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Institutional Variety and Ayres-Veblen "Lag": Implications for Selection and Development

Smita Srinivas

Abstract: Firms and nations attempt to build their technological capabilities amidst co-existing systems of knowledge and a variety of institutions. This variety might in principle result in fragmented knowledge and learning systems with no easy adaptation, clear social connection, or shared idea of progress. High institutional variety environments may be innovative but offer an uncertain future environment in which individuals and firms act, and which can paralyze the search and learning process. This paper discusses the Ayres-Veblenian concept of institutional 'lag' and its links to institutional variety. Industrial policy is routinely used conceptually and administratively as a selection device to cull such institutional variety, for example, re-steering the health industry's knowledge and production context or integrating informality in social policy design. Policy selection can thus offer valuable framing contexts to build inference and judgments about evolutionary systems and technology products. Once an evolutionary and institutional perspective is employed however, 'lag' and 'progress' are technologically contingent. The paper concludes that both industrial analysis and economics' philosophical foundations may benefit from co-evolutionary and combinatorial approaches, and insights from a non-Western perspective.

Keywords: technology, institutional variety, lag, economic development, Clarence Ayres, Thorstein Veblen

JEL Classification Codes: B40, B25, D83, L52, O12, O33

Institutions are the bedrock of economies. They provide a context for the dynamics of progress, for individual and group behavior and adaptation, and for the sourcing of knowledge and evaluation of technological capabilities. Institutional variety differentiates economies by their norms, rules, standards, structure, governance, and distinctive features, such as a high percentage of own-account, piece-rate, or casual workers, or variation in types of knowledge systems. Yet, by and large, development economics tends to approach such institutional variety from the vantage point of quasi-optimization and ordered convergence of economic

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structure and institutions over time. Schumpeterian scholars often view institutional variety as synonymous with creativity, the bedrock of innovation and central to economic development; labor economics considers that "informal" work can be "formalized," and some industrial policy scholars are concerned with selective intervention, even "picking winners." Many growth theories assume variety or treat it as a natural, even attractive element. For an economist in the Schumpeterian tradition, variety broadly can be characterized as "the number of actors, activities, and objects necessary to characterize the economic system" (Saviotti 2001, 120), and the relationship between innovation and economic development manifests in productivity growth in existing sectors and the variety of new products and sectors (Saviotti 2001, 120). Innovation theories treat variety from an ex-post perspective, focused on industrial development. However, the systems of institutions cannot rely on ex-post analysis of industrialized economies to direct development (Arocena and Sutz 2000) and development policy cannot be universally valid. Therefore, is institutional variety "good" for development, and should such variety disappear over time or with income convergence (Srinivas 2020)?

Institutional Variety from Catch-Up to Uncertainty

A focus on institutional variety offers us potential connections to the original institutional economics (OIE). As I have argued (Srinivas 2012, 2016, 2020), development economics tends to approach such institutional variety from the vantage point of instrumental quasi-optimization over time and as ordered convergence of economic structure and institutions, whether through dominant institutions such as markets where societies of one kind become more like another, or because priorities of social relevance are filtered through primarily market outcomes. Depending on the training or sense of adventure of the economist, some non-market institutions such as values and social custom may also be prominent in their analysis, for example a focus on some ethnic groups in specific types of business activity, or contracts and intellectual property established or enforced through familial, linguistic, or geographic ties of trust rather than arms-length legal recourse. In microeconomics, however, a variety of such institutional combinations can potentially result in fragmented systems of knowledge and innovation rather than cohesive ones. Therefore, in order to conceptually progress, more explicit value propositions may help firms or other organizations to anticipate state action on industrial policies which can prune institutional variety and reduce uncertainty (Papaioannou and Srinivas 2019). Such uncertainty about the future environment in which firms act in the absence of a clear sense of institutional design, knowledge priorities, or anticipated social progress, can direct, or paralyze the search and learning which are critical to building technological capabilities.

