

Data: a critical perspective

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“Cram them full of non-combustible data, chock them so damned full of ‘facts’ they feel stuffed, but absolutely ‘brilliant’ with information. Then they’ll feel they’re thinking, they’ll get a sense of motion without moving. And they’ll be happy...”

Ray Bradbury ([1954], 2018), *Fahrenheit 451*.

Introduction

According to Klein and Morgan (2001, p. 1), “Since the late nineteenth century, measurement has been an integral part of economics”. Currently, based on powerful information technologies and software development, we live in the era of big data and its misleading “data science” without theory or “theory-free”. That being the historical setting, we have normalised living in a tyranny of metrics, i.e. in an age of mismeasurement, over-measurement, misleading measurement, and counter-productive measurement (Muller, 2018, p. 4).

Using as a backdrop the measurement in economics approach (Boumans, 2007), we will develop a critical perspective to data. To thoroughly accomplish it, we will first revisit the main characteristics of economics –and the classes of data produced and consumed by it as an empirical and pseudo experimental science. In this regard, we will be forced to address major issues, among others the non-neutrality of measuring instruments and its epistemological limits. Secondly, we will develop the gross domestic product (GDP) as a case of measurement “with theory” and the consumer price index (CPI) as a case of measurement without theory. Thirdly, we will close with recommendations to overcome the “often” application of “non-scientific methods” (Lequiller and Blades, 2014, p. 39) by statistical institutes –provoked by, as we will exhibit, the axiomatic imposition of equilibrium (Arnsperger and Varoufakis, 2022).

Labelling economics

Economics, much like any other discipline, is inherently social and historical. It is also an empirical science unlike, for example, theoretical quantum physics, and a pseudo experimental one –for a moment, let us think about the arguments behind the title of Sims’ (2010) paper, *But economics is not an experimental science*.

Our science is empirical because its objects of study –economic processes with their inputs and outputs, the many results, and so on– exist outside our heads. For example, in his *Guide to Griliches*, Nerlove (2001, p. F425) wrote, “Economics is an empirical science and thus concerned with the real economic world”.

As no other branch in our science, *ecological economics* correctly focuses on its socio-empirical basis (Vianna and Missemmer, 2023, p. 4):

... the economy is not above ground; it is embedded in society and in the natural world. There is no economic process or economic action disconnected from social relations and material constraints. All human activities take place in a social context and on planet Earth.

In botany –an experimental empirical science–, a flower falling from a tree, like a cherry blossom, stands as an object of study. Quite the opposite, in our socio-empirical discipline, we have to literally *recreate* our objects of study. To that end, long ago, economists became tool makers (Morgan, 2001, pp. 236-7):

We don't see a macroeconomy, a consumer price index, or an individual choice decision; hence, fashioning measuring instruments in economics has been, in part, a matter of developing ways of observing the economy.

Thus, data are, no more no less, a form of recreation of our objects of study and are not, in any sense, the result of controlled experiments carried out in a laboratory. The data roots in economic theory and its practice. As a consequence, as producers of data, caution must be exercised when handling instruments to the extent it may be difficult to distinguish (Boumans, 2005, p. 121) “between the facts about the phenomenon and the artefacts created by the instrument”. Or to quote our favourite post-Keynesian (Lavoie, 2008, p. 9):

The word artefact carries several definitions. The most common definition, relevant to science, says that an artefact, or artifact, is a spurious finding caused by faulty procedures... The word artifact is also used in the fantasy literature. In the fantasy and sorcery literature, an artifact is a magical tool with great power, like a magic wand.

Moreover, from our point of view, over time, economists, other professionals, and citizens alike have become carefree consumers of data. Regrettably, the diagnosis proposed by an insider is bleaker than ours (Bos, 2007, p. 7, and 2013, p. 4):

The problem is that national accounts are a language not very well spoken and understood anymore. This applies to economic researchers, policymakers and national accountants alike... The widespread illiteracy in national accounting among researchers should, therefore, be regarded as a threat to economics as an empirical and policy-relevant science.

