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What is economics? A policy discipline for the real world

James K. Galbraith* [The University of Texas at Austin]

Abstract
Economics is a policy discipline. It is engaged with the problems, large and small, of social organization and the general good. As such it co-evolves with circumstances. It is historically contingent. The application of economic ideas to specific problems under specific circumstances may succeed or fail, and in the latter case, people with different ideas normally rise to prominence.

Capitalism is an economic system whose characteristics and problems have preoccupied economists since the 18th century. It is not the only such system; there were economists before capitalism going back to Aristotle. And there have been economists under competing systems: socialism and communism had economists of their own. Today it is common to speak of "varieties of capitalism"; these too foster economists of differing views and perspectives. Economists and economic theories are a byproduct of the social order that spawns them.

The world to which economic policies are ultimately addressed is a complex system. Yet economists seeking to develop appropriate policies are necessarily guided by simplifications and heuristics. The question before the discipline is to decide what sort of simplification is best suited to the task. In the spirit of modern science, this paper argues that appropriate generalizations, simplifications, heuristics and principles are to be derived from a study of the actual world. While these may deploy mathematical tools and draw on insights from the behavior of mathematical systems, the latter by themselves are inadequate, especially where they start from the dead dogmas of the neoclassical mainstream: *ex nihilo nihil fit.*

"Kepler undertook to draw a curve through the places of Mars, and his greatest service to science was in impressing on men's minds that this was the thing to be done if they wished to improve astronomy; that they were not to content themselves with inquiring whether one system of epicycles was better than another, but that they were to sit down to the figures and find out what the curve, in truth was" (Charles Sanders Peirce, 1877).

Introduction

Economics is a policy discipline. It is engaged with the problems, large and small, of social organization and the general good. As such it co-evolves with circumstances. It is historically contingent. The application of economic ideas to specific problems under specific circumstances may succeed or fail, and in the latter case, people with different ideas normally rise to prominence.

* James K. Galbraith holds the Lloyd M. Bentsen Jr Chair in Government/Business Relations at the Lyndon B. Johnson School of Public Affairs, The University of Texas at Austin, and is an elected member of the *Accademia Nazionale dei Lincei*. A version of this essay will appear in P. Chen, W. W. Elsner and A. Pyka, eds., *A Handbook of Complexity* Economics, in preparation for Routledge and used there with permission of the World Economic Association. I thank Jerri-Lyn Scofield and Polly Cleveland for having the kindness to read and comment an earlier draft. This essay is dedicated to the memory of Eugenia Correa Vasquez (1954-2021), a distinguished policy economist in the real world.

Capitalism is an economic system whose characteristics and problems have preoccupied economists since the 18th century. It is not the only such system; there were economists before capitalism going back to Aristotle. And there have been economists under competing systems: socialism and communism had economists of their own. Today it is common to speak of "varieties of capitalism" (Hall and Soskice, 2001) these too foster economists of differing views and perspectives. Economists and economic theories are a byproduct of the social order that spawns them.

The world to which economic policies are ultimately addressed is a complex system. Yet economists seeking to develop appropriate policies are necessarily guided by simplifications and heuristics. The question before the discipline – and the challenge of this volume – is to decide *what sort* of simplification is best suited to the task. In the spirit of C.S. Peirce and of modern science, this paper argues that appropriate generalizations, simplifications, heuristics and principles are to be derived from a study of the actual world. While these may deploy mathematical tools and draw on insights from the behavior of mathematical systems, the latter by themselves are inadequate, especially where they start from the dead dogmas of the neoclassical mainstream: *ex nihilo nihil fit.* Later in this paper, we will sketch out elements of research strategies that seem suited to a complex economic world. Before reaching that point, we must first draw the critical distinction between the practice of economics in the sense meant here, and the academic discipline that presently describes itself as economics.