Thus, there remain important theory differences and policy consequences in the epistemology and methods of "late industrial" development where institutional variety is considerable. These result in unresolved gaps in a taxonomy of phenomena about what technological capabilities are being built, but also a lack of clarity of what inferences and judgments to settle on from such phenomena (Srinivas 2020). Can the Ayres-Veblenian concepts of institutional "lag" inform this developmental challenge of institutional variety? As much as economics is rooted in European history and convergence concerns, is there a philosophical challenge—whether from Judeo-Christian and Greek philosophy—to reconciling the variety of organizations and institutions visible in many countries as they

build technological capabilities and experiment with the governance of such industrial systems?

Development "direction" is difficult to defend without assuming that societies will lose their variety over time or converge to similar measures of organizational form and outcomes (e.g., the growth of mid-size firms and convergence of manufacturing value addition). In this gap, alternate systems of logic which are precise about types of perception and burdens of proof may help strengthen economics' inferential foundation. Nyāya and Vedānta (of the six Hindu Schools of philosophy), or other pre-Cartesian perspectives on reason and consciousness can provide context to individual perception and action, including collective "direction" (Srinivas 2020). When a systemic, co-evolutionary approach is used to study technological capabilities, intermediate heuristics and methods will require explicit attention. Clarifying such relationships between institutional variety and institutional "lag" is therefore an opportunity to enrich the philosophy of development economics with insights from a Veblen-Ayres perspective (see also Ayres 1952; Dugger 1980; Waller 1982; Hall, Lacasa, and Günther 2011). Contemporary policy environments, in which the author is involved, routinely use industrial policy conceptually and administratively as a selection device. Examples include the re-steering of the health industry during Covid-19, the organization of vaccine R&D, and approaches to job loss or informality in labor theory or social policy design. These policy actions and their chain of consequences offer unique and valuable interpretive contexts for situating the contributions of the OIE scholars to the microeconomics of industrial policy and the direction of technological change.

The technological capabilities of countries during the COVID-19 pandemic have demonstrated noticeable variety. While it is tempting to view this response primarily in medical terms, the industrial background to this clinical foreground, especially in conditions of high uncertainty, is noteworthy (Srinivas, Prasad, and Rao 2020). This variety has brought into sharp focus and over short timelines, the institutional changes that some societies can sustain or direct such as how they respond to deep uncertainty induced by the pandemic and specifically, their ability to consolidate a strong technological response: supports for a COVID-19 vaccine, the production of COVID-19 diagnostic kits, the scaling up of clean room facilities and setting up pathology labs, or the ability of natural science to appropriately connect virology, population demographics, epidemiology with clinical translation. Similarly, troublesome links to zoonoses impacts in food supply continue, as do food supply resiliency challenges in a lock-down. India and Japan, Senegal, Ghana, Nigeria, or South Africa have organized their response in different ways, calling on varied industrial histories and central R&D initiatives, norms of organization accountability, and intensity of local manufacturing.

In this sense, the "adjustment" lag of socio-cultural or other forms to technological advance is less convincing. Institutional change—a type of social evolution, not necessarily "progressive"—occurs when social norms, customs, rules, laws (i.e., the institutions) transform. In the process, organizations change as well. A firm, for example, is an organization but also constitutes a range of institutions—contracts, policies, technical standards, and laws—by which it functions and grows. A society therefore transforms through its institutions and organizations, either through dominant institutions such as markets, or through other customs and norms embodied in representative or powerful organizations. Non-market institutions too such as values and social custom can manifest in particular institutions such as marriage or religion, seemingly unconnected to technological capabilities, but having impact on firms, to shape their services, their policy responsiveness, their products, or their market

approach. In many respects, cultural attributes continuously shape preferences, products, and services, most noticeably in the industries of food, in materials use, in construction, or healthcare, but also in defining what is acceptable proprietary or collective knowledge.