We still need one more “label”. Following English political economy and its critique, notably Adam Smith, David Ricardo and Karl Marx, we must emphasise that, ontologically speaking, economics is also *political*.¹ Wealth, as Mr. Hobbes says, is (purchasing) power, the starting point of Smith's

¹ In their book *Approaches and Methodologies in the Social Sciences: A Pluralist Perspective*, della Porta and Keating (2008, p. 353) point out that ontology “...refers to the study of the essence of a certain phenomenon (i.e.

commanded labour theory ([1776], 1904, p. 31), scaled in terms of quantity of labour by Ricardo and surpassed by Marx from his definitions of value and surplus value. And certainly not in a special way since each and every (human) science is social, historical and political –without exception. As a corollary at this point, we must demystify the working of scientists (Han, 2022):

Scientists no longer tackle the social context of knowledge. They are doing positive research. Every knowledge takes place within a power relationship, and under power relations, new knowledge and discourses are generated. Knowledge is always embedded in a power structure. Simply today, positive research is done without recognising that one is under the spell of that power and without reflecting on the social context of knowledge.

Once economics is suitably characterised, we are in a position to address the type of data produced and consumed in our science. As follows from the discussion above, this major issue revolves around the epistemology – “how we know things” (della Porta and Keating. 2008, p. 22) – required in economics as a socio-empirical and pseudo experimental science.

The non-neutrality of measuring instruments

Measurement in economics has been developed and implemented by beautiful minds in our science. The major contributor is, without a doubt, Trygve Haavelmo. Certainly, other authors will be mentioned, for example, Angus Deaton, Richard Stone and, notably, Tjalling Koopmans.

Haavelmo (1944) entitled section 3 of his seminal monograph “*Observational*”, “*true*”, and *theoretical variables; an important distinction*. For all intents and purposes, the Nobel award-winning, who offered the foundations for the probabilistic revolution in econometrics, put the first two adjectives in quotation marks but not the word *theoretical*.

First, Haavelmo (1944) did not put the adjective *theoretical* in quotation marks because the starting point of the recreation of our objects of study as data is the theory. The other case would represent mere empiricism. Hence, initially, we assume that data are founded on theoretical definitions. Moreover, as practitioners, we should explore the kind of correspondence between their theoretical and accountant definitions, that is, at the extremes, weak or strong (Juselius, 2008, pp. 6-7). But believe it or not, in economics, we have remarkable examples of “measurement without theory” –the business cycle is the classical one (Koopmans, 1947), and the consumer price index is a modern case which will be examined later.

Second, and by extension, the act of indirect observation, as we economists do, and the instruments involved are not *neutral*. That being the case, what we have at hand, for example in the National Accounts (NA), are estimated values simply because only after *ad hoc* conversion processes are

without considering its specific variation)”. In this sense, neoclassical theory has emptied economics of content, replacing it with quackery and ideology (in French, *charlatanerie idéologique*). Bernard Maris, former member of the General Council of the Banque de France (2014, p. 14) wrote in the following terms: “Diabolical and sinister, economics is the ash with which our age covers its sad face. In a few decades, a century from now, before perhaps, it will seem implausible that a civilization could have attached so much importance to a discipline that is not only empty, but also utterly boring... A discipline that had only its own contradictions as a science and only its contradictions as a matter of rationality, economics would end up revealing itself as an incredible ideological quackery that was also the morality of an epoch.”

observations converted into measurements. Third, statistically speaking, the adjective *true* immediately draws attention to the measurement bias –the gap between the measured values and the true ones.

As the reader has already discovered, here we are not initially distinguishing the classes of data according to whether their generation process is deterministic or stochastic, but instead being consistent with our approach, highlighting their theoretical foundations.² That said, we should point out that the objects of study in economics are stochastic processes, and so, the routine application of algorithms, i.e. mathematical instruments, for seasonally adjusting and for extracting the trend, among other examples, contradicts their probabilistic nature.

A well-known instrument behind the bulk of available data is, in our current world, the complex survey. Still others are implicit and undervalued in terms of their implications, first and foremost the *aggregation instruments*. Regarding the book that founded the advanced literature of *index numbers*, Foster wrote (1922, p. vii):

In the future, we must substitute measurement for guesswork. Toward this end, we must first agree upon instruments of measurement. To the Pollak Foundation for Economic Research, it seems fitting, therefore, that its first publication should be *The Making of Index Numbers*.

