PROGRESS AND REGRESS: UNDERSTANDING COMPLEX SOCIAL MEASURES AND THEIR TRADE-OFFS

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Abstract: *What is progress and what is not progress? We can talk about progress in lots of different arenas; we will focus primarily on economic and scientific progress, but also make brief reference to cultural and moral progress. In our discussion, we want to distinguish, especially, between overall, long-term progress and narrower, shorter-term progress or regress. We will refer to these as "global" and "local" progress, respectively. Of course, one can also regress; therefore, we will also look at instances where progress, along some dimension, slows or even moves backwards. Generally, such regress is local, and often still in a context of broader, global progress. In scientific progress, for example, there are many instances of short-term progress which, if not completely discarded or disproved, are at least substantially modified or fundamentally challenged. And yet, those research paths, even when later abandoned, still contributed to the overall progress of the field. In that sense, the regress (that is, rejection or modification of previous theories) is corrected by, but not in conflict with, the overall progress. In the case of economic progress, the concept of regress usually takes on a different form in which things that aren't advancing progress don't necessarily stop it, but are simply retarding progress — that is, making the rate of progress less efficient. The consequence, we suggest, is that when talking about economic progress, objections to certain consequences of economic progress (for instance, income inequality — a type of regress, in our terminology) should not be cordoned off and dealt with independently, but should be incorporated into the way we think about economic progress itself — as instances of local regress within a context of global progress. We explore the effects of these different relations between progress and regress to suggest some of the challenges those seeking to broaden the standard measure, GDP, to incorporate other social values of well-being will face moving forward.*

KEY WORDS: GDP, well-being, income inequality, scientific progress, economic progress, economic growth, value, economic measures

> "When progress ceases, in what condition are we to expect that it will leave mankind?"
>
> John Stuart Mill[1]

I. Introduction

Human history is marked by progress, but progress is not absolute, linear, nor equal across all dimensions of life. Understanding how much we

[1] John Stuart Mill, *Principles of Political Economy with Some of Their Applications to Social Philosophy*, William J. Ashley, ed. [1909] Library of Economics and Liberty. 13 Feb. 2016. <http://www.econlib.org/library/Mill/mlP61.html>.

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progress in any major area (for example, science, economics, culture) is a function of the measures that analysts use. Here, we argue that agreement about progress has differed historically across economic, scientific, and moral progress because of differences in the goal of progress each field sets and the accepted methods of measuring progress and regress in each of the areas. In science, the generally accepted scientific method allows scientists to find agreement about progress made toward advancing knowledge. Likewise, economic progress has generally used growth (usually measured as some form of GDP), as the common goal; and, until recently, the question of how to measure economic growth allowed straightforward inclusion of local and global improvements and declines. By contrast, measuring moral progress has been characterized by general lack of agreement on the object or direction of progress across key dimensions. For example, some see the change in the definition of family as an indicator of moral progress, while others see it as a challenge to maintaining moral objectives they value. But the disagreement goes even further, as we observe a lack of consensus on how one might even measure progress toward a given moral goal.

A more refined understanding of different perspectives on progress requires that we distinguish between overall, long-term progress (which may present more clear-cut growth) and narrower, shorter-term progress, which we refer to here as "global" and "local" progress, respectively. In addition to the forces that create progress in each area, there are circumstances or actions that operate to retard or even reverse progress. We will identify such circumstances as regress. Generally, regress is more likely to characterize a narrower or local decline, and often can occur in a context of broader, global progress. In scientific progress, for example, there are many instances of short-term advances which, if not completely discarded or disproved, are at least substantially modified or fundamentally challenged. And yet, those research trails, even when later abandoned, still contributed to the overall progress of the field. In that sense, the regress (that is, rejection or modification of previous theories) is corrected by, but not in conflict, with the overall scientific progress.

In the case of economic progress, the concept of regress usually takes on a different form in which things that aren't advancing progress don't necessarily stop it, but are simply retarding progress — that is, making the rate of progress less efficient. The consequence, we suggest, is that when talking about economic progress, objections to certain consequences of economic progress (such as, for example, income inequality — a type of regress, in our terminology) should not be cordoned off and dealt with independently — these issues both raise valid criticisms to measuring progress by GDP and bring the trade-offs of doing so to light. Ultimately, though, acknowledging such limitations need not cause us to reject GDP as the primary measure of progress, but simply

reminds us that it is a blunt and imperfect tool, even if it still is the best instrument overall. We would suggest reframing such criticisms as instances of local regress within a context of global progress. Some of these factors might even be thought of or modeled as variables in endogenous growth models — key elements that are both consequences of and inputs into long-term economic progress. We explore the effects of these different relations between progress and regress with reference to general perceptions of progress to suggest some of the challenges of measuring human progress.

The reason to fully understand these different issues of measurement and the nature of progress and regress is to better understand the potential consequences of the recent shift in measuring economic progress. Instead of a focus on measures of economic growth such as GDP, a measure that provided consistent directionality in evaluating economic progress historically, recent efforts to evaluate economic progress incorporate many non-economic or non-monetized factors such as environmental sustainability or human happiness. We argue that these recent debates indicate that measures of economic progress have moved from their place of general consensus similar to other measures of scientific progress to take on the more confounding challenges characteristic of the debates about moral progress.

Certainly, the earlier assumption of consensus on the objective measures of economic progress was an oversimplification, as demonstrated for some time by the Austrian School (and especially in the work of Hayek and Mises).[2] But, the movement beyond GDP that we see today looks increasingly like the multipolar world most characteristic of the debates on moral and cultural issues that generate political and social controversy.

II. Defining Progress

To begin to talk about different types of progress, much less to go on and develop a notion of regress offsetting progress, we must first grapple with what progress itself is. We will begin with Ruth Macklin's definition of progress,[3] in which she identified progress as having two components: a descriptive element and a normative element. As she describes the two elements:

[2] For example, see Ludwig von Mises, *Human Action: A Treatise on Economics* (Indianapolis, IN: Liberty Fund, Inc. 2007), 30–71; And F. A. Hayek, "The Subjective Character of the Data of the Social Sciences" in *The Collected Works of F. A. Hayek, Volume 13: Studies on the Abuse and Decline of Reason*, Bruce Caldwell, ed. (Chicago: University of Chicago Press, 2010), 88–98.

[3] Ruth Macklin, "Moral Progress," *Ethics* 87, no. 4 (1977): 370–82.

