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THE DIALECTICAL METHOD

AND

PUBLIC/PRIVATE SECTOR PRODUCTIVITY MEASUREMENT

by

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Opinions expressed in this paper are those of the author and are not necessarily those of the U.S. Department of Justice.

BACKGROUND

In 1977, I was assigned the task of developing measures of performance for my agency - a public sector agency. I failed because I used an analytical method (cost-benefit analysis) without first assessing the underlying assumptions and philosophy of this method. I later learned that this kind of error is not exceptional but rather routine in the field of sciences. Now after study of the fields of philosophy, history of science and epistemology, my advice is that others do the same for the reward is well worth the investment.

With this paper, I will address the general performance question in a more familiar term - productivity, showing that a common measure exists for both the public and private sectors and for all producing units within both sectors. To do this I will employ a method of science known as "the dialectical method" and show how this method can be employed to measure productivity in my field - criminal justice.

UNLOCKING THE PRODUCTIVITY MEASUREMENT PROBLEMS

Recent research by Holzer and Halachmi[1]/ on productivity shows that a universal measurement scheme for productivity has not yet been found by the many researches aimed at this objective. This is true for measurements of productivity in both the public and private sectors.

Evidently the problem of measuring productivity lies in the definition of productivity which most researchers assume is a "relationship" between the output of a "producing unit" and its input. This assumption, therefore, treats the "producing unit" as if it was producing something in isolation of its environment, i.e., in isolation from the rest of the society it belongs to. When viewed in isolation and with this relational concept of productivity measurement, the current measurement technique becomes limited to that of being a measure of the <u>efficiency</u> of the producing unit. Obviously, a highly objective measure of producing unit efficiency can be attained when both its input and output are measurable using the same dimensional units (e.g., dollars). But such measurement does not avoid corruption if input and output dollars are not measured at the <u>same</u> time.

Unfortunately, nothing in a created universe is totally isolated from its environment. Thus, there is both an <u>inside</u> and <u>outside</u> to everything including a "producing unit". Here is the first key to developing a true measure of productivity. Productivity has an <u>inside</u> feature which can be called "efficiency" but it also has an <u>outside</u> feature which can be called "effectiveness" or "benefit". The concepts of cost/benefit and

cost/effectiveness have failed to assist policy makers and objective productivity measurements because they do not give ample attention to the fact that cost is a measurable found inside the producing unit whereas effectiveness (or benefit) is a measurable found outside the producing unit. This inside-outside dualism must be recognized and unified if a true productivity measure is to be found.

Now then, the economist arguing on behalf of the current method of productivity measurement in the private sector will say that the effectiveness (or benefit) for the outside is measured by the consumer when he purchases the output of a producing unit. This economist will argue that the consumer's "willingness to pay" the "price paid" is the measured effectiveness (or benefit) of the producing unit.

But this argument treats the producing unit merely as having a relationship with individual consumers and that as long as there are consumers of the output of the producing unit, the effectiveness (or benefit) is a reality and positive and hence measurable production. Here is the second key to developing a true measurement of productivity. Currently only effectiveness (or benefit) for individual consumers is measured. Society as a whole is assumed to gain nothing from productive output.

The assumption that productive units serve only individual consumers and not the society as a whole is a false assumption as shown by Carey. [2]/ Carey demonstrates with compelling empirical evidence that any society that does not increase productivity in such a way that it is becoming master of nature will become mastered by nature or by ruling despots. In fact Carey shows in "The Unity of Law" that the assumptions of the economists David Ricardo (on "rents"), Thomas Malthus (on limits to population) and John Stuart Mill (on diminishing returns) are incorrect when examined on an empirical basis. Yet these assumptions bear heavily on today's economic theory and productivity measurement.