Neoclassical dogma

Contemporary academic economics – orthodox, mainstream, neoclassical – was born in reaction to a panoply of radical turns in the second half of the 19th century. These included: a) the left turn of classical political economy from David Ricardo to Karl Marx in the logical extension of the labor theory of value; b) Henry George's application of Ricardo's single-tax doctrine to American land, naturally opposed by American landowners; and c) the easy-credit, bimetallist, free-silver campaigns of the Populist movement in the 1880s and 1890s, naturally opposed by bankers (Frank, 2020). Behind all of these economic and political movements lay an even more profound shift in the nature of thought, namely the emergence of evolutionary materialism and the frightening realization that the entire majestic and terrible apparatus of Nature is the product of self-organizing complex systems governed by a small number of indefeasible physical and biological laws, including most notably natural selection and the second law of thermodynamics (Georgescu-Roegen, 1971).

Against this horror of incessant change, irreversible time and potential upheaval, against the awful thought that human institutions are man-made, mutable and subject in principle to democratic control, neoclassical economics created a temple to Nature's God, conveniently domesticated in the guise of an all-knowing, self-regulating and benign market. In this happy mirage, the ancient Chinese notions of celestial harmony, appropriated to economics by François Quesnay (Davis, 1983), morphed into Alfred Marshall's scissors of supply-and-demand, and were generalized by Léon Walras to the case of *n* commodities in perfectly competitive markets, each equilibrated by flexible prices through the workings of an invisible auctioneer. Eventually Paul Samuelson (1947) cast the pall of J. Willard Gibbs over economic formalization, and misappropriated Adam Smith's metaphor of the Invisible Hand, which was

altogether too apt to be left to the partly-prosaic use Smith actually made of it.[1] With the Arrow-Debreu (1954) model of general equilibrium the system was nearly complete, give or take the introduction of rational expectations and the representative agent, leading ultimately to computable general equilibrium (Scarf, 1973) and the Dynamic Stochastic General Equilibrium model.

The appeal of the neoclassical system was two-fold. First, it resonated with the urge of all societies to justify themselves in terms of some higher purpose: the Will of God, *la mission civilisatrice,* Manifest Destiny, and so on. Such a need becomes acute when the actual organizing principle of a commercial culture is as crass as money-making for its own sake, or the pleasures of material consumption. Second, the dogma provided a robust ideological response first to Georgism (Gaffney, 2007) and later to Marxism in the fetid intellectual climate of the Cold War. And so, it became the entry portal to a host of academic sinecures from which deviants were rigorously barred – even though the practical work of making economic policy continued to be done, in most Western countries, by a relative handful of non-neoclassical non-Marxists, mostly the otherwise-ostracized followers of John Maynard Keynes.

From the standpoint of intellectual hegemony, what was most important was the *framework.* In defiance of Joseph Schumpeter's (1942) dictum that capitalism is an evolutionary system, neoclassical economics fixed the taxonomic structures and concepts of the field once and for all: rational self-interest, representative agents, firms and households, capital and labor, prices and quantities, profits and wages, neutral money, natural rates of interest and unemployment, general equilibrium. Any deviation from this framework simply stepped out of bounds; it was by definition not economics. The theory was pure, and as the pure theory applied to nothing, it could not evolve.

Mainstream orthodox economics was thus hitched to Professor Pangloss and his timeless dogma of everything for the best in the best of all possible worlds, except when there are distortions such as interdependent preferences, Giffen goods, Veblen goods, monopoly, externalities, public goods, public spending or taxation, let alone any form of uncertainty not reducible to a probability distribution with finite variance. In short, modern academic economics adopted the "model of a modern Major General" in Gilbert and Sullivan's *Pirates of Penzance.*[2] Its range extends to all conceivable situations, except those that matter in the real world.

In the real world, with the disappearance of state socialist systems in the USSR and Eastern Europe – though not in China – neoclassical doctrines enjoyed a brief period of actual hegemony, famously captured in the phrase "the end of history" (Fukuyama, 1992). In policy, efforts to make social realities appear to correspond to the underlying suppositions of the ideal type had been underway already for a decade, and these accelerated in an atmosphere of triumphalism. Deregulation, privatization, low taxes, small government, free trade and

[1] "*By preferring the support of domestic to that of foreign industry*, he intends only his own security; and by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention..." (Smith, 1776). Roncaglia (2019, p. 177) notes that there are two other references to the phrase in Smith's work, neither of which support the meaning commonly attributed to the expression.