> There are two components in this analysis: (a) a so-called descriptive element, and (b) a normative component. I hope to capture our ordinary notion of progress in this explication, and so I seek as neutral a formulation as possible, deferring the more controversial aspects of this issue to the analysis of moral progress itself.
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> a) The descriptive element in the notion of progress is supplied by observable changes that have occurred or differences that exist between any two cultures or historical eras. These observable changes or differences are used to support or justify judgments that progress of some particular sort has taken place. Where these changes have taken place over time, judgments about progress will be of a historical sort; that is, changes in laws, customs, practices, methodologies. . . .
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> b) The normative component in the notion of progress is the pro-attitude, favorable evaluation, or positive assessment expressed when any judgment is made that progress of some sort has occurred. In other words, progress is believed to be a good thing and when anyone claims that progress has occurred, he is using 'progress' as a term of positive value.[4]

But, even with a clear definition of the nature of progress, there are challenges in applying such evaluations across different phenomena — culture, morality, economics, science, and so on. Using Macklin's concept of progress, the difference in controversy between fields that we note is consistent with the extent to which the analysis focuses more on descriptive or more on normative considerations. Differences in perceptions of empirical facts can usually be resolved with additional data or reconciliation of the existing data. So, where progress is largely a matter of an improvement along a generally recognized metric, then it can be understood largely as an information problem. The normative components, however, move a step beyond the information dilemma to incorporate value differences as well. Reconciling such social choices in a way that is consistent with the competing values common in most large societies is a common concern in modern democratic societies. As Macklin recognized,

> It is wholly uncontroversial to hold that technological progress has taken place; largely uncontroversial to claim that intellectual and theoretical progress has occurred; somewhat controversial to say that aesthetic or artistic progress has taken place; and highly controversial to assert that moral progress has occurred.[5]

[4] Ibid., 373.
[5] Ibid., 370.

For our purposes, we are somewhat less concerned with progress per se. What we are concerned with is when there *isn't* progress, or when progress in the area of focus is retarded — intentionally or not. (Generally, we are assuming that economic progress by conventional measures *has* in fact occurred.) We propose to call these situations, occurring primarily at the local level, "regress." The significance of regress as a concept is that it allows us to build in an explicitly normative consideration to situations of progress. This allows, in some sense, a way of putting moral arguments on an equal footing — and common language — with purely quantitative measures. These moral arguments could either: (1) support and settle that progress had occurred; or (2) be used to contextualize, criticize, or discount progress in light of negative moral consequences, real or perceived.

Even in the context of global progress, there can be local regress — either actual negative progress, or retarded progress. (In quantitative terms, a decrease in the slope of the curve, or rate, of progress.) Using one set of criteria we might argue that the United States and many other countries are thriving economically, while Venezuela is in increasingly dire straits. Or alternatively, if one is concerned about inequality, one notices that Americans' overall wealth is growing, but at faster rates among the rich than the poor, resulting in a regress on the dimension of equality. In both cases, *globally* there is progress, but *locally* there is either less progress or negative progress (i.e., regress).

We want to emphasize that our notion of regress should not be taken to mean that its instances are necessarily bad or unjustifiable. Instances of regress are negative in a technical sense, because they negatively affect the quantities measured in the descriptive side of progress, but they may also be put in place intentionally, for normative, moral considerations about the consequences of purely technological and economic progress. Those reasons may be right or wrong, morally, but we certainly do not mean to say that intentional local bumps on the road to global progress are unjustified. Indeed, we imagine that regress could come in infinitely varying forms, with different mathematical functions, and competing normative justifications as well.

In looking at scientific progress, we see something of an inherent conflict between competition and access. On the one hand, modern science is designed for contestation and competition to discover and confirm important results. This leads to the growing level of achievement that marks scientific progress in modern history. But it also has limitations on entry that may impede progress. Among this is a substantial buy-in investment, including costly education and expensive equipment, but also includes a paradox of having invested so much in the scientific mainstream that one is perhaps more conservative and less risky in challenging certain ideas. We could easily point to contemporary discussions about the state of the scientific community, open access research, and the appeal to funders that

suggest these tensions. Current hot-button issues include limits on certain types of genetic research, stem cell research, atomic research, and climate change research.[6]

And the political dimensions of these debates arguably fuel the agendas of scientists, funders, and their opponents more than the science itself. Of course, in reality these constraints have always been political at their core, including Galileo's fight with the Church. These difficulties cut against the inherently competitive grain of the Scientific Method and can result in possible regress or at least a slowing of scientific progress. These restrictions may take the form of funding priorities, regulations in higher education, or outright restrictions (for instance, laws against embryonic stem-cell testing or cloning). As scientific ideas are tested and not disproved, we come to recognize them as genuine progress. Yet, at the same time, we also only know the absolute truth of these ideas if and when they are *disproved*.

In the case of economic progress, we have historically used a monetized (and thus measurable) sense of direction coupled with self-interest that makes it seemingly easier to establish progress and regress. Traditionally, economists have measured economic progress largely by tracking GDP growth. This sort of progress measurement can be corrected, of course. But, unlike scientific ideas, GDP cannot be *disproved* like a scientific idea, hypothesis, or theory. GDP may be a highly imperfect measurement, but it cannot be proved *wrong* in the same way ideas like "the Earth is flat" or "the sun revolves around the Earth" can.

As long as market competition exists (and clearly this is not always the case), the process itself will generate progress, as firms enter the market and compete for quality and price. But, if there is no competition to generate energy and movement, then it is possible to regress along the economic dimension. Sometimes diminished competition is stifled naturally (for example, through monopoly or oligopoly, a strong incumbent advantage through reputation, and so on) but, in those cases, there is still an incentive for other firms to move into the market. More likely — and more troubling, competition is stifled through the authority of the state and regulation intended to introduce other objectives. These other objectives may well

[6] For example, in Fillippo Radicchi, "Papers Criticized in Comments Have High Scientific Impact" *Nature: Scientific Reports* 2, Article # 815, (2012). Accessed at <http://www.nature.com/articles/srep00815>, Radicchi notes that controversy in science is common and can even be beneficial to the scientist. As he argues:

> Either resolving in favor or against the scientific findings that originated the disputes, scientific controversies are thought to be necessary for scientific progress. Even if not all the greatest achievements in science have passed through a dispute, as for example the unification of electricity and magnetism by Maxwell, many major steps in science have been controversial. Revolutionary changes are *per se* controversial because they reverse previous scientific paradigms, and thus necessarily encounter some resistance before getting accepted.

be morally justified (and democratically approved), but they still alter the system in a way that diminishes the efficiency and growth of the system and is therefore, once again, an example of local regress.

In contrast, evaluating moral progress poses additional challenges to the analysts, as there are many competing objectives that may be pursued with no clear consensus among individuals. Moreover, if a single objective is selected or imposed, because it is not an equilibrium, it is vulnerable to efforts to change or move away from it unless force is exercised. In this case, it is harder to argue that change is regress, since there is no consensus on the direction or objective we hope to achieve; but it is also equally difficult to argue that we have achieved progress in such an arena, when the attributes being studied may themselves be so deeply and essentially contested. In the realm of culture and morals in diverse societies, normative values are almost always at stake. These normative values are probably impossible to prove or disprove, and are barely easier to measure. Thus, they are the hardest and most-contested areas in which to assess social progress and regress.

