrollment [Murphy, Shleifer, and Vishny 1991]—at which most developing countries fare poorly. Most researchers attribute these, however, to failures of policy or of institutions. Underlying both, however, Mokyr is unafraid to say, is the *culture* that supports them.

The deeper phenomenon, more subtle and difficult to measure, is how much or how little value a society places on innovation and production. To what activities are social prestige and validation assigned? What are the social rewards to innovation and production versus other activities? And if culture, institutions, and policy all currently conspire to undervalue useful knowledge and its social role, whence will come the cultural entrepreneurs, harbingers of change, enlightened elites—whether from government, industry, or academe—that can shift the equilibrium?

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Over the years, the PES has served as one of the strongest networks of economists in the academe, government, and business sector.

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