These questionable assumptions also gave birth to the so-called law of supply and demand which has been demonstrated to be a law indeed but only for the plant and animal kingdoms. Human nature is not responsive to this law as will be shown later for the human mind is able to continually improve the human condition without limit. Additionally, Mill's law of diminishing returns is easily refuted by simply examining energy technologies. According to Mill, humans would have discovered nuclear energy first followed by natural gas and oil, followed by coal and then finally wood. Such a sequence of discovery would indeed be diminishing energy-wise with the resultant being lower populations, not the population growth seen today. But the reverse of this sequence is actually happening. Humanity is not moving backward when viewed from an energy standpoint and this trend is not limited to energy technologies.

A third key to developing a true measure of productivity is found if quality of the output of a producing unit is addressed. If, for example, heroin was made legal in the U.S. and the efficiency of the heroin producing units increased, does the productivity of these producing units increase and should such productivity increases be combined with productivity increases of, say, a food producing unit? I believe most people would say, no, to this question. The exception would be heroin users. Thus care must be taken on quality of output in structuring a measure of productivity if the measure is to be a true measure rather than one resting only on opinion. When producing unit output is found not to be a contributor to national level productivity measures, it belongs in the opposing, "not-productive" category usually referred to as "overhead". Since overhead is entropic, it counters productivity increases. Accordingly, overhead must be minimized if productivity gains are to be fruitful.

A fourth key to locating a true measure of productivity is found by noting that current attempts at productivity measurement often view production factors in isolation rather than as a unified system. For example, the two basic inputs of producing units, labor and capital, are often considered separately resulting in phrases such as "labor productivity" and "capital productivity". Considered separately, these two quantities are generally used to compare one producing unit, for example, with another competing producing unit. But the real unanswered questions are: "how does one concatenate labor and capital productivities and how can the resultant concatenation be representative of total productivity?"

In the private sector, concatenation of labor and capital is simply assumed to be the process of "addition" where outputs and inputs are measured in dollars. But is the use of the dollar in these measurements correct? The answer is "yes" if increasing dollar outputs, that are produced by fixed or decreasing dollar costs of inputs, are known to be representative of productivity increase. But how does one know that a one-to-one relation exists between productivity increases and producing unit output increases when this output is measured in dollars? The answer is that such a relation has never been found and we would not expect to find one unless the dollar remained as fixed as the speed of light. Since the value of the dollar itself varies, any other variable (e.g., productivity) measured with respect to it would be severely corrupted. Therefore, relationships between productivity increases and the dollar are highly questionable. If producing unit outputs are to be aggregated monetarily, a more stable monetary source, e.g. gold, would be needed.

In the public sector, the concatenation of labor and capital productivity is also possible by addition but only if measured relative to the same output. However, it is impossible to

compare one public producing unit with another as is done above for the private sector because the outputs of public agencies are not measurable in dollars. Any comparison at all is left to personal judgments and this inability to compare public expenditures objectively is the major source of taxpayer debate.

A fifth key to developing a true measure of productivity is found by noting that in current productivity measures, the notion of "progress" does not have a well defined relationship with productivity variations. The question is: do variations of productivity relate to variations of progress and if so, what is it that is progressing? Is the producing unit progressing, is the consumer of the output of a producing unit progressing, are both progressing or is society progressing? It seems as though productivity increases should addresses all of these and that such increases should produce progress for the producing unit, individual consumers and society.

Finally, a sixth key to developing a true measure of productivity is found by noting that past researches on the subject do not cite the most fundamental research done to date on measurement foundations. One does not see citations of the writing on measurement found in Plato's Philebus Dialogue,[3]/ the work on measures by Riemann[4]/ which led to Einstein's relativity theory, the work by Nicholas of Cusa[5]/ on maximum and minimum variability nor the more recent work of Krantz[6]/ et al. (the latter which addressed measurement in the soft sciences). While this latter research "throws in the towel" on measurement in the soft sciences, it would not have had to do that had the researchers given proper attention to the work of Plato and Riemann on variability and measurement. The work by Cusa is probably unknown to most researchers since his work is only recently being translated into English.

In summary, past and current research to uncover a measure of productivity have been unsuccessful for the following reasons:

1) lack of attention to the difference between the inside and outside of a producing unit.