In each realm, we face the added challenge caused by perception differences in actual versus perceived progress and regress. For instance, in the toughest cases (moral and cultural progress) there is often not only a commitment to a particular view, but arguably a strong bias in favor of that view that makes one very sensitive to threats, whether to majority or minority interpretations of progress. In the case of economic progress, one often finds that supporters or critics of the idea may be unfair in their judgment. And even in the case of scientific progress, which might initially be thought to be the most objective and least controversial instance of progress, there may be differences in perceived versus actual progress by misestimating the impact of any particular discovery. In order to explore these arguments more fully, it will be helpful to briefly develop the concept of progress and regress in science and in the realm of moral progress to help account for the change that is taking place in the realm of economic progress.

A. Scientific progress

The notion that, at least over the last several hundred years, we have made significant progress in science and technology is, today, virtually uncontested. In the words of David Wooten: "No one imagined a day when the history of humanity could be conceived as a history of progress, yet barely three centuries later, in the middle of the eighteenth century, progress had come to seem so inevitable that it was read backwards into that of previous history."[7] Matt Ridley puts it even stronger, and describes

[7] David Wooton, *The Invention of Science: A New History of the Scientific Revolution* (New York: Norton Books, 2015), 4.

scientific and technological progress as "inexorable," even across many centuries, explaining that:

> Two other phenomena underline the overwhelming inevitability in the progress of technology. The first is the equivalent of what biologists call convergent evolution — the appearance of the same solution to a particular problem in widely different places. Thus the ancient Egyptians and ancient Australians both invented curved boomerangs without conferring. Amazonian and Bornean hunter-gatherers both invented blowguns to fire poisoned darts at monkeys and birds. Remarkably, both lit upon the counterintuitive idea that to use them accurately requires holding them with both hands close to the face and turning them in slow circles rather than trying to keep them perfectly still.
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> The other hint as to the inevitability of technological change comes from the way that progress happens incrementally and inexorably – and is impossible to prevent. The clearest example is Moore's Law. In 1965, the computer expert Gordon Moore drew a little graph of the number of "components per integrated function" on a silicon chip against time. On the basis of just five data points, he deduced that the number of transistors on a chip seemed to be doubling every year and a half. . . . [Moore concluded:] "By making things smaller, everything gets better simultaneously. There is little need for trade-offs."
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> Eerily, the progress of the computer has followed Moore's Law ever since, with extraordinarily little deviation.[8]

But, if we look closer at the history and nature of this progress, we find many instances where the road to progress was bumpy. Today, we live in a time during which we better understand our bodies, the world we inhabit, and the universe it is found in far better than ever before. Yet, we also have reason to question even some of the most important and fundamental advances. Quantum mechanics is far from displacing classical mechanics, but it does show that its Newtonian foundations are, at best, limited in their universal applicability.

Celestial bodies aside, we seem to be constantly advancing knowledge, and yet we are also increasingly perplexed at the things we do not understand about viral infections, the brain, and physiology. For all of the advances in medical treatment and pharmacology, many of today's wonder drugs were in fact discovered to be most effective in something completely unintended.

[8] Matt Ridley, *The Evolution of Everything: How Ideas Emerge* (New York: HarperCollins, 2015), 123.

So, when we look at scientific progress, we are right to emphasize all of the good — both normative and descriptive. But even in this realm, the paths that brought us to where we are were not always straight, and we will no doubt find that much of what we currently understand today is, in fact, insufficiently explanatory, if not outright wrong. To admit this, though, is not to deny progress. To admit this is simply to describe scientific progress as global progress, with instances of local regress. Even when not *disproved*, many of our scientific ideas once thought to be progressive were later found to be far less complete than they once seemed.

Wooten's and Ridley's recent works highlight both the constant evolution and the inevitability of scientific progress across centuries. While it remains a truism that individuals will be the proximate cause of specific innovations (that is, progress), there is good reason to think that such improvements in knowledge and technology are, in fact, the result of larger and more collective advancements. Individuals are simply inputs to this sort of progress — not insignificant or interchangeable, but also not as unique as we might imagine.

Thomas Carlyle's so-called "Great Man" theory of history turns on the idea that a handful of rare geniuses forever redefine human history and are the sources of humanity's greatest innovations and, in turn, progress. Although Herbert Spencer produced a counterargument to this a generation later, many are still persuaded that Great Men make history (and progress). However, Wooten and Ridley, among others, mount convincing evidence that most, if not all, of our most significant advances are more or less inevitable. Edison was but one of at least twenty-three inventors creating an incandescent light bulb.[9,10] Einstein was but one of at least three physicists discovering the foundations of special and general relativity. And it goes on and on:

> It's just as true in science as in technology. Boyle's Law in English-speaking countries is the same thing as Mariotte's Law in French-speaking countries. Isaac Newton vented paroxysms of fury at Gottfried Leibniz for claiming, correctly, to have invented the calculus independently. Charles Darwin was prodded into publishing his theory at last by Alfred Wallace having precisely the same idea, after reading precisely the same book (Malthus's Essay on Population). Britain and France almost went to war in the 1840s when the dispute between John Adams and Urbain Le Verrier over who discovered Neptune reached fever pits in the press: they both found the planet. The tumour-suppressor gene p53, the disabling of which is crucial to the malignancy of most cancers, was discovered independently in

[9] Ridley, *Evolution of Everything*, 119.
[10] Ibid., 121.

1979 in four different laboratories in London, Paris, New Jersey and New York.[11]

If we think of scientific progress as a cumulative and inevitable outcome, instead of a story of exogenous shocks (by the Great Men), then we actually have a far more stable and predictable system. In other words, even if advances in science and technology occur stochastically, we can at least model such innovations as being endogenous to the system — a byproduct of the Scientific Method itself.

However, abandoning the idea of the Great Man also leaves us with the issue of how we incorporate failure, as well as incompleteness and redundancy, in scientific progress. Perhaps the most difficult questions for scientific progress is to better understand what Wooten and Ridley describe as inevitable progress, and learn whether this makes it more or less efficient. In other words, if supposed breakthrough discoveries are regularly happening convergently around the world, does that mean scientific and technological progress is more or less efficient as a result? Or, colloquially, is this duplicativeness a feature or a bug of scientific progress? In the terms of this essay, is it progress or is it progress *and* regress (diverting interest and talent that could be used more efficiently)?