Policies can therefore generate important selection effects on social evolution and influence the scope of adaptation. When particular types of organizations and institutions are involved (e.g., a vaccine or diagnostic firm, an IT firm or a renewable energy firm) the policy effects are manifested in industrial organization as the industrial "systems" evolve from one type to another. Technological change then involves a range of institutional changes—from skills to sub-sectoral transformation that involve the active organization of people, techniques, organizations, and policies. Technological change is endogenous and embedded within these various types of institutional change. Consequently, while there are many ways in which institutions combine to build technological capabilities and dynamic industries, there is no *a priori* best way to deliver socially relevant outcomes (Srinivas 2012). Some institutions may dominate economics analysis, such as markets, but market variety (the "market menagerie") may nevertheless remain under studied with important theory-methods gaps to define better pathways and social impact consequences (Srinivas 2012). Institutional variety thus provides alternate perspectives on co-evolutionary institutions and may suggest ties to concepts such as an Ayres-Veblen institutional "lag."

The Development Crisis: Taking Institutional Variety Seriously

Many institutional spheres of action as well as policy domains exist in which variety has daily practical impact. For example, healthcare can include both health policy and industrial policy where a multiplicity of institutional combinations can manifest in specific types of variety: several conflicting, complex markets, technical standards, intellectual property rules, safety and quality standards, and price controls (Srinivas 2012). How these are governed is determined in turn by particular types of accepted knowledge systems. While a country such as India or the United States may have parallel and sometimes disconnected advances in biomedical science for vaccines, generic drugs manufacturing, or community health in clinical training, these countries have distinct institutional histories of technological advance, as also non-democracies such as Cuba or Vietnam. Today's biomedical science and digital or manufacturing spin-offs in a country's COVID-19 response demonstrate that industrial considerations may dominate health policy priorities. The particular national policy context will then determine how resolutely clinical translation and health outcomes are enshrined in health policy guidelines, thus shaping the norms by which biomedical science and engineering complies (Srinivas, Prasad, and Rao 2020). Senegal, India, and Nigeria have each industrially responded to their respective COVID-19 crises and indicated with different degrees of success their ability to signal and steer in the direction of a goal. Policy makers may accomplish this through centralized national labs, defense R&D expertise, and in India's case, a large private and diversified industrial sector. However, they have had different successes in combining such production with the multiple institutional domains that determine the demand and delivery of healthcare (including employment, food, lock down rules, and so on). Acknowledging wide responses to adaptation provides an opportunity to refine the notion of lags and drifts, including how values and industrial policy instruments can act as selection devices to cull the institutional variety into a presumed cohesive industrial system. Adaptation as a combinatorial approach permits debating the developmental notion of directed progress and methods involved of going to "better" combinations of institutions

from "worse," without necessarily a preassigned direction or presumed timeline (see also Adkisson 2010, 368).

From an evolutionary-institutional perspective, the more combinatorial variety in institutional combinations there may be, the less likely that one pathway to development can be assumed even in a single industry. For instance, industrial policy has concerned itself more directly with selection and steering as have innovation policies. A co-evolutionary and systemic perspective recognizes high levels of uncertainty and a combinatorics of open-ended outcomes but raises value questions of emphasis and method between different schools of innovation economics (Papaioannou and Srinivas 2019).

An opportunity thus exists to reinvigorate the insights of development with Old Institutional Economics (OIE). The call for further scholarship on Veblen and Ayres can clarify some features and definitions of technological change (see Klein 1995: Waller 1982). At the same time, in development political economy, whether a nod to OIE is required or not, institutional variety is a pressing challenge, with important silences across sub-schools of neo-Marxian, neo-Schumpeterian analysis of adaptation, contingent technological advance, and assumed value propositions.