2) attention only to individuals as the consumers of a producing unit and thus missing society as a whole as a consumer also.

3) lack of attention to "quality" of the producing unit output and to whether producing unit output is "productive" or "overhead".

4) lack of attention to the unity of labor and capital employed in a producing unit and to the joint purpose of labor and capital.

5) lack of attention to the relationship between productivity and progress and to just what should progress as productivity is increased.

6) lack of attention to important measurement foundations discussed by past researchers.

Now let's move toward a solution to these problems.

THE UNDERLYING PHILOSOPHY

One truth of the physical world is that it is entropic. This is proven by the 2nd Law of Thermodynamics. Chemistry students know of this entropy as the process of "oxidation". We see it when a rain gutter rusts and so also does a farmer as his land becomes unfertile if he does not recharge it with organic material and fertilizers. In general, increasing entropy implies decreasing organization (chaos) and decreasing diversity.

Following from this truth is a 2nd truth: In any society, physical resources (matter) are limited and continually depleting but only if the level of technologies employing these resources remain fixed (constant with no advancement). From these two truths, the following conclusions can be made:

> With a fixed level of technology, a society is entropic and must continually lower its living standards. Expanding populations, at constant or increasing standards of living, can be accommodated only by advances in those sciences and technologies which produce productivity increases. Such advances can be produced only by the human mind. The human mind is thus the non-physical, negatively entropic resource which has the potential to counter physical entropy.

In chemistry, the process of negative entropy is known as "reduction" and when a farmer measures the "redox potential" of his field soil, he is measuring how productive his soil will be given normal sunlight and rainfall.

From an epistemological standpoint, the only true knowledge is that knowledge which counters physical entropy. The current scientific process of theory development and subsequent validation of theory by experiment followed by a claim of proof is only a small part of the truth process. Truth seeking is a dialectical process that never ends. In a society whose hope is to survive, the field of economics will serve the society best by linking the physical sciences to the social sciences assuring over the long term that human life sustaining productions exceed consumptions.

That new science gives birth to new technologies and that new technologies provide the potential for productivity increases is not a new discovery for this relationship has been known since man made his first tool and discovered and mastered fire. Unfortunately, this relationship is sometimes forgotten with the result that productivity stagnates. The economist, Thurow, has recently recognized this relationship as seen in his recent article [7] calling for more education and technology. But new science is also needed.

IMPORTANT SCIENCE HISTORY

The lack of success in all kinds of measurements, including productivity measurement, can be traced to the continual debate concerning the correct method of science. This debate began 2400 years ago in ancient Greece and still goes on today.

A review of the ancient Greek writings by Aristotle and Plato will reveal that both of these famous writers targeted much thought on variables viewing them through the concepts of opposites (often called dualisms).

The dualisms (opposing concepts) which appear in the above truths and conclusions are:

mind - matter
nonphysical - physical
negentropy - entropy

There is a difference, however, between Aristotle and Plato on how they handle opposites. Aristotle views them using logic whereas Plato views them in unity. Therefore, with Aristotle only one of a pair of opposites can be true at the same time. This leads to the logical concepts known today as "thesis" and "antithesis" and the "principle of the excluded middle." In other words, with Aristotle, there is no middle or continuum connecting opposites. Aristotelian opposites stand in isolation as "things of and by themselves" (absolute singularities). If one of the opposites is true its opposite must be false. Thus, if one views things in the world using logic admitting also that these things have both an inside and an outside, the truth that emerges is that everything is opposed to everything else- a most unusual situation indeed.

With Plato, opposites coexist simultaneously as truth. Thus opposites are connected with a middle or continuum called the "becoming" or "to be" region by Plato. This middle or continuum represents a mixture of the opposites which lie at the extremes of the continuum. This continuum represents continuous

variability and Plato shows in his Philebus Dialogue how to meter this continuum by locating the agent that causes the "to be" to become "what is" on the continuum.