B. Cultural and moral progress

At the other end of the spectrum, consensus about moral progress often poses the thorniest difficulties of measurement. What does it even mean for culture or morality to progress? Is there a single end at all? For some there is a clear teleological end, whether it is defined by religion, politics, or aesthetics.But what if you disagree? What if you reject outright that morality and culture are teleological? These normative values can be irreconcilable. And to many, teleology is itself an essential aspect of moral progress – perhaps definitional. As Richard John Neuhaus put it: "To be modern is to believe that history is 'getting somewhere' in overcoming the problems and limitations of the human condition . . . . The unarticulated, and perhaps unconscious assumption is that change is going somewhere . . . . In the language of philosophers, change is teleological."[12]

If you believe the ultimate ends of humanity (that is, progress) are to be raptured to heaven or taken there upon death, and I believe differently, then we may never agree on moral progress. However, if we define moral progress more abstractly, such as living more-peaceful lives, then we might be able to better identify and measure such a goal.[13] Moral progress

[11] Ibid., 121.

[12] Richard John Neuhaus, "The Idea of Moral Progress," *First Things* (1999), 1–2. *available at* http://www.firstthings.com/article/1999/08/the-idea-of-moral-progress.

[13] Steven Pinker, *The Better Angels of Our Nature* (New York: Viking, 2001).

is surely less tractable than economic or scientific progress, but it cannot be impossible. It remains, however, that the object (the more abstract goal) must gain consensus for an analyst to make the judgment of whether change is in fact progress or regress.

Returning to Macklin's criteria of progress, in culture it is hard to claim progress because the descriptive, even if objective, depends solely on the identification and measurement of the normative, and we may never agree on that. Because the very concept of cultural and/or moral progress depends on an entire society (or, at a minimum, substantial subcultures within that society) agreeing on these normative ends, those differences threaten the very notion of progress within those domains. The descriptive and normative may collapse upon one another.

These puzzles, while fascinating, are beyond the scope of this essay. One question that is worth considering, however, is whether there is a basic moral or cultural consensus that is required to assess progress in economics or science? Examples such as Adam Smith's sympathy, the American Founders' notion of virtue, or more recently the moral code of the modern social entrepreneur has each been held up as key to the advancement of economic, scientific, and/or moral progress. In identifying a basic set of values or code that is more open to opportunities and growth, certainly liberty or freedom of thought and action would be key. But, while we might discover links to particular values/morality associated with progress at a given time, it would be hard to go further to suggest a consensus around imposing such a code. As the state becomes the ultimate arbiter of appropriate morality, individuality and nuance tend to be lost.[14]

One of the challenges this poses is that the authority making the policy selects the dimension along which we will measure success — so, as Charles Murray has argued for the U.S. case, when we focus on greater racial opportunity as the metric relative to economic success, rather than core characteristics of individual morality, we actually create a circumstance in which we divide society even more fundamentally (around a new division based on class).[15] While intended for good purposes, the policies in such complex cultural and economic arenas create unanticipated consequences that may be even more challenging going forward.

III. Economic Progress Out of Technological Change

Somewhere between the general consensus of measuring scientific progress and the challenges of measuring moral progress, we might place

[14] Kenneth Arrow kicked off an entire field (Social Choice Theory) dedicated to exploring the challenges of a diverse society in reaching social agreement under a reasonable set of conditions. Certainly, when the decision is over issues in the value realm, we can expect even greater problems.

[15] Charles Murray, *Coming Apart: The State of White America, 1960–2010,* (London: Crown Forum, 2013).

the history of economic progress and regress. In some ways this history has looked more like the pattern of understanding science. For example, a great deal of economic progress is directly attributable to technological progress, starting at least with the Industrial Revolution, which suggests a scientific grounding. There may even be an epistemological link between scientific and economic progress. In short, the modern Scientific Method makes a critical advance in the way that we both ask and go about answering questions. By formulating, then testing, hypotheses, we create a linkage between belief, fact, and discovery. As David Wooten describes the approach to scientific questioning:

> Naive realists, those who think that science always establishes incontrovertible truths about the world (a view difficult to sustain, given the evidence that scientific theories change radically as the evidence they are based upon is revised), assume that scientific enquiry is always going to ask similar questions and produce identical answers; relativists assume that both the questions and the answer are infinitely variable. In truth the questions may be variable, but sometimes the answers are not. You do not have to sail west, but if you do you will end up in America. And once you have found America, if you were trying to get to Asia, then the search will begin for ways round it. One question leads to another; scientific enquiry is path-dependent.[16]

In other words, the discoveries we make are a product of the inquiries we make, even if those inquiries lead to incorrect answers, or were the wrong questions to ask in the first place. Learning the answers to one question (or hypothesis) leads to the formulation of the next. Although the example of a misadventure to America was regress in exploring Asia, it was progress in a question that was not even formulated. Like a choose-your-own-adventure novel, sometimes the mistakes are the most interesting paths.

As science progressed, we understood more of our immediate world, we were able to ask more detailed questions (that is, to formulate narrower hypotheses) and thus understand more and more. However, in some cases that also necessarily led us to revise what we believed we already understood about previous hypotheses. That process, we believe, has a strong corollary to political economy, and especially to the way Hayek described the difference between law and legislation.[17] Hayek argued that laws emerged naturally from the interactions of men engaging in economic and

[16] Wooten, *Invention of Science*, 527.

[17] F. A. Hayek, *Law, Legislation and Liberty Volume 1: Rules and Order* (Chicago: University of Chicago Press, 1978); and F. A. Hayek, *Law, Legislation and Liberty Volume 2: The Mirage of Social Justice* (Chicago: University of Chicago Press, 1978).

social interactions, but that periodically it was necessary to legislate to correct for inferior outcomes that emerged as a result of this spontaneous process.

A. The conventional way economics measures progress and regress

Understanding how to represent economic growth socially presents a number of problems for modern economists. This became especially critical as policymakers sought to intervene to change overall economic conditions. With the focus on technological improvement, it was logical that the measure of economic progress economists adopted would be a measure of the values of new goods and services. Since World War II, modern economists have used changes in Gross Domestic Product (GDP) to measure economic growth.[18] GDP is a monetary representation of the final market value of all goods and services within a nation. The logic behind using such a measure is that it captures virtually all economic activity regardless of source or activity.