[2] "For my military knowledge, though I'm plucky and Adventury/ Has only been brought down to the beginning of the Century/ But still, in matters vegetable, animal, and mineral/ I am the very model of a modern Major-General..."

sound money were the watchwords of this era, denoted as neoliberalism. In a remarkably short time they brought on deindustrialization, stagnation, inequality, and precarity (Azmanova, 2020) With the Great Financial Crisis of 2007-09 the dogmas stood exposed and embarrassed: how could a theory that took no account of money or credit, that indeed had no banking sector and lacked any concept of fraud (Black, 2005), explain the greatest financial catastrophe of all time? But inertia and tenure carried neoclassical economics forward to the pandemic of 2020, at which moment a – possibly definitive – further collapse occurred (Galbraith, 2020).

Behavioral economics and complexity economics

What is to take the place of neoclassical economics and its neoliberal policy offshoot? There is no shortage of candidates, grouped under the broad banner of economic heterodoxy. Some of these successor doctrines – behavioral economics and complexity economics are examples of note – take the neoclassical orthodoxies as a point of departure. They therefore continue to define themselves in relation to those orthodoxies. Others avoided the gravitational pull altogether – or, as in the exceptional case of Keynes, made a "long struggle to escape".

The behaviorists depart from neoclassicism by giving up strict assumptions of rational and maximizing behavior. Complexity theorists explore the dynamics of interacting agents and recursive functions. Both achieve a measure of academic reputability by remaining in close dialog with the orthodox mainstream. Neither pays more than a glancing tribute to earlier generations or other canons (Reinert, Ghosh and Kattel, 2016) of economic thought. The model is that of neoclassical offshoots – New Institutionalism, New Classical Economics, New Keynesianism – that make a vampire practice of colonizing older words and draining them of their previous meaning.

The dilemma of these offshoots lies in having accepted the false premise of the orthodoxy to which it proposes to serve as the alternative. The conceit is of a dispassionate search for timeless truth, once again pursued by "relaxing restrictive assumptions" in the interest of "greater realism". Thus, for example, in complexity theories agents follow simple rules and end up generating intricate and unpredictable patterns, nonlinear recursive functions give the same result, the variance of returns turns out to be non-normal, and so forth. But once the starting point is taken to be the neoclassical competitive general equilibrium model, these exercises are largely drained of insight and relevance. The behaviorists can tell us that real people do not appear to fit well into the portrait of autonomous, selfish, commodity-obsessed pleasure-seekers that is "economic man". The complexity theorists can tell us, as Arthur (2021) does, is that a system constructed from confections of interacting agents may be unstable. These things, even the dimmest observer of real-existing capitalism already knew.[3]

[3] It is true enough that the application of statistical physics to finance (Yakovenko and Rosser, 2021) reduces orthodox finance theory to rubble. But what does that really add to the experience of Long Term Capital Management (Galbraith, 2000), the Asian crisis, the NASDAQ bust, the Great Financial Crisis or even *The Great Crash, 1929* (Galbraith, 2009)? What, in particular, do these new theories suggest that we *do?* An economist concerned with the effective regulation of a banking system gains little from mathematical statements of commonplace experience.

Evolutionary and biophysical economics

The evolutionary and biophysical approach to economic phenomena is not a new thing, and actually long predates the neoclassical orthodoxy from which some believe it now springs. It began with the intellectual interplay of Malthus and Darwin, developed through Marx and Henry Carey and (to a degree) in the work of the German Historical School, brewed and fermented in the pragmatic and pluralist effervescence of late 19th century American philosophy, and achieved a first full articulation in the hands of Thorstein Veblen (1898). It thereafter developed in the Institutionalist tradition of John R. Commons (1934) and Clarence E. Ayres (1944), among many others, and emerged as the dominant intellectual force in American economics under the New Deal.