Institutional lag especially in the context of Ayres-Veblen on the nature of technology raises important questions (and different emphases) of selective intervention, "blind drift," and direction in economic progress. Philosophically, it could be argued that Judeo-Christian worldviews and Greek foundations for economics have situated the OIE concerns of social context and progress with more than a touch of unease about meaning in industrial societies. However, Nyāya and Vedānta, or other pre-Cartesian perspectives on logic, reason, and consciousness raise alternate questions of phenomena and action at the level of the individual, with important practical economic consequences for how one considers whether society is evolving, what types of knowledge systems to support, and which technological capabilities better integrate human beings with other systems of knowledge. An example in health is the ancient science of Āyurveda, a system of knowledge which assumes many individual behavioral shifts and supporting social institutions. Āyurveda involves important technological advances including extensive biological inquiry into plant and human interactions affecting food, ecology, and health. It now requires a supportive industrial policy to build supply chains with high quality plant nurseries and biological extracts, in directions other than those for generic drugs or cardiac stents. However, while at one level the product is evidently different, the microeconomics of such a system of knowledge of technological advance and an epistemology of care and self-perception is fundamentally different. Āyurveda relies much more on highly individual diagnosis, preventative and ecologically integrative approaches, and systemic changes to lifestyle. At the same time, it addresses curative strategies and can proceed in conjunction with other systems of medicine. In contrast, traditional "western" medicine is focused on symptoms and treatment without always searching for a root systemic cause or treating the patient in context of a wider philosophy of health and healing. The fundamentals of technological capabilities therefore cannot be inferred too simply at the level of production and output (Āyurveda herbs or the pharmaceutical industry), but are embedded in the systems of knowledge and policy supports for inquiry and investment in which firms search, learn, and build their technological capabilities, and the changes individuals adopt. Institutional variety—from the technical standards for manufacture of Āyurvedic formulations, to the science and epistemology of evaluation of efficacy is "developmental" when the wider health system and industrial policies can support

it. Furthermore, uncertainty at the firm level about the future policy environment for healthcare can direct or paralyze the search and learning process. An absence of discussion of industrial resolution on antibiotic resistance, climate change and diet, or chemical pollutants in food systems, may result in a reductionist approach to the science of health but equally its policy response. For an individual and society seeking answers to major twenty-first century issues, this may undermine the individual and collective meaning of progress. Institutional variety can thus signify opportunity of development alternatives but generate product confusion. Economics by and large, and even narrowly in industrial policy design, has tended to sidestep such philosophical underpinnings or theory-methods challenges except in some of the institutionalist traditions.

Contingent Technological Advance in Comparative Industrial Development

Whether or not Clarence Ayres and Thorstein Veblen fully clarified when the institutional environment was sufficiently enhancing of technological advances is not my preoccupation (see instead Klein 1995, 1194–1199). The argument here is that institutional variety within the "industrial" sphere is sizable and worthy of attention in its own right. A closer analysis serves to explain the context in which technological change today can contribute to the OIE while drawing on evolutionary perspectives and development phenomena, lest too-easy or universal inferences and judgments emerge about industrial policy design (Srinivas 2018, 2020). Ayres's emphasis may have been on what Philip Klein (1995, 1190) terms pejorative labeling of obstructionist institutions that do not adapt to technological changes "ceremonial, make-believe, status, feudal, taboo, mystic, legendary, mythic, superstitious, etc." Similarly, William Dugger and Howard Sherman (1998, 858) argue that while Ayres and others discussed social progress "a great deal of work still needs to be done to trace out and explain how the myriad effects of new technology work their way through the institutional structure" (see also Waller 1982, 758 on hypothesis refinement).

Contingency of technological advance rather than determinism or seeing society and technology as distinct domains may thus help deepen development analysis (Srinivas 2012, 228–238). In discussing how the field of economics was moving far away from the critical insights of OIE, and even the optimism of Ayres's view (1961) that instrumental value could strongly guide technological process in the direction of progress, Klein (1989, 545) argues against a methodological utopia. In his presidential address to the Association for Evolutionary Economics (AFEE), he stated:

> I see entire generations of young highly trained economists emerging from our most prestigious graduate schools who come to tell their 'stories' invariably encapsulated in 'models' built on 'stylized facts.' (This customarily means a world so neatened up and simplified as to be easily captured in a series of fairly simple simultaneous equations. These can be solved to yield high correlation coefficients, which, it is implied, we should all find impressive). These efforts are filled with assumptions that perhaps oversimplify more than is customary in other social sciences that feel some obligation to focus on the actual world. In economics, this work rarely enlightens us about how to make economic activity enrich human