GDP is used by economic policymakers to evaluate the progress taking place as a result of the many interventions and decisions coming out of the Great Depression and World War II. GDP differed from earlier measures that focused only on the production-based economy. It incorporated a broad set of services and other economic activities that contributed to the social value, including the activities of government. As such, it has become the most frequently used measure of a country's aggregate economic activity. As Diane Coyle notes, GDP can be measured in three ways: a value added approach, an expenditure approach or an income approach. All three methods are deemed equivalent broad measures.[19]

While useful in making comparisons across time, GDP per capita failed to take into account the cost of living differences and inflation rates that impacted the "real value" of a given level of production. As a result, many economists use the Purchasing Power Parity (PPP) modifier on GDP to improve comparability and to smooth exchange rate differences across a year and across nations. The logic behind such a measure is to have a consistent measure closest to a common economic experience across nations that are at quite different levels of economic development.

Certainly, one can imagine many problems with such an aggregate measure of settings as complex as a nation's economy. As economists modify or open up the measures to differences or modifications across nations or individuals, it becomes difficult to ensure the consistency and the simplicity that has been the greatest strength of relying on GDP per capita.

[18] Diana Coyle, *GDP: A Revised but Affectionate History* (Princeton, NJ: Princeton University Press, 2015).
[19] Ibid., "Introduction."

According to Coyle, GDP is "… an important measure of the freedom and human capability created by the capitalist market economy. GDP indicates, although imperfectly, innovation and human possibility."[20] The consistency of GDP is often lost as we move to broader measures of well-being. Monetized measures, such as GDP, maintain focus on market activity, but the benefits that derive from a tighter focus are confounded by the introduction of more-subjective measures.

Just as economic growth/progress can be represented as a gain in GDP, declines/regress in economic productivity can be represented as a decline in GDP per capita. Economic recessions that extend for years or are marked by sharp declines (usually more than 10 percent) are referred to as depressions. By this measure, we note that economic progress over the past centuries in the West has been marked by global progress, with relatively infrequent global adjustments downward, but perhaps more frequent local adjustments. Because of the political consequence of depressions or even recessions, many policymakers in the West sought policies to prevent significant adjustments downward.[21] The growth of government involvement in the economy has reduced the number or duration of this natural regress. The question remains how such intervention impacts this pattern of progress. Economists are split on whether such intervention improves overall progress by offsetting the damaging effects of declines or instead, may reduce progress because of the inadequacy of policymakers to intervene effectively.

These monetized measures were used by economists and policymakers to more simply represent hugely complex market activities along a common continuum, and also allowed for the incorporation of regress more readily. Of course, this assumes that the measure is capturing what we are interested in. Monetized measures may represent the social value of an individual's contribution to society, but, as Mises notes, "[i]t does not tell us anything about the individual's increase or decrease in satisfaction or happiness."[22] It is not surprising, therefore, that this empirical direction of economics has seen critics emerge from all sides of the political debate. In particular, Austrian economists warned of the hubris of macroeconomists who assumed they could measure and then control the economy along the GDP continuum. More recently, progressive economists have raised serious questions about the extent to which this economic growth measure adequately represents economic well-being. In the next sections, we will explore each of these schools of criticism.

[20] Ibid., 5.

[21] The debate between John Maynard Keynes and F. A. Hayek was largely a debate about the appropriateness of government intervention to offset economic declines that continues to this day. Over time, the influence of Keynes' theory led politicians to intervene more frequently and more extensively to offset economic declines.

[22] Mises, *Human Action*, 279.

B. An Austrian view of the individual and the relationship between local and global progress and regress

> There is a danger in the exuberant feeling of ever growing power which the advance of the physical sciences has engendered and which tempts men to try, "dizzy with success', to subject not only our natural, but also our human environment to the control of the human will. The recognition of the insuperable limits to his knowledge ought indeed to teach the student of society a lesson in humility which should guard him against becoming an accomplice in men's fatal striving to control society…[23]

In addition to providing a way of evaluating theories, the Scientific Method also provides a means to modify our theories to incorporate the adaptation central to the Austrian school. It was in response to fears about the control models associated with Keynesian economics that Austrian arguments gained prominence in the twentieth century. By moving incrementally through the process of economic growth or decline, those adhering to the Austrian school seek an explanation, rather than a simple predictive conclusion. They reject the idea that such progress can be simply aggregated and monetized.

Hayek argues that decentralized and competitive learning, knowledge, and information are at the heart of man's ability to function individually within a collective arena. These form the basis for Hayek's continued commitment to a decentralized market decision process. He argues that the predictability of this process is superior to even the smartest or most informed decision maker because of the sheer scope of information required to generate results in a complex market. The sum is almost infinitely greater than the parts. Hayek focuses on this creative aspect of the process for revealing this knowledge. Hayek's description and explanation of the invisible hand of prices in a market is one of his core contributions.

> The peculiar character of the problem of a rational economic order is determined precisely by the fact that the knowledge of the circumstances of which we must make use never exists in concentrated or integrated form, but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess. The economic problem of society is thus not merely a problem of how to allocate "given" resources-if 'given' is taken to mean given to a single mind which deliberately solves the problem set by these "data." It is rather a problem of how to secure the best use

[23] F. A. Hayek, *The Pretense of Knowledge, The Market and Other Orders*, ed. Bruce Calwell (Indianapolis, IN: Liberty Fund Inc., 2014).

> of resources known to any of the members of society, for ends whose relative importance only these individuals know. Or, to put it briefly, it is a problem of the utilization of knowledge not given to anyone in its totality.[24]

But, even with the power of the market, Hayek recognized that there would be times when corrective action would be required. He noted the difference between evolved decisions of the market with the corrected outcomes as the distinction between law and legislation. Hayek's notion of rationality is related to the choice of self-directed goals, which have a longer time frame and may evolve. Rationality is revealed through action and not determined in advance as many modern theories assume. As time goes on, the correct choices or goals emerge, with some thrown out at each decision stage. As the common law evolves in society, it can grow in unpredictable and sometimes unfruitful ways; legislation (just like the Scientific Method) gives us a mechanism to pare down and prune those unproductive and incorrect ideas.

Hayek rejects the constructivist notion that man chooses with perfect foresight. Rules can bind humans even when it seems the actions or choices are not in an individual's short-term interest — as suggested in Richard Thaler and Cass Sunstein's *Nudge*, rules can produce a better long-term outcome for the individual. Examples abound in areas such as manners, grammar, or scientific scholarship.[25] Each actor operates within constrained arenas similar to a regulated market setting or moral frame. This does not mean that the discovery process is predetermined, but it may be regulated to direct behavior in certain ways.

However, creativity or evolution may best take place when someone breaks the rules and goes outside the constraints to find new fertile ground. Trial and error in this form leads to new ideas and development. By this logic, liberty is essential to the progress and growth associated with the dynamic process Hayek outlines.[26] It is the give and take that exposes the possibilities within the economic arena. But, it is not even clear that the actors within such arenas must fully understand how these rules operate. Hayek suggests that there are certain basic principles that guide behavior (perhaps norms) and those norms of behavior must be at least vaguely contained in public understanding. This suggests a current challenge as sources of information and the number of communities one relates to expand with technological progress. This has opened up so many avenues, but it also has introduced efforts to constrain as those

[24] F. A. Hayek, "Use of Knowledge in Society," *American Economic Review* 35, no. 4 (1945): 519–20.