For example, as heat (the cause) moves to and from the outside and inside of water, the water's "hot-cold" continuum is metered by temperature and water is "effected" to become "what it is" (solid, liquid, gas or plasma) at different temperatures. The presence of such phase changes also shows that the effects found on any continuum are always related to their causes in a non-linear manner. (According to Plato there is only one dualism, that when mixed to form a triad, has no casual agent. He discusses this in his Timaeus Dialogue.)

This Platonic method of treating opposites leads to what is known today as synthesis (unity of thesis and antithesis). It was employed by Socrates and is sometimes called "the Socratic Dialogue" or "the dialectical method." The method is also sometimes referred to as "unity-of-opposites" and compares with the Aristotelian alternative referred to as "struggle-of-opposites". In the orient, the Aristotelian viewpoint is called ying-yang.

Noteworthy is that with Aristotelian logic, a variable can have only two states - an affirmation and its negation. This principle is the ground floor of today's computer analysis program known as logit. On the other hand, Plato's method allows variables to have an unlimited number of states. That the two-state variable is not a reality of nature, but rather only a mathematical phenomenon (called the step function), can be seen by noting that nature abhors discontinuities. If for example, one could pass from an affirmation to its negation in zero time the Platonic "middle" would be excluded. This causes an ambiguity for both the affirmation and its negation would be true <u>at the same time</u>. This ambiguity is the cause of "Gibb's Phenomenon" in truncated fourier analysis.

That a variable in nature cannot be in two states at the same time is seen when melting ice reaches $32^{o}F$ and when freezing water reaches $32^{o}F$. At $32^{o}F$, water cannot be both a liquid <u>and</u> a solid. Thus there is always a middle in-between opposites and this middle is referred to in the literature today as "phase-space". Phase-space is a concept that was well developed by Plato in his Parmenides Dialogue. This mixing of opposites also seems to be the reason why ancient Greeks were very interested in proportion or ratios such as Golden Mean Ratio.

Further work on the Platonic method of synthesis is then seen in the aforementioned work of Nicholas of Cusa. Cusa addresses the variability of <u>any</u> continuum bounded by a pair of opposites. He does this not in an "unlimited" sense but in an "infinite" sense. By positing an absolute maximum for any continuum representing

variability between a unity of opposites, he finds that the absolute maximum must also be absolute minimum. He thus finds that all continuums are bounded on the two extremes by an invariant (absolute maximum and absolute minimum). This coincidence of logical and absolute opposites he calls the Infinite One (absolute singularity). Cusa thus locates the unity of the invariant-variant and infinite-finite dualisms. His analysis of the infinite also locates for geometry the unity of the curved-straight dualism which set the stage for Kepler's laws of planetary motion and the unity of differential-integral calculus by Leibniz.

Riemann then follows this work of Cusa to create his famous paper linking the notion of quantity to the notion of variability in multiply connected manifolds and identifying "discrete" and "continuous" manifolds which apply to "counting" and "measuring" respectively. By this time Kant[8] had already shown the limits of logic in his four famous antinomies forcing the scientific community to move away from logic and back into "the dialectical method". George Hegel's dialectical idealism, Karl Marx's dialectical materialism and Friedrich Schiller's dialectical monism, the latter a synthesis of the methods of dialectical idealism and dialectical materialism, are exemplary of applied dialectics. Unfortunately, Marx was rather inconsistent when employing dialectics for he posits the "always variant" Epicurean thesis of the universe and the "always matter" materialistic thesis without their antitheses. These errors force Marx into atheism and a physical world having entropy only. Such a world is absent purpose making dictatorships a necessity to prevent anarchy.

USING DIALECTICS TO MEASURE PRODUCTIVITY

The new measurement of productivity must employ dialectical methods which unify opposites by a connecting continuum. When viewed dialecticly (synthesis), the aforementioned three dualisms can be placed on continuums where the dualism particulars are the extremes and the "in-between" region (the continuum) represents variability, a mixture of the concepts lying at the extremes. The position of the effect found on the continuum is determined by an outside cause. This sketch represents these syntheses:

Mind	Continuum	Matter
Nonphysical	Continuum	Physical
Negentropy	Continuum	Entropy

The continuums represent variability between the extremes and, as Riemann shows, are metered by a causal agent found somewhere outside of the triad represented by the two extremes and the middle.