In the sciences, theoretical insights precede the inventions of measuring instruments and, evidently, the act of measuring itself, not the other way around. That is how homo sapiens' mind operates. The title chosen by Maas (2001, p. 277) for his chapter is then misleading, *An instrument can make a science: Jevons's balancing acts in economics*. In contrast, Muellbauer's statement is forceful (1976, p. 32): "index numbers are not 'neutral' statistical indicators".

Hence, *how* do we know things? Firstly, never lose sight of the characteristics of economics as a science. Secondly, and as a consequence, acknowledging that, although there is a permanent recursive process between the theory and practice –the act of measuring in our case–, the "force of abstraction" (Marx, [1867], 1887, p. 6) is its origin.

The best ancient example is the work of Sir William Petty. According to Stone (1997, p. 30 and p. 31), Petty's *Verbum Sapienti*, published in 1665, constitutes "the first complete and consistent set of national accounts ever to have been made... a landmark in economic history". A few years later, Petty published his *Political Arithmetick, or A Discourse* ([1671], 1899, p. 244, Capital Letters in the original), in which he first proposed the use of data in economics:

The method I take to do this is not yet very usual, for instead of using only comparative and superlative Words and intellectual Arguments, I have taken the course... to express myself in Terms of Number, Weight or Measure; to use only Arguments of Sense, and to consider only such Causes, as have visible Foundations in Nature; leaving those that depend upon the mutable Minds, Opinions, Appetites, and Passions of particular Men, to the Considerations of others.

² Granger explains the different nature of deterministic and stochastic processes, and thus of the bricks (or the pieces of legos) of mathematics and statistics (2003, p.1): "One can begin with the ancient subject of Mathematics which is largely concerned with the discovery of relationships between deterministic variables using a rigorous argument. (A deterministic variable is one whose value is known with certainty.) However, by the middle of the last millennium it became clear that some objects were not deterministic, they had to be described with the use of probabilities, so that Mathematics grew a substantial sub-field known as 'Statistics'."

Marx ([1857], 1999, p. 27, our *italics*) also had words of praise for the same writer: “Petty regards himself as the founder of a *new science*... His audacious genius becomes evident, for instance... the father of English political economy”. Similarly, according to Hillinger (2007, p. 5): “It is no exaggeration to say that modern economics begins with measurement. This statement refers to William Petty and the ‘political arithmetic’ he created.”

Considering the aforementioned insights, we have to properly assess Petty’s method and, by extension, the recursive process between the theory and practice in economics –that is, to point out its limitation from an epistemological point of view to the extent *data* constitute a recreation based on theoretical understandings and, in second place, are the output of the utilisation of biased measuring instruments.

Measuring “with theory”

The Gross Domestic Product (GDP) equals the sum of the gross values added plus taxes on products net of subsidies. On its key component, we should highlight the following (European Commission et al., 2009, p. 95 and p. 103, our *italics*):

Value added represents the *contribution* of labour and capital to the production process... As value added is intended to measure the value created *by* a process of production, it ought to be measured *net* since the consumption of fixed capital is a cost of production.

A minor correction, value added is not created *by* but *during* the production process. Noticeably, this phrasing fails to differentiate neoclassical theories of production and distribution –which is saying something, but not only. It assumes the empirical validation of its distribution hypothesis, namely that marginal products determine the functional distribution of income.

Although it is trivial to define a mathematical function and to calculate its partial derivatives, Cobb and Douglas (1928) did not confuse the economic content under discussion. In other words, they did not merge the theories of production and distribution. Their seminal paper was narrowly entitled, *A Theory of Production*.³ In contrast, Sumner Slichter, the commentator assigned to discuss the paper during the meeting of the American Economic Association, weighted the arguments differently (Biddle, 2012, pp. 225-6):

Despite the fact that the marginal productivity theory was not explicitly mentioned in the paper, Slichter thought he could see a hidden agenda, and he did not approve: “Professors Cobb and Douglas conclude that it has been statistically demonstrated that the relationship between the agents of production on one hand and the volume of output on the other meets the requirements of the marginal productivity hypothesis.”