[25] Richard Thaler and Cass Sunstein, *Nudge: Improving Decisions About Health, Wealth, and Happiness* (New York: Penguin Books, 2009).

[26] Hayek, *Law, Legislation and Liberty*.

in authority seek to regulate against the openness of the Internet and information revolution. Examples on college campuses challenge the educational and intellectual freedom necessary to the progress that Hayek outlines. Trigger warnings and safe spaces pose among the most recent challenges to traditional, hard-nosed civil libertarian ideals that the most offensive and controversial ideas are *exactly* the ones we should be protecting.[27] If academe or biased news sources control or filter information, they can limit the extent to which outcomes consistent with Hayek's principles of freedom might emerge out of today's economic, social, or scientific processes.

Subpar performance of the competitive market model can suggest the potential for gain by altering the economic structure. Scholarship on market failure implies that the general equilibrium model fails to account for economic behavior adequately within certain market settings. Examples such as monopoly concentration, public goods problems, and information asymmetries all suggest the limits of the model and provide the opening for those seeking to move away from free markets. Once alternatives introduce the possibility for policy intervention into the market, it makes such interventions more likely for other noneconomic reasons as well.

C. Ways of improving or supplementing GDP (as a measure of progress)

As far more individuals across the globe are actively involved in market processes and become better educated, they may ask for other objectives to be incorporated into the economic process — equality, justice, and so on — as forces that incentivize a different normative goal or outcome. They seek these as regulation and economic policies imposed on the marketplace. As it takes on this regulatory form, such changes push economic progress away from its science basis to the cultural/moral dimension and the challenges of measurement presented in that space.

Other regulations followed with virtually endless offsetting policies and market corrections.[28] Whether public goods provision, redistributive transfer policies, or market regulation, government policies work to change the market outcome to serve goals beyond the standard market objectives of efficiency and growth. Such policy diverts resources in a way that changes incentives and might deter us from a "better" outcome under some definitions, but this diversion is a calculated choice. Even if we are interested in multiple goals, the government system that emerges

[27] Greg Lukianoff and Jonathan Haight, "The Coddling of the American Mind," *The Atlantic* (2015).

[28] Riccardo Natoli and Segu Zuhair, "Measuring Progress: A Comparison of the GDP, HDI, GS and the RIE," *Social Indicators Research* 103, no. 1 (2011): 33–56.

to produce these combined goals may not be the most efficient system. Others seek far more than strictly market-based and production-measured goals. Mill, among others, articulates the linkage between economic and moral arenas. As Rudi Verburg notes:

> In the first stage, human actions are born out of self-interest and necessity, from habits and customs or obedience to rules of morality. This implies that in the first stage of progress self-interest is the material to work with to set out on the road of progress, or as Robson put it, "selfishness cannot be overlooked in social planning" (1968: 137). Hence Mill's praise for and condemnation of Bentham's views on morality, suited as they were to his purposes in the first stage of progress of educating people in the necessities and art of improvement, were deficient as soon as progress would enter the phase of self-development. Education, rules of other-regarding conduct and the cultivation of sentiments by way of social pressures and institutional arrangements aiming at calculated self-interest should set off this process of moralization, encouraging the growth of beneficial habits in individuals up to the level at which the individual takes control of this process of development.
>
> Calling himself a "reformer in opinions," Mill thus showed how political economy was to be understood as an instrument of progress. For that purpose he emphasized the need to establish political economy as a science, to be held distinct from normative issue[29]

Those favoring a more active level of market intervention often argue that the objectives of capitalist markets are contrary to core human values. Instead they seek to overlay a more fully developed moral dimension on top of the economic dimension. Under such an approach it is proper not only to modify, but to completely undo market outcomes in order to serve other needs such as equality or social justice. By moving into this arena, the regress that is generally measurable in the economic realm is lost to the much more contentious interactions that characterize debates about moral progress.

Regress in economic progress also occurs whenever the knowledge gained through economic exchange/activity is lost or limited by interference or a shock to the market. In pre-industrial times, such regress occurred due to general problems in the society since economic skill and knowledge were contained within the people themselves. Until there were the means to retain knowledge outside humans (creation of mass publishing, recordkeeping, and so forth), the population declines associated with

[29] Rudi Verburg, "John Stuart Mill's Political Economy: Educational Means to Moral Progress," *Review of Social Economy* LXIV, no. 2 (2006): 225–46.

economic downturns resulted in real loss of knowledge that limited growth for extended periods following any economic decline. As Shekhar Aiyar, Carl-Johan Dalgaard, and Omer Moav argue:

> But before the advent of the printing press and widespread literacy, technological knowledge would have to be embodied primarily in humans, and actively transmitted across generations in order to be preserved in society. This opens the possibility of technological regress. A transient negative shock to aggregate demand or supply, caused by a shock to population size or land productivity, would induce the neglect of techniques rendered temporarily unprofitable. These techniques would not be transmitted to succeeding generations and thereby would be lost. The stock of technology would not immediately return to its former size when the shock passed. It would have regressed, to recover over time only as old techniques were rediscovered, or new techniques invented. [30]

D. A global response to GDP's limitations

Policymakers, stakeholders, and academics continue to struggle with the question of how to measure economic progress, as they identify the inadequacies of the standard measures of GDP to fully capture modern economic activity or give weight to the concerns of life that go beyond simple economic production (sustainability, well-being, and so on). Clearly these traditional measures capture the core of economic productivity, but often they miss or are slow to capture technological shifts, the service economy, or the value of product improvements. Michael Boskin,[31] for example, outlines several factors that limit the effectiveness of traditional measures in capturing real economic progress: 1) growth of hard to measure services; 2) new products; 3) quality improvements in existing products; 4) technology and innovation; 5) changes in time use; 6) growth of international trade; 7) the introduction of new firms; 8) financial innovation and payments; 9) changes in production and distribution; 10) the rise and proliferation of capital accounts; and 11) changes in demography. There is little doubt that these measures are simplifications, even if we focus only on economic considerations. Boskin calls these "satellite accounts" to traditional national income accounting techniques.

A further wrinkle is added when we consider other life improving aspects beyond economic productivity. Today, citizens of those societies that have moved beyond subsistence and scarcity seek to incorporate

[30] Shekhar Aiyar, Carl-Johan Dalgaard, and Omer Moav, Technological Progress and Regress in Pre-industrial Times, *Journal of Economic Growth* 13, no. 2 (2008): 127.