These syntheses indicate that societies (the effect) have variability on numerous dimensions and that they differ basically according to their mastery of the physical world (nature). The aforementioned truths and conclusions also show causality in that a society's position on the continuum depends only on the society's level of science and technology. Societies tending towards the left side are mastering nature (their environment), have high standards of living and can increase population whereas those on the right side have opposing characteristics. The left side also reflects an advancing nation whereas the right side represents backward, uncivilized nations.

When heat changes solid ice to liquid water, the laws of solids become illogical and the laws of liquids become logical. In a similar manner societies enter new phases that "turn accepted logic on its head" due to the aforementioned non-linear relation between the effect seen on the continuum and its cause. For example, it would be illogical to heat a home with wood in a society that has effected a nuclear energy based economy as a result of wood shortages and the availability of nuclear science sought to overcome the shortage. Here is an example of the reality of the "struggle-of-opposites", the empirical manifestation of society's development by self-movement as a "unity-of-opposites." Accordingly, if productivity measurement is to be related to progress, new and progressive productions must be separated from old, declining productions. The new and progressive productions provide a measure of the rate of change of society- a predictor of the future direction and health of a society.

Henry Carey, advisor to Abe Lincoln, was a prolific student of the freedom-slavery dualism. In his books, "Unity of Law" and "Principles of Social Science", he employs synthesis on this dualism as is done above to get the following continuum:

Freedom _____ Continuum _____ Slavery

In his works, Carey provides compelling empirical evidence from ancient times, that freedom of societies increases as they become more and more masters of nature and that they become more and more enslaved to nature and rulers when mental progress diminishes or is not existent to produce productivity increases.

The productivity measurement to be developed must meter the entropy-negentropy continuum which reflects with one-to-one correspondence on Carey's freedom-slavery continuum. Bearing in mind that increasing productivity leads to decreasing entropy and

that the causal agent moving productivity upward is science and technology, one merely needs to get a quantitative handle on living standards and population growth since these two variables are exchange variables under conditions of productivity increases or decreases. In other words, productivity increases provide a society with two clear benefits - increased standards of living or increased populations. Obviously, both can be increased if productivity increases are sufficiently large.

But increasing productivity provides a third benefit to a society and that is the continued existence of it. As new members of a society are born and old ones die away, continued productivity increases provide for the continuity of the society itself. History has shown all too often that societies and nations come and go and that those which go out of existence became stagnant technologically and eventually enslaved to nature via limited physical resources. The continued existence of all of humanity will eventually be tested, for if humanity has not advanced far enough to locate a new sun by the time our's burns out, human life as we know it will cease. Therefore, space science and technology will be the cause that frees humanity from slavery to the nature of planet earth. Only with dialectics does one comprehend the continuous struggle of freedom against all forms of slavery.

Now then a true measure of productivity can only be developed if labor and capital are considered to be a unified concept. And note that these are opposing concepts for capital is artificial labor and hence the negation of labor. As such, labor and capital are also represented by a continuum bounded by the labor and capital extremes where the continuum measures the mix of labor and capital in a society. Therefore, a capital intensive society is a must, not a goal. However, such a society is not possible unless labor is continually elevated in skills to produce and maintain such a society. This is the harmony of interests between labor and capital showing also the necessity for education.

CAPITALISM - A MISUSED TERM

The term capitalism is misused when viewed with respect to such terms as socialism and communism. When the human species made its first fire (not tool for animals also make tools) is when humanity passed into a new phase-space which allowed large population growth. Until that time populations were limited to hunting and gathering societies that were enslaved to what nature would give them. Carey interprets the Biblical story of Adam and Eve in a different way by saying that Eve did not sin by taking the fruit from the Tree of Knowledge but rather because they did not improve their condition and were enslaved to nature and thus had to take it.