The Keynesian and Institutionalist traditions then merged again in North America in the hands of John Kenneth Galbraith (Carter, 2020), and the line of work known as Post Keynesian was pursued by Robert Eisner, Hyman Minsky, Paul Davidson and Wynne Godley; it has now been popularized by William Mitchell, Randall Wray (2006), Stephanie Kelton (2020), Pavlina Tcherneva (2020) and others as Modern Monetary Theory. In Britain the Keynesian cause was carried forward by Richard Kahn, Nicholas Kaldor (1985), Joan Robinson, and others, with close ties to an Italian strain led by Luigi Pasinetti, Pierangelo Garegnani, Mario Nuti and others. The calamity of the great financial crisis is treated in many books and articles, a notable example being Varoufakis, Halevi and Theocarakis (2011). Specific attention to the problem of resource quality originates with Jevons, was developed in the modern era by Meadows et al. (1972) and is advanced today by the biophysical school (Hall and Klitgaard, 2018), (Chen and Galbraith, 2009). A further branch of the Institutionalist approach, with roots in Marx and Keynes, occurred in Development Economics, epitomized by such figures as Albert Hirschman, Raoul Prebisch, Samir Amin and many others, and carried forward still today by (among others) Ha-Joon Chang and Ilene Grabel (2014), Jayati Ghosh, and Luiz Carlos Bresser Pereira (2010). One might further identify a branch of transition-economy and China studies, in which the New Pragmatism of Grzegorz Kolodko (2020) figures, along with Isabella Weber's (2021) path-breaking history of Chinese policy-making. There are many more; applications will vary according to problems.

The useful economist

The common characteristic of almost all of this work, excepting a few who preoccupied themselves with logical skirmishes with the neoclassical orthodoxy – e.g., the Cambridge-Cambridge controversies over the theory of capital (Robinson, 1956; Sraffa, 1960; Harcourt, 1972), or in microeconomics (Keen, 2011) – is that the protagonists were concerned, in the first place, with the practical questions of policy facing their governments or the international community of which they were a part. Whether reformist or revolutionary, their economics was (and still is) the elucidation of problems and the means of dealing with them. The purpose of economic reasoning is to inform and buttress political and social choices. It is not merely to create a simulation that kinda-sorta emulates some run of economic data.

The useful economist is one who engages in the quest for solutions. A truly useful economist does so in an open-minded, informed way, aware of underlying principles but not hypnotized by them, and independent of financial gain and personal ambitions, whether political or for status and celebrity among economists. The behavior of bankers and speculators, the emissions of factories and transport networks, the withdrawal of critical resources from a finite

reserve in the crust of the earth, the level and distribution of wages, profits and rents, fair and effective taxation, how to achieve the willing cooperation of free citizens in pursuit of the common good – all these are part of what a useful economist may study. The person who stands outside and aloof from such questions, who purports merely to "model the system" is, for most purposes, an idler, not so much a scientist as a hobbyist.

Thus: Adam Smith's objective was to promote the interests and welfare of the trading community of which he was part, by expounding the virtues of large markets and the division of labor. David Ricardo sought to shift the burden of taxation from profits to rent, and Henry George sought to shift them from wages to rent, in both cases so that taxes would fall on the idle and unproductive landholding classes. Karl Marx wrote *Capital* as a theoretical foundation for the expropriation of capitalists. John Maynard Keynes sought to save and reform Britain and the bourgeois democratic order by advancing a practical cure for mass unemployment. John Kenneth Galbraith (1958, 1967) turned the attention of his readers to the economic problems of abundance: public squalor, pollution, residual poverty, the cultural and aesthetic wasteland, and corporate power. Hyman Minsky described the phase transitions of financial instability – hedge, speculative, Ponzi – and the need for Big Government and a Big Central Bank as stabilizing devices. Milton Friedman, an engaged conservative, co-wrote a monetary history to support a case for monetary rules (Friedman and Schwartz, 1963). In brief, the notion that any significant economist of any century has stood aside from the policy questions of their time is purest pretense.

Economic research

Economic research as it should be, is therefore a matter of trying to understand *how* the particular complex system in which we happen to live functions – or malfunctions – at any particular time, and to what sort of forces, pressures and policies it responds. Here one illuminating example is P. Chen's (2021) demonstration, from real data, that exchange-rate crises "can only be caused by financial oligarchs". Another was Mandelbrot's (1999) showing that the movement of capital asset prices is well-modeled by a multifractal generator, hence open to intrinsically unpredictable crashes. Such findings have the property that they are drawn from, or compared directly to, the phenomena of the real-existing economy in such a way as to motivate political and social choices. They do not consist in deriving policy from first principles, nor in exploring the properties of mathematical systems that – however interesting in themselves – map poorly or not at all to the complex economy in which we live. Again, examples of good work can be multiplied; the problem is not that research on the real world is lacking among economists and (especially) physical scientists turning their attention to economic questions. It is rather that such research lacks the standing it deserves, because it cannot be integrated into the dominant theory.