[31] Michael J. Boskin, "Economic Measurement: Progress and Challenges," accessed at http://www-siepr.stanford.edu/papers/pdf/99-15.pdf

such nonproduction factors in their evaluations of economic progress. The result has been an explosion of alternate measures of progress and the accompanying disagreement that comes with the move into subjective value arenas. This push to measure more than GDP is a product of the recognition of GDP's limitations, much like Boskin has outlined. However, the responses have been far more wide-ranging. In turn, as these broader measures gain influence in political debates, contending interests want to ensure that the means of comparison reflect their own normative policy objectives.

> Even the Noble Laureate Simon Kuznets, one of the main originators of GDP, said: "the welfare of a nation can scarcely be inferred from a measure of national income", and almost 30 years later he wrote: "Distinctions must be kept in mind between quantity and quality of growth, between costs and returns, and between the short and long run. Goals for more growth should specify more growth of what and for what".[32]

This push to go beyond GDP has resulted in an entire field of work on alternative measures of human progress.[33] The core arguments of this debate emerge in the report of the Blue-ribbon commission established by French president Nicholas Sarkozy in 2008 as part of the *Beyond GDP* movement. The prestigious panel (including several Nobel Prize winning economists) was tasked with a reevaluation of current measures of economic well-being designed to reflect social concerns beyond productivity and growth. The attention the resulting product[34] received suggests both the importance of such measures for public policy debates and the breadth of the objectives "economic" policymakers pursue as government has expanded. The panel recognized the challenge of such an effort, but also argued that it was necessary at this point:

> Another key message, and unifying theme of the report, is that the time is ripe for our measurement system to shift emphasis from measuring economic production to measuring people's well-being. And measures of well-being should be put in a context of sustainability. Despite deficiencies in our measures of production, we know much more about them than about well-being. Changing emphasis does not mean dismissing GDP and production measures. They emerged from concerns about market production and employment; they continue to

[32] Quoted in Luca D'Acci, "Measuring Well-Being and Progress," *Social Indicators Research* 104, no. 1 (2011): 47–65.

[33] Brent Bleys, "Beyond GDP: Classifying Alternative Measures of Progress," *Social Indicators Research* 109 (2012).

[34] Joseph Stiglitz, Amartya Sen, and Jean Paul Fitoussi, Report by the Commission on Measurement of Economic Performance and Social Progress, 2009.

> provide answers to many important questions such as monitoring economic activity. But emphasising well-being is important because there appears to be an increasing gap between the information contained in aggregate GDP data and what counts for common people's well-being. This means working towards the development of a statistical system that complements measures of market activity by measures centred on people's well-being and by measures that capture sustainability. Such a system must, of necessity, be plural – because no single measure can summarize something as complex as the well-being of the members of society, our system of measurement must encompass a range of different measures. The issue of aggregation across dimensions (that is to say, how we add up, for example, a measure of health with a measure of consumption of conventional goods), while important, is subordinate to the establishment of a broad statistical system that captures as many of the relevant dimensions as possible. Such a system should not just measure average levels of well-being within a given community, and how they change over time, but also document the diversity of peoples' experiences and the linkages across various dimensions of people's life. There are several dimensions to well-being but a good place to start is the measurement of material well-being or living standards.[35]

Those who seek objectives beyond economic growth want a measure that reflects the trade-offs such growth policies can impose on other desired goals. The dozens of competing measures cross several dimensions, including the human development, sustainability, human needs assessments, quality of life indices, and happiness or life satisfaction measures. As Brent Bleys notes:

> . . . concerns about both the desirability and the sustainability of continued economic growth have increased over the years. The criticisms raised can be related to three central issues (Bleys 2009): well-being (the economy is a means, not an end), economic welfare (good growth versus bad growth) and sustainability (acknowledgement of the physical limits to growth).[36]

Debates about economic measurement and models are not new. The criticisms of GDP as overly general have been around since its development. However, the new broader concerns reflected in Stiglitz, et al, are

[35] Stiglitz, Sen, and Fitoussi, Report by the Commission of Measurement of Economic Performance and Social Progress, 11.

[36] Brent Bleys, "Beyond GDP." Bleys identifies and classifies dozens of the current measures of progress, breaking them down based on their treatment of three major categories — well-being, economic welfare, and sustainability.

a more recent development that shifts measures of economic progress as an indicator of human progress from its monetary metric to a far more subjective indicator. Many would argue that economists should always have recognized the subjectivity of economic decision making embedded in such efforts. F. A. Hayek and others in the Austrian School have long maintained that economics is incapable of definitively measuring values of economic activity. Humans must evaluate goods and activity for themselves at the point of the decision. Money and other metrics can only estimate real valuation at the point of voluntary market exchange. When the measurement debate moves to the level of social decision making, much knowledge contained in these individual transactions is lost. Hayek's critique of the socialist calculation problem suggests great skepticism about the ability to resolve this dilemma, even within the narrower productivity realm. It is unlikely that the Austrians would support the adoption of even broader planning measures.

E. More subjective considerations

> "One can add up prices expressed in terms of money, but not scales of preference." Ludwig von Mises: Human Action[37]

The Austrians give primacy to the individual, so much so that their entire approach is anchored in "methodological individualism." Consequently, their approach can also be considered inherently subjective and rooted in individual (and sometimes unpredictable) observation. Unlike contemporary theorists of economic progress, however, the Austrians regard this subjectivity as a reason to *avoid* making normative conclusions and public policy prescriptions based on these observations. Making happiness, for instance, the goal of public policy makes a rather different conclusion about the role of subjectivity — effectively instantiating it *as* public policy.

Despite such warnings, there are many occasions where citizens seek reforms to the market because of normative considerations. Whether "market failure" or some other consideration, coalitions of policymakers deem that the machine of the free market should be reined in or otherwise modified. In general, we call these modifications "regulation." In short, regulation often exists to mediate the engine of economic efficiency, for explicitly normative ends. To extend Macklin's terms, it is a normative check on the descriptive aims. Economic progress is calculated, but we deliberately choose to mediate its effects when other ideals or values are at stake. We regulate to mediate, and this mediation is what we here call "regress." Regress, in this sense, does not have a particular moral valence — it is not good or bad, but is simply the deliberate decision

[37] Mises, *Human Action*, 33.

to slow down the engine of pure market forces in order to incentivize a different normative goal or outcome; local regress in a context of global progress. In its regulatory form, regress diverts resources in a way that changes incentives and might deter us from a better economic productivity outcome, but this diversion is a calculated choice.