This new phase of humanity which we call capitalism is a necessary phase for humanity because it increases the power of labor. Such power increases the number of people in a society that can attend to new science and technology needed for continued productivity increases and for continuity of a nation. Interestingly, such increases in the power of labor were the target of Leonardo daVincis' studies of horses (horse power) and hydrodynamics (water power) and the invention of the principle of least action and the word "technology" by Gottfried Leibniz. To Leibniz, technology is the study of alternative techniques to increase the power of labor.

When capitalism is viewed as a unity of labor and capital, as dialectics views them, it is correctly viewed and sets the stage for a true measure of productivity and a true definition of capitalism.

MEASURING CRIMINAL JUSTICE PRODUCTIVITY

It is easily seen that a single, timeless and rather simple productivity measure can be developed for both the public and private sectors. The specific productivity measurement of the criminal justice system (CJS) should be developed within the overall concept of productivity presented above. In the case of CJS productivity, additional factors must be considered.

First, if criminals are not included with CJS employees as the total number of personnel, productivity measures relating to CJS employees represent the "inside" or efficiency side of CJS productivity. With this in mind, criminality would then represent the outside or effectiveness side of the productivity question. Thus crime reduction and CJS efficiency must be captured together in the CJS productivity measure. And although Auchter[9] found that 75% of court managers did not agree when queried on the question of CJS responsibility for crime reduction, this response must be totally reversed. Otherwise what unit is responsible for CJS contribution to productivity of the nation if not the CJS itself? With no "outside", the CJS has no effectiveness or benefit measure. What then is it producing? The CJS must produce crime reductions otherwise it is merely "a thing of and by itself."

PRODUCTIVITY IS SYSTEMIC

The aforementioned work by Carey provides us with a rich source of dualisms relating to productivity increases. Some of them cover social variations as well as economic variations on both

the micro and macro levels. Special attention should be given to the utility-value, centralization-decentralization, trade-commerce and unity-diversity dualisms (the latter concerned with divisions of labor).

The actual measure of productivity sought should result in a systematic set of dualisms known to have a systematic tendency with respect to the amount and direction of movement on their associated continuums as the casual factor of movement, science and technology, varies. (Here science and technology is meant to include both hard and soft sciences and technologies.) This system of dualisms must measure "quality of life" and the "quality of life potential"- the latter a measure of what can be expected in the future. This measurement system is similar to those systems used in the field of medicine to assess bodily health or syndromes of sickness.

THE UNITY OF COMMERCE, RELIGION AND RESPONSIBILITY

Finally, since the U.S. guarantees freedom of religion, it also guarantees that no specific religous beliefs be imposed. Productivity and productivity measurement must thus be freed from all religous dogma. This freeing is accomplished simply by insuring that the major purpose of productivity increases is tied directly to continuity of the U.S. Continuity of society is a "must" for all religions in a free state and as such no rational human could disagree that productivity increases are a necessity and a required condition for any kind of freedom.

Without question freedom and responsibility walk hand in hand. Irresponsibility in a society, such as criminality, merely increases society's "overhead" forcing the whole society away from freedom and toward the opposing direction of slavery. The resulting lack of freedom takes away "freedom of thought"- the only process by which physical entropy is countered. The conclusion one arrives at about freedom is that it has no cause other than itself. As such, freedom is an absolute singularity- "a-thing-in-itself" having no outside. Freedom thus provides its holder with an unlimited self-determination. This finding is further proof that the founders of the U.S. were correct by saying that "liberty" is a self-evident truth in the Declaration of Independence. One now also sees that the sequence of rights in the "unalienable rights" clause of the Declaration is not arbitrary and also why the founders knew that freedom of religion would require the unifying force of commerce. However, not all commerce is responsible commerce. Only that commerce which supports or directly produces productivity increases and does not contribute to overhead can be placed in the "responsible commerce" category.

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