> life, other than to argue that whatever we have been doing has probably been a mistake. (Klein 1989, 552)

To a great degree, the seemingly inexorable impact of industrial societies has defined the developmental paradigm *as* industrial development, and labeled the various backlashes against it, including alternative paradigms as "anti-development," even those ecological trajectories addressing urgent climate change concerns. Underlying most of these paradigms of development is the degree to which human beings are shaped by technological advance, especially that originating in the overexploitation of nature.

It may have seemed as if development analysis should resolve such variety in the last decades, as post-independent and post-colonial nation states took on their own manufacturing paths. Yet major differences in institutional variety have tended to be collapsed into state versus market ideologies, a conceptual mistake. They have also manifested deep geopolitical and ideological divides from the Cold War politics of capitalism and communism, the deep ravages of war and nuclear arsenal of the superpowers, and the consolidation of powers in the composition of the UN Security Council which belies the one-vote, one-country representation of the UN General Assembly. The calls for solidarity of a "Global South" notwithstanding, a closer scrutiny of economic and industrial development, reveals considerable institutional variety which breaks even the "club" of the Global South and its terminology into industrial categories for further research (Srinivas 2018). It could be argued that the political economy of "varieties of capitalism" to "national systems of innovation" have suffered inherent ex-post biases in claiming as policy objects what they should be answering (Arocena and Sutz 2000; Albuquerque 2007; Srinivas 2012). In this sense the reading of institutional "drift" and adaptation as "lag" avoids the fact that entire sub-systemic domains of institutional change are co-evolving but not always necessarily at the "level" of nation-states. While many others in the development political economy traditions such as Alexander Gerschenkron or Moses Abramowitz made the case for specific (often state-led) development where the state substituted for other missing institutional scaffolding to mediate industrial development, they recognized that institutional variety, even among the first and "late" industrializers was inherently different. The "magic sauce" thesis (or "social capabilities" of Abramowitz, for example or East Asian bureaucracies), with some forays over the last four decades into manufacturing convergence and technological capabilities, has mostly persisted. One of the challenges of the "magic sauce" thesis, however sophisticated, is that it has left important structural questions on the table without explaining why institutional variety persists. In COVID-19 times, this might mean a developmental urgency that in principle could activate institutional changes in the "direction" of social adaptation, since there are many ways to solve the production of COVID-19 diagnostics kits and vaccines as well as their use.

Because of a seeming determinism driven by a concern with convergence indicators such as manufacturing value addition or the percentage of R&D spending in GDP, I would argue that technological advance has too quickly been boxed into its positive and negative social effects instead of more contingent and evolutionary ideas. By rounding the edges of the square holes of "industrial society" too quickly, the OIE too has drawn and nurtured a meta-level analysis of industrial society and workmanship which has presumed much about social and work life. It has understandable roots in Western intellectual pursuits (or North Atlantic geopolitics) such as nuclear war, or even today's climate crisis response as "green" technologies. Analyzing technological change with reflections of good or bad development, risks suffocating the analysis by presuming that some paths are better than others without

discussion of values and uncertainty. More fundamentally, economic methods could be more explicitly engaged with the phenomena of development and its inferences and judgments for comparison. These in turn are closely tied to the notion of determinism and even industrial anomie.