We should then distinguish the process of production, in which the value is created, from the process of circulation, in which it is realised through exchange and distributed through price fixing. The net

³ Just for the record, the Nobel Solow (1956, 1957) explicitly distinguished the sphere of production and the sphere of distribution. The processes of production and distribution, and also of consumption and exchange, are elegantly analysed, based on dialectical logic by Karl Marx [1857] in his *General Introduction to the Critique of Political Economy*.

value added compiled by the statistical agencies only reflects its *appropriation*, not its generation by the capital (sic) and labour, nor its distribution following the rule of marginal products –whether strictly applied or for example nuanced according to a post-Keynesian perspective.

No matter the route taken by statistical institutes in their attempt to estimate value added, “random” errors and biases occur in both, the sizes of which are unknown (Commission of the European Communities et al., 1993, p. 491):

As value added at constant prices is equal to the difference between output at constant prices and intermediate consumption at constant prices, it is affected by measurement errors in both series. Assuming that such errors are at least partly random, the errors will tend to be cumulative, making value added extremely sensitive to error... it may be better to abandon the attempt to measure value added as the difference between two series subject to error and to try to estimate the volume movements of value added directly using only one time series, i.e. a “single indicator” instead of double deflation. Although single indicators may be biased, they are much less sensitive to error.

All of the above assumes the availability of “adequate” price indices. The recommendation concerning the estimation of value added in net terms is not a neglected accounting detail but addresses the most relevant issue in economic science, namely the *generation of value* (European Commission et al., 2009, p. 34):

In principle, the concept of value added should exclude the allowance for the consumption of fixed capital. The latter, in effect, is not newly created value but a reduction in the value of previously created fixed assets when they are used up in the production process. Thus, theoretically, value added is a net concept.

Only labour creates (new) value; the rest of the inputs required during the production process –capital, energy, raw materials and services– merely transfer it. The mainstream theory willingly disregards the above to assert that physical capital also creates value, in accounting terms the operating surplus. In doing so, it prefers to acknowledge a fundamental theoretical weakness and a collateral damage, i.e. it negates its ability to distinguish the gross part from the net part of the value added (European Commission et al., 2009, p. 103 and p. 95):

Consumption of fixed capital is one of the most difficult items in the accounts to define conceptually and to estimate in practice... consumption of fixed capital can be difficult to measure in practice, and it may not always be possible to make a satisfactory estimate of its value and hence of net value added.

As hard as that is to admit it, the claim that physical capital creates (new) value once its gross value is deducted represents a non-scientific statement. By extension, the entirely NA system is contaminated by its “net aversion” and, as a result, the main variables and accounts are mismeasured, among others: intermediate consumptions and outputs (the input-output tables), the three approaches to domestic product, capital formation (capital account), and operating surplus (income account).

The *reliability* of data is characterised by three qualities: invariance, accuracy and precision (Boumans, 2007, p. 4).⁴ On this subject, Lequiller and Blades (2014, p. 39, *italics* ours) pointed out the following:

⁴ Boumans (2007, p. 4) clarifies: “The difference between invariance, accuracy and precision can be illustrated by an analogy of measurement with rifle shooting, where the bull’s eye represents the true value of x. A group of

National accounts could better be called “national accounts statistics” because, without this qualifier, users may think they are as reliable as the business accounts of a company. This is not true. In particular, while GDP for technical reasons is often expressed in millions of units of the national currency, users should be aware that they are very far from being accurate at the level of millions... Indeed, national accounts, particularly GDP, are not the result of a single big survey for which one might compile a confidence interval. They are the result of combining a complex mix of data from many sources, many of which require adjustment to put them into a national accounts database and which are further adjusted to improve coherence, often using *non-scientific methods*.

It may seem curious that the OECD publishes a textbook. We believe that its intention is to draw attention to the urgency of improving statistical practices to the extent that the fulfilment of its mission, the detection and dissemination of “effective” policies, requires much better data. While the last sentence of Lequiller and Blades (2014, p. 39) will be rejected by any agency, it must be profoundly disturbing to the reader.

Measuring without theory

Koopmans (1947) labelled Burns and Mitchell’s efforts to analyse the business cycle as “measurement without theory”. By the way, according to Hendry and Morgan (1996, p. 8), although Mitchell was regarded as one of the main exponents of quantitative economics in the early twentieth century, he did not adopt statistical ways of thinking; “Instead, he was an empiricist who adopted quantification as a natural tool for gleaning evidence in economics”.