The next section of the paper argues that for further progress, an economics for the post-neoliberal era needs to develop *empirical* research methods adapted to the evolutionary perspective, thus permitting the worlds of the academy and those of practical policy to again be associated in a useful way. As Peirce wrote of Kepler, *this* is what is to be done if economics is to be improved. The paper presents some approaches drawn from projects carried out by this author over five decades. They are presented here partly in a spirit of *apologia pro vita sua,* but also in the hope that they may usefully illuminate a methodological argument.

The problem of economic taxonomy

A characteristic problem in the analysis of complex systems is the construction of an efficient taxonomy. Here the example of botany is instructive. In the hands of Linnaeus, a beautiful system was crafted, truly a work of art, but not science in the modern sense. Today the Linnaean classification is no longer in use. Instead, biological taxonomy is rooted in consanguinity at the molecular level, and reflects the divergences of an evolutionary process over time. Similar principles apply to classification in any complex system, including chemistry, engineering, and anthropology, and have been applied to the history of technology (Basalla, 1989). Such evolutionary trees are fundamental to scientific inquiry in respect of any complex field.

Economics in both its academic incarnation and in its practical work remains largely innocent of this prerequisite to understanding. "Purely theoretical" economics is characterized by taxonomies of only the most primitive and ideological kind, largely reflecting the recognized class divisions in Europe several centuries back (landlords, capitalists, workers) or their denatured replacements (capital and labor, households and firms). Practical macroeconomics relies on the taxonomic structure of the national income and product accounts, which is behavioral only insofar as Keynes (1936), Simon Kuznets, Richard Stone and other architects of the system saw fit to distinguish household consumption, business investment and government spending, as well as exports and imports, as behaviorally distinct categories. Nearly a century later it is by no means clear that the distinctions remain valid. For example, household consumption is comprised of non-durables, durables, and services. But while non-durables consumption closely tracks services (up until the pandemic), durables and business investment share characteristics. A model of behavior might therefore usefully reclassify household durables as a form of investment. More generally, a parsimonious and efficient analysis of aggregate expenditure should be preceded by a reclassification exercise, so that the taxonomic categories are not blurred by massively overlapping behavioral patterns, nor kept distinct artificially by force of habit. But such preliminary and behavioral reclassifications of given category schemes are rare, if not absent, in the literature.

Microeconomic analysis *per contra* tends to rely on survey data, usually that undertaken by a national government in pursuit of some ancillary obligation, such as a decennial census or the Current Population Survey in the United States. Such surveys are rarely identical or coordinated across countries (with limited exceptions in modern Europe) and so making them compatible for the purpose of transnational comparison is a major scientific task, undertaken in recent years over a limited range of mostly rich countries by the Luxembourg Income Study. But there is a deeper difficulty, which is that the information collected is limited by the mandate of the survey taker, and this typically runs to such personal characteristics as gender, age, ethnicity (as legally defined in the country), years of schooling and so forth. The result is a vast literature on the economics of race, gender, and education, but far less attention to issues (such as industrial change) that do not so easily fit the template or register as characteristics of individuals and households.

In a similar vein, Thomas Piketty and his colleagues (Alverado et al., 2017) have mined income tax records to construct historical accounts of the income distribution in a range of countries over periods extending to more than a century in a few cases. The approach has advantages over surveys insofar as tax records cover a large number of individuals and households and ostensibly capture better information from the upper tail of the distribution. But, as with survey questions or even more so, the information reported is nationally-specific,

since taxable income is a legal fact of the national tax code, and tax codes vary widely from one nation to the next. And the overall reach is limited by sparse record-keeping, tax avoidance, and the fact that many countries do not collect income taxes (Galbraith, 2019b). Even in the case of the United States, care is essential; tax filers and households are not synonymous categories (Rose, 2018), and changes in tax law and in filing incentives may have serious adverse effects on data comparability over time.