> In order to tackle uncertainty about the inferential foundations of the discipline, preceding characteristics of exposure to phenomena matter. [. . .] In some respects, one can frame this process as going deep rather than going wide, becoming more confident that a phenomenon exists, is worthy of conjecture, and the ability to compare and contrast it with other phenomena that can be described as distinct or related. (Srinivas 2020, 21)

Such scholarly improvements could admit alternate systems of logic that predate the Cartesian perspective, and which unbundle the disciplines of the social, behavioral, and natural sciences in context-specific ways. Experimental design, evolutionary methods of evaluation of costs and benefits, product design in conversation with new users, are opportunities to broaden the analysis of technological capabilities. Lowered energy consumption, new food choices in response to health and climate concerns, virtual meetings, efficient transport systems, or minimalist lifestyles—whether by necessity or design—bridge these disciplinary perspectives and require economists in mixed teams to make sense of development indicators. In the end, an absence of explicit consideration of institutional variety leaves economics with shaky scientific foundations and obscure inferences about how technological capabilities in any society are connected to use and "development." At the same time, consciousness, behavior and choice, or social action in a context of technological advance and the development of individual meaning need not be resolved primarily in economic policies nor even in western systems of logic (e.g., Vaidya 2017). Food choices or preventative health strategies which require an understanding of human beings and individuals of themselves, for instance, can make more explicit the translation of economic theory into planning, public administration, and policy design.

Technological advance requires frameworks in which human beings as creators are shaped by the available knowledge systems in which they live their daily lives. It need not offer deterministic overarching narratives of development, but rather reveal specific choices of daily use, techniques better honed in firms, failed experiments, power and social relations, new networks, and industrial sectors to which these are applied. After all, active problem-solving and planning require working frameworks of evaluation which are in turn embedded in local institutional and organizational variety (e.g., bureaucracies, craft guilds, religion-linked sub-sectors, technical arts, industry associations, civic groups, R&D teams within large firms, public research institutes, "hobbyist" volunteerism and so on). The resulting individual and collective systems of knowledge and organizations can in turn define a contingent technological "system" in which partial or complete, cohesive or fragmented institutional parts evolve. Individuals and societies experience these as the existing social customs, norms, rules, laws such as industrial regulations, technical standards, intellectual property rules, or trade barriers through which their daily activities and their lived experience may continue for years if not their entire lifetimes.

In COVID-19 times as we are witnessing, some of these institutions and practices may suddenly shift and a "new normal" timeline may be impossible to predict. The new norms,

rules, and laws may define whether countries are able to research and/or manufacture a vaccine, whether individuals must earn a living by construction work instead of through telecommuting, can reliably depend on financial support for hospitalization or workplace injury, or the availability of a highly adaptive prosthetic covered by insurance. Rather than technological determinism, the more reflective of human experience is a contingent technological advance where available systems of knowledge and individual and collective choices to use and sustain specific techniques, organizations, standards, or laws, defines the contingent arc in a specific period of human experience (see Srinivas 2012). This can be witnessed in craft-intensive building techniques, morphine availability for palliative cancer care, energy efficient transport systems, antimicrobial resistance from contaminated water, or the large fiscal outlay to COVID-19 vaccines. This specific institutional variety evident in communities and in countries may evolve at different rates and in complex combinations.

Making Inferences and Judgments More Explicit

In theories of learning that lead to the building of technological capabilities, the microeconomics must be specified. Firms are situated in uncertain institutional contexts where they must make sense of multiple markets, regulatory designs, and specific industrial policies. The large variety of institutional combinations can result in a firm being uncomfortably situated between multiple, fragmented systems of technological advance where products may be disconnected from better health outcomes, or evaluation systems skewed toward particular types of firms or technology platforms.

Michael Polanyi's approach to tacit knowledge so central to theories of technological learning, may have been situated in his own understanding and questioning of Christian or other universalism, some of which can be further explored by better understanding the inferences Polanyi makes (Scott and Moleski 2005). More fundamentally, the paucity of alternative epistemological perspectives for economics creates universalism challenges for how the discipline deals with uncertainty yet may presume too much about either a full range of social choice, or individual psychological or philosophical presuppositions. Here, gaps in the philosophical foundations of logical reasoning may be mentioned, such as opportunities offered by the Hindu/Indian Nyāya school of logic and reasoning (circa 2 BCE) (see Vaidya 2017). Nyāya does not follow the academic separation of scholarly disciplines but questions sources of knowledge and institutions (rules, norms, laws). It offers a critical thinking around systems of reasoning, especially in the framing of economic phenomena, inference types, burden of proof of evidence, and extrapolation to judgment (Srinivas 2020, 17).