While there is little doubt that individuals value a broad range of social activity, moves to include such measures potentially confound the clarity and the generalizability of the simpler economic metric. Thus, as a standard of measuring progress, such subjective measures may be more explanatory of the human decision process, but may also complicate analysis of progress over time as analysts are less sure if they are comparing apples to apples. It also opens up the criticism of manipulation by those designing the metric — if your measure does not produce the positive outcomes you promised in the political process, recalibrate the metric to deliver. If GDP improves, but at a measurably slower pace in the presence of regulations intended to serve other purposes than it would in their absence, should we judge the trade-off as an economic cost (an example of regress) or is it simply a more nuanced (and modern) measure of economic progress? It is beyond the scope of this essay to address this vast new literature. Instead, we want to maintain the focus on progress and regress in knowledge of the economy. While related, this suggests a slightly different perspective. In line with the Austrians, we believe such knowledge impacts the successful operation of the economy.

IV. Conclusion

> While sensible people have problems with the simplistic proposition that change is good, they have equal difficulty with the counterproposition that change is bad. Leaning toward one proposition or the other marks the difference between dispositions usually called conservative and liberal, or, as some prefer, progressive. Even the most progressive, however, allow that there are setbacks in history, that time is not the vehicle of smoothly incremental progress.[38]

In today's interconnected world, more individuals than ever before are aware of economic progress and regress as they feel its impacts more directly. As economies moved beyond their earliest period, acquired knowledge and information was no longer lost to the same extent with each demographic shift. Economic performance took off in a way inconsistent with the pre-industrial age. Frequently referred to as the hockey stick pattern of economic growth, the retention of knowledge by an increasingly diffused set of traders had an explosive effect on economic growth.[39]

[38] Neuhaus, "The Idea of Moral Progress," 2.

[39] Deirdre McCloskey, "Tunzelmann, Schumpeter, and the Hockey Stick" *Research Policy* 42 (2013): 1706–15.

This knowledge expanded in late eighteenth century with mass publishing, and so on, to be more dispersed and lead to greater diffusion of knowledge and growth. No one captured this relationship between social and economic sectors better than Adam Smith in his *Wealth of Nations* and *Theory of Moral Sentiments*.[40] For Smith, the father of modern free market economics, self-interest of economic trade provided the engine of pure economic growth and development, but the benevolence and beneficence of human beings in a social setting provided the offsetting effect on social life. Smith recognized the costs of the pure modern system would take its toll in these other arenas. He recommended public education to offset the detrimental effects of working in the factory and the potential isolation of division of labor. Individuals, who operated within the constraints of both dimensions simultaneously, could balance the effects. But, while this balancing was possible at the individual level with implications for social outcomes, such balance was far more challenging as we moved to efforts to incorporate a single balance socially.

A. GDP is flawed, but ultimately the most objective way of measuring progress

As long as the issue of economic growth or loss remains simple or if most issues are kept out of the public realm, then the process of resolving economic measurement remains tractable. However, as we incorporate many, potentially contending, dimensions into economic policy at the social level, then the lack of consensus over preferred goals or objectives creates social instability in which decision makers or special interests can manipulate the process to achieve their own preferred outcome. GDP is an overly simplified means of measuring economic progress that misses many of the values that individuals seek in their economic decisions. However, moving to incorporate competing values opens the process up to majorities (or bureaucrats/experts) determining how the well-being of individuals should be defined. In this case, we do not expect the determination to go any more smoothly than it has in the moral or cultural arenas where individual tastes divide us.

By maintaining focus on the overly simplified measure of GDP, we can continue to examine the big picture of global progress and keep the differences, and potential regress, that will emerge along more local dimensions as part of the considerations that individuals (or groups of individuals) trade off against that progress. We contend this will allow for greater comparability across nations and permit the diversity of values and objectives at more local levels and that this is most

[40] Adam Smith, *An Inquiry into the Nature and Causes of the Wealth of Nations*, Edwin Cannan, ed. [1904], Library of Economics and Liberty. Retrieved September 3, 2016 from the World Wide Web: http://www.econlib.org/library/Smith/smWN.html; and AdamSmith, *The Theory of Moral Sentiments* [1790], Library of Economics and Liberty. Retrieved September 3, 2016 from the World Wide Web: http://www.econlib.org/library/Smith/smMS.html

conducive to continued economic advancement overall. Finding consensus at the world level presents a social choice problem virtually impossible to comprehend or resolve.

Progress and regress of knowledge in each of the arenas we examine are somewhat different, but all are affected by the degree to which knowledge is dispersed and free from regulatory/authoritative intervention. There may be justifications for interrupting the mechanistic progress of economic growth, for normative reasons. Individually, people may choose regress because they believe it promotes certain normative ends, regardless of the effects on the descriptive measure of progress in that domain. Knowledge of the many differences that individuals value, however, is lost as we try to reconcile such differences in increasingly large and heterogeneous groups. We argue that it is better to make the trade-offs explicit rather than folding them into a complex metric.

In science, knowledge moves forward through scientific method that puts every finding through contested demonstration — proof requires replication for confirmation or the finding is discarded. But science is not as broad-based as economics or moral contentions, as the methodology creates a language that can limit full participation by the average person. At times, scientific progress is restricted for reasons beyond science such as the limits on work in genetics and biology, the broad political restrictions like the Cultural Revolution, the political pressure from the clergy (as in the case of Galileo), or the totalitarian limits (as in North Korea today). Training of scientists may fall between these two — where authorities decide who can gain entry, but this will only work in fairly closed society as scientists external to that society will continue to progress and challenge the restricted setting.

In economics, we see a similar scientific structure with one exception, the knowledge used to reach conclusions is even more dispersed beyond the professional class. As a result, far more individuals are aware of progress and regress as they feel the impacts more directly. This knowledge expanded further in the last few centuries with mass publishing, the Industrial Revolution, and the unprecedented growth in the intangible economy.[41] Over time, knowledge and progress itself became even more dispersed and led to greater diffusion of knowledge and growth. Not only was there economic growth, but the slope of the curve increased dramatically — leading to a graph that Deirdre McCloskey has described as the "hockey stick," where the slope of GDP (particularly in the West) rises exponentially in modernity.[42]

But as the whole population is more involved it may also make them more inclined to ask to go beyond simple economics to incorporate other

[41] Deirdre McCloskey and Arjo Klamer, "One Quarter of GDP is Persuasion," *American Economic Review* 85, no. 2 (1995): 191–95.

[42] McCloskey, "Tunzelmann, Schumpeter, and the Hockey Stick."

incentives — equality, justice, and so on — that may operate more like the cultural moral dimension. To the extent these other goals intervene through regulation, they may create local "regress" in economic progress (but may be justified or accepted if masses prefer the overall, or global, outcome). They may move economic progress away from its mechanistic or scientific basis to the cultural/moral dimension with all of the challenges of measurement it presents.

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