Another type of economic statistic relates to employers, establishments, industries and sectors, often collated by geographical subdivisions, such as states, provinces, counties, townships and so forth. Such data are a reservoir of information about what P. Chen (2021) following Walt Rostow, terms the *meso-economy,* otherwise known as the industrial structure or level of economic development. However, these measures are characteristically bibliographic and Linnaean; industries and sectors are grouped according to a wide and confused variety of criteria, including product type, process type, stage of the production process and others. From time to time new industries emerge and new categories are added or old ones subdivided. The classification scheme is typically hierarchical, in the manner of geographic subdivisions categories are divided and subdivided in layers of decreasing group size and increasing detail. But the industries and sectors so specified are intrinsically arbitrary to a degree; underlying similarities of genealogy or behavior do not rule, and so any given group structure will contain units whose organic similarity to, or difference from, each other will vary widely. As with almost every other source of data, economists working on policy issues rarely trouble to acknowledge the reification of category structure, which accepting a prior taxonomy constructed by non-economists for unrelated purposes necessarily implies. A similar story holds for budget categories in the analysis of public spending; expenditure categories constructed for legal and political reasons are not necessarily informative for social and policy analysis.

Efficient evolutionary classification

An evolutionary approach to taxonomy was worked out for the federal budget of the United States by this author in a PhD dissertation (Galbraith, 1981), later developed by Berner (2005). A parallel approach was developed and applied to US industries in Galbraith (1998), Ferguson and Galbraith (1999) and various papers in Galbraith and Berner (2001). The essence in all cases is to find a suitable, unit-free criterion variable to measure the behavioral similarities across and between taxonomic categories. In the case of budget categories, the variable is simply the percentage change in nominal expenditure from one period (usually a year) to the next. Each category therefore has a vector of characteristics of length T-1 where T is the total number of time periods in the data set. A simple Euclidean distance in (T-1) space then gives a measure of the *behavioral* similarity, from which clusters minimizing within group variance can be constructed, with the number of clusters determined by a criterion of information loss as stepwise agglomeration proceeds.

In the case of industrial data, the concept of industry-specific labor rents (Katz and Summers, 1989) establishes a case to use changes in annual average wages (technically, payroll per employee) as the criterion variable. Underlying categories can be a single hierarchical data set by industry or region, or a hybrid of categories, including sector, region, gender and others, provided the categories are mutually exclusive (non-overlapping). The resulting classification tree provides an efficient summary of divergences through time, as entities within clusters do not diverge (or diverge less) than entities separated at the different

branching levels of the tree. The cluster tree is thus a map of the evolution of elements within a complex system. A suitable group structure is then chosen by means of a stopping rule: groups are preserved as distinct entities, rather than being added together at later stages in the clustering, when the information lost by agglomeration exceeds a previously-specified threshold.

Extracting information from evolutionary group structures

Once a suitable clustering is achieved, a further step is the calculation of discriminant functions that account for the largest proportion of variation between groups. These functions are a vector of weighting coefficients (eigenvectors) of the matrix of time-series vectors underpinning the now-constructed evolutionary category scheme. The resulting eigenvectors are themselves synthetic time-series variables, capturing forces that move the variation between groups. The corresponding eigenvalues give the relative weight or importance of each force in accounting for between-group variations. Plots of the resulting cross-products illustrate the closeness and distance of the underlying elements along the various dimensions. As a final step, each eigenvector can be matched to historical time-series so as to identify the economic, political and social forces at play. For a full presentation of the technique, see Galbraith and Lu (1999).

In this way, Ferguson and Galbraith (1999) demonstrated that relative wage changes in the years 1920 to 1946 in the United States were driven by changes in (a) effective demand, (b) labor organization and strike activity, and (c) exchange rate movements, in that order of importance, together accounting for 90 percent of the significant differential effects. This analysis thus obviated the hypothetical effects of education levels, demand for skills, new technologies and so forth, that were commonly advanced in the mainstream literature, largely on *a priori* grounds (Goldin and Katz, 2010). Galbraith (1998) performed a similar analysis on the United States for the years 1958 to 1992, which identified variations in business investment, consumption spending, trade protections and war as four forces accounting for about 59 percent of inter-industry variation in wages.