Contingent technological advance is therefore representative of the institutional variety that is implicit within societies and may be endogenous (and often invisible in the methods chosen to study the phenomenon) to the policy choices and value priorities of governments and society (Srinivas 2012, 2020). Furthermore, the discipline of economics suffers the fundamental problem of whether it is a science of pattern recognition, focused on single, (national) natural experiments, or universal prescription about how firms and their systems cohere.

> '[N]obody knows' is an important original institutionalised concept. The economic process is one of constant problem solving: the ends-means-ends continuum. As the economic process continues, conditions change, new problems arise, and attempts to solve them are undertaken. However, in

> the original institutionalist view, change has no predetermined direction. In the face of any set of problems there are a variety of institutional or technological responses possible. The question of adaptation is to find which institutional arrangements are best suited to the new circumstances. (Adkisson 2010, 366)

Nations may reveal innovations that solve the particular local problem but because of some institutional constraints, do not scale up and remain policy orphans, therefore revealing the gaps between the generation of innovations and the norms and rules through which they are institutionalized into wider industrial use. This offers a theory-methods challenge for associating innovation with developmental outcomes, as well as a selection bias in deciding how to study innovative or progressive societies.

Discussion: Contingent Technological Advance, Adaptation, Uncertainty and Time

Institutional variety is not a side effect of industrial development but a fundamental element of its co-evolutionary systems. Such variety offers a means to revisit the specific assumptions behind an Ayres-Veblen interest in institutional lag and its industrial and psychological framing of "drift." Similarly, rather than seeing development as a successful convergence of institutional variety, it may be more methodologically honest to recognize that co-existing systems of knowledge exist, with no a priori best way to deliver socially relevant outcomes (Srinivas 2012). Klein (1977) argues:

> From that point of view the term 'underdeveloped' is far less satisfactory than the term 'developing' because the former connotes a static state, whereas the latter connotes a process. But the same comment can be made of the term "developed." [Simon] Kuznets is correct because, in the Veblen-Ayres tradition, he recognizes that all economies are always in process of change. In precisely the same way that [John] Dewey's means-end continuum provided the most appropriate undergirding for what Ayres liked to call the instrumental theory of value, modern economics could benefit from acceptance of the notion that industrialization is not a process with a finite end. (Klein 1977, 789)

Do states or other stakeholders then legitimize some value propositions to steer technological capabilities toward more socially relevant products, processes, or outcome measures? Viewed from my research perspective, the Ayres-Veblen notion of lag may be better treated as adjustments between established and nascent, competing or coordinated, problem-solving frameworks in economics and policy. These frameworks are built endogenously into the development of particular products, platforms, and skills, rather than as a harder technological determinism. Fundamental unease about uncertainty and indeterminacy lies at the heart of critical sectors such as health, where industrial policy and health policy rules have no simple convergence. The unease is arguably generated not because of "technological determinism" but rather of potentially indeterminate combinatorial possibilities as institutions combine and co-evolve, and the technologically contingent policy options made available. Individuals, social groups, and societies make continuous choices led by their values and priorities in a philosophy of problem-framing and problem-solving. Policy context generates the inductive ground of development phenomena. The combinatorial basis of the

institutional variety brings in the notion that with several emergent pathways (or potential pathways), society may not steer decisively.

The American institutionalists thus offer a set of propositions of how uncertainty connects to institutional variety and a set of assertions about how important institutional configurations emerge from this variety. Institutional change is a necessary element of technological change (see also Hall, Lacasa, and Günther 2011). Therefore, rather than seeing institutions as the social features that "lag" technological advances, contingent technological advance drawing from a co-evolutionary perspective of institutional variety situates the social context and avoids a universalist, determinist, and exogenous approach to technology (Srinivas 2012, 2016). This appears broadly consistent with William Waller (1982, 7675–7678) noting the numerous differences on "technology" within the OIE tradition. Clearly, more scholarship is required here.

When the emphasis is on problem-solving, the specific policy responses, and social experiments, economics analysis is forced to clarify the time horizon of the problem to be solved, the presumed mechanisms, and a plausible solution timeline. Evolutionary-institutional (E-I) methods when aligned closely with institutionalist theories of institutional change, as with the example of E-I game theory, then permit a "shadow of the future" with interactive economic policy and agents engaged in practical problems. They may find non-zero-sum outcomes and economists are forced to find endogenous explanations for why some forms of "lock-in" occur (Elsner 2012, 36–38). Some hierarchical structures may emerge and dominate over time dependent on the methods (Elsner 2012, 36–38). For example, a qualitative heuristic I have used as an intermediate methodology, classifies nation states and specific sectors or sub-sectors of the economy (e.g., health, energy, food) into industrial production, demand institutions, and those of delivery. The institutional "vertices" and the three co-evolving domains may get more slack or tighter over time indicating where problem-solving attention is directed, and where such "muscle" can be strengthened (Srinivas 2012, 2016).

Working theories, workable theories, heuristics, and problem-framing, may thus help save economics from its occasional pretensions of certainty. Policy engagements can invigorate economics where methodological improvements alone or theoretical preoccupations cannot. The current pandemic has made far more evident the challenges of zoonoses arising from destructive institutional combinations of how we produce and consume food and natural resources, but also the highly creative and rapid solutions that have emerged in how people have adapted to new modes of working, firms' switching of their supply chains, and possibly fundamental changes underway in how we consume. Policy engagements—not merely in making policy, but in thinking through the minutiae of policy phenomena and the absence of theories and methods to capture these—are opportunities to be seized for economics. Logistics, procurement, last mile delivery, cold chains, bureaucratic rules for buying oxygen cylinders from new suppliers, private e-commerce companies working alongside food supply from the government, and direct cash transfers, are the specifics of building technological capabilities.

Shifting from assumptions of optimal or convergent systems to co-evolutionary perspectives, recognizes high levels of uncertainty, and a combinatorics of open-ended outcomes. Clarifying this relationship between institutional variety and institutional lag is therefore an opportunity to enrich economics and contribute to critical policy debates on the

viability of selection of industrial policy instruments and "progress" through technological advance.

An Ayres-Veblen lag between technological advance and social adjustment may seem inevitable and predictable. But this assumption would be a too-hasty leap to a determinist view of technology and a confusion of separating social adaptation from its knowledge and specific techniques. Without more clarity about the contextual values and actors driving the development goals and the scientific rationale of economics, theoretical frameworks may push toward a seeming inexorable but empirically false convergence of industries and technologies. Perhaps more of economists' attention is needed to intermediate frameworks of problem-solving and methods such as qualitative, iterative heuristics, other network analysis or simulation methods that can capture diverse forms of institutional evolution.

Conclusion

The OIE has provided some of the strongest internal economics discussion of different approaches to institutional change and is among the deeper inquiries into why economics philosophy needs to advance. Nevertheless, Veblen and Ayres's view of industrial societies and the corresponding technological capabilities deserves further connection with the issue of institutional variety and its theoretical gaps. Furthermore, as much as the OIE originates in U.S. and comparative European history of industrial transformation, today's theories of large "developing" economies, technological dominance in specific industrial sectors, and response to climate or pandemics, requires an updating of phenomena, evidence, and methods. Conceptually at least, but limited by policy context, potential indeterminate outcomes can arise from the multiplicity of combining institutions. If neither the frameworks for the combinations nor the resulting multiplicity are captured in the economic discipline, the study of diversity in technological capabilities is obscured by a universal perspective. Institutional variety may generate uncertainty to firms about selection through policy priorities and manifest in fragmented sub-systems of technological capabilities, often co-existing in single nation-states. The institutional language to describe this thus far may well have been squeezed into the experiences and preoccupations of some countries. Leaving the discipline there would be a mistake.

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