The technique is thus non-parametric and atheoretic, yet capable of tracking changing conditions in a complex economic system with high precision and in a fashion that elucidates the impact of policies, mass mobilizations, external markets and environmental conditions on distributive outcomes.

Exploiting complexity for policy-relevant patterns: the case of inequalities

Real-existing economic systems have properties that are illuminated by the behavior of simple recursive non-linear functions; in particular they exhibit phase transitions – Minsky's trichotomy of hedge, speculative and Ponzi financial positions being an example (Minsky 2008) – and the characteristics of systems produced by multifractal generators, in particular distributions of asset price changes with infinite variance and a tendency to sudden and unforeseen collapse. These are useful heuristics, pointing in particular to the utility of trading limits, circuit breakers, price controls (Galbraith, 1952) and storage-release systems (Graham, 1997) for key commodities. Such policies have since ancient times been deployed to stabilize unstable economies (Weber, 2021).

The fractal and self-similar properties of actual economies present another opportunity for policy-relevant research. That is to exploit what is visible and recorded to measure what is partly invisible and unrecorded. It is characteristic of administrative data sets – again by sector, industry or region – that they are collected routinely, in stable format, on a regular basis, compiling a consistent record over time and space. They are of course biased in their coverage – informal work is not covered; services and agriculture are often covered poorly. But self-similarity suggests, and in many instances even dictates, that fluctuations observed between the categories and groups whose size and mean incomes are measured in the data will bear a normally-consistent relationship to unobserved sectors of the complex economy.

Thus, the evolution of a between-groups measure of *inequality*, typically the between-groups component of Theil's T-statistic (Theil 1972, Galbraith, 2014), will capture the principal movements of inequality in the economy as a whole. For a full discussion of the theory, see Conçeicão et al. (2001). And a compilation of such measures permits the creation of dense, consistent measures of inequality across countries and regions covering extended historical periods, along with precise detail as to which groups (regions, sectors, industries) are driving change in the overall measures (Galbraith and Kum, 2005). In this way a new accounting for complex structural change becomes possible. For further details on global inequality data sets, their quality and uses, see Galbraith, Halbach et al. (2016) and Galbraith, Choi et al. (2016).

Once an appropriately dense and consistent panel of inequality measures has been created, the simple application of a two-way fixed-effects regression to the panel permits a bi-dimensional decomposition, yielding both a consistent ranking of inequalities across countries (or other geographic units) and the mapping of a common pattern of change through time (Galbraith and Choi, 2020). Thus, there emerges a *macroeconomics of inequalities* at the global level (Galbraith 2007; 2019), The patterns of change in these data for the period since the early 1960s reveal clear turning points that correspond to the global financial crisis of the early 1980s, and to the peak of the credit boom in 2000/2001, thus bringing out forcefully the roles of debt, interest rates and financial crises as drivers of economic inequalities in the world economy. This in turn, once again, points directly toward relevant policies at global scale.

The integration of distributive outcomes with forces affecting the economy as a whole illuminate the need to break yet another bad but deeply-entrenched taxonomic habit: the distinction between "macro" and "micro" economics. This distinction arose as a political compromise in American economics departments after World War II, between temporarily-ascendant Keynesians and the large strata of "determined little- thinkers" (Solow, 1967) trained in Marshallian supply-and-demand analytics and neither capable of nor willing to make the leap from neoclassical Newtonian mechanics to Keynes' invocation of Einstein's relativity as the basis for an integrated theory of economics-as-a-whole (Galbraith, 1996). But a showing that *as an empirical matter* changes in distribution – the major ostensible object of microeconomic analysis – are driven by a small number of large forces acting on the whole economy through time is dispositive in favor of a change of theory.

Similarly, the demonstration *as an empirical matter* that national economies are closely linked – and not merely in Europe where *de facto* political integration is well-advanced – makes the case for an integrated global economic analysis *as the point of departure* for economic thought. The fact that statistical services operate mainly at other levels is an inconvenience but not an excuse.

Regulation as the general policy challenge for real economies

That complexity arises in open, dissipative systems (P. Chen, 2021) as part of the development of the life process is not itself economics. It is a universal insight drawing on physics, and illuminating biological, mechanical and social systems alike. A common feature of all such systems is regulation; the mechanics of survival require that the forces passing through the system be contained – in terms of temperature, pressure, volume – within the capacity of the materials from which the system is built to withstand them (J. Chen and Galbraith, 2011; 2012a; 2012b). A proper post-neoliberal economics is the art of applying this principle to the workings of economic life. Sometimes this involves lifting restrictions that are no longer necessary; sometimes it involves creating and imposing regulations and standards so as to foster stability, sustainability, and resilience.

In particular, financial instability, underpinned by a strong tendency of free financial markets to degenerate into waves of financial fraud, is a key driving force behind crisis, collapse and rising inequalities, and at the global level. The problem for the policy economist is therefore defined: how to stabilize the worldwide financial sector? The problem is not new; it was most forcefully addressed in the United States in the early 1930s through the Emergency Banking Act, the creation of the Securities and Exchange Commission, the separation of investment and commercial banking and the introduction of federal deposit insurance. Further it becomes apparent that the *deregulation* of the financial sector, pursued in the United States from the late 1970s and emulated around the world, has been the enabler of the resurgence of instability and ultimate crisis. Attention therefore focuses on how to achieve an appropriate *re-regulation* and a reassertion of stabilizing control, without at the same time extinguishing the legitimate functions of credit and debt.

The problem of appropriate, effective and autonomous financial regulation at global scale is one of the most difficult facing the policy economist at the present time, but its purpose here is to illustrate *one case* of the *general policy problem:* how best to regulate the economic system. In their need for regulation, economic systems are no different from biological or mechanical systems; without regulation and maintenance and rules-of-the-road they invariably fail in a short period of time. In understanding the nature and purpose of regulation, we come to a very basic difference between real economists and their mainstream, orthodox, model-driven academic simulacra.

In the mainstream view, the *pure economy* is a self-regulating world; the only requirement for equilibrium at the maximum of social welfare is that all property rights be allocated and that the price system be allowed full freedom to adjust. Any impediments to the optimal result are due to externalities, distortions and interventions, and the function of the economist is to try to remove these so far as possible. This frame of mind helps to account, for example, for the enthusiasm of some economists for small business, for their hostility to unions and to taxes, and for the recurrent references to competition as a device to ensure better economic performance. Regulation is therefore a second-best approach, to be treated as having costs as well as benefits, and to be imposed only to the minimum degree necessary to offset such impediments to optimality as cannot be removed.

To the economist operating on policy in the real world, regulation is not an add-on. It is rather a necessary condition for the emergence of complex structures in the first place. Regulation is the complex of laws, rules, norms and habits that make the sustained functioning of complex systems possible. Only the Robinson Crusoe economy, lacking any actual society, can do

without it, and then only in the absence of resource or environmental constraints, affecting the sustainability of even Robinson Crusoe on his island over time. In the real world, without economic regulation there would be no long production chains, no stable lines of credit, no trust in supermarkets or electric appliances or medicine, no air travel, no mass market for automobiles or any other complex device. Indeed, one can reasonably define the process of economic development as the achievement of regulatory standards that permit complex economic activities to emerge and to be carried out on a large scale and to be sustained over time. Rich countries have these standards and – if they wish to remain rich – they enforce them.

Conclusion

That the world economy is a complex system is beyond doubt. The issue for economists is how best to come to grips with this reality. One popular approach is to begin from the premodern simplicities of the neoclassical model, showing that fundamental differences in the behavior of the model occur when the most elementary assumptions are relaxed. This is progress of a most limited sort, providing some sense of intellectual achievement but no real guidance to the economist, whose task is to assist society in moving from the present into the future.

The alternative, advocated and described in this paper, is to exploit the methods of evolutionary science and some properties of complex systems to classify, measure, analyze and understand the forces driving significant economic change at the global, continental, national and local levels. This is the sort of knowledge that can then be turned to the practical work of economic governance, in the pursuit of common values for society as a whole: security, sustainability, prosperity and freedom. While methods will evolve with circumstance, this is broadly the approach taken by every economist in history whose name is likely to be remembered.

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Author contact: galbraith@mail.utexas.edu

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