The following quotation summarises Koopmans’ approach (1947, p. 162):

Fuller utilisation of the concepts and hypotheses of economic theory (in a sense described below) as a part of the processes of observation and measurement promises to be a shorter road, perhaps even the only possible road, to the understanding of cyclical fluctuations.

Around the measurement without theory debate, we find the labels used to describe economics as a science, i.e. power structures, competition for financing, and (human) egos. Again, citing Hendry and Morgan (1996, p. 69):

This was an intellectual argument between the Cowles Commission (where Koopmans was a senior research figure, soon to become Director) and the National Bureau of Economic Research (NBER), against a backdrop of both groups seeking funding for their work, the Cowles in theoretical econometrics and the NBER for applied economics.

shots is precise when the shots lie close together. A group of shots is accurate when it has its mean in the bull’s eye. When during the shooting the target remains stable this is a matter of invariance.”

The aim of the theory of index numbers is to propose “solutions” to the index number problem. Sydney N. Afriat (2005, p. 21), the “guru of price index” (Deaton, 2005, p. xvii), understands the problem we are dealing with as follows:

... the only authority for the present is the past. In early economics, the correct price or wage is simply the price or wage that has been settled by custom and has the value which, so far as anybody can remember, it has always had... Price indices express respect for that authority. They offer a kind of exchange rate between £s in different periods... A force acting on what a wage should be this year is what it was in some former year converted into this year's £s. Sums today are measured by a yardstick which has reference to the past. The ‘index number problem’ can be understood as the problem of fashioning such a yardstick.

Currently, there are two competing calibrating instruments to conceptualise the CPI (Guerrero, 2017). The first one is based on a sort of simplistic view of the CPI as a fixed basket of products priced in successive periods, i.e. a cost of goods index (COGI). In this regard the European Central Bank on its website states that:

Conceptually, the Harmonised Index of Consumer Prices is a Laspeyres-type price index rather than a cost-of-living index. Nevertheless, the HICP is not a strict fixed-basket index. It measures the development of prices over time for fixed “consumption segments”, sets of consumer expenditures that serve a common purpose. Although these consumption segments are fixed, the specific products that are included in particular segments may change over time. In other words, certain items may exit the basket, and new ones may enter as they become relevant to household consumption expenditure. In any case, the conceptual differences between the two types of price indexes do not generally lead to substantial differences in practice.

Extending Arrow (1958, p. 78), we would say that the COGI approach merely shows a “banal tautology” analogous to “national income is that which is measured by national income statisticians”. The second calibrating instrument, the so-called (Konüs) Cost of Living Index (COLI), is based on a microeconomic orthodox point of view, according to which a CPI measures the change in expenditures a household would have to make in order to maintain a given standard of living.

To minimise criticism regarding potential errors and biases, statistical authorities around the world embrace a COGI approach. On this subject, the following quotation is blunt (International Labour Organization et al., 2004, chapter 11, p. 13):

Statistical agencies have been reluctant to provide their own estimates of CPI bias. In some cases, they have accepted the existence of substitution bias, recognising that the use of a Laspeyres formula implies that the CPI usually will overstate price change relative to a cost of living index. Statistical agencies have, however, been reluctant to draw even qualitative conclusions from fragmentary and speculative evidence on quality change, new products and new outlet bias.

The political content of the acronym should be obvious; suffice it to recall the title of the seminal paper written by Prais (1959), *Whose cost of living?* Regrettably, the replacement of the acronym was due to a personal vendetta (Persky, 1998, p. 204):

However, the Mitchell committee did recommend that the name of the “Cost of Living Index” be changed, arguing that an index of prices couldn’t fully reflect changes in welfare (Davis, 1944, p. 23), and as a result, the Bureau of Labor Statistics renamed its series as a “Consumer Price Index”.

A COGI conceptualisation of the CPI involves a measurement without theory. On the other hand, the COLI assessment should be revisited considering the criticisms regarding the comparison and aggregation of utility levels (Persky, 1998, p. 203) or the pointlessness of the assumption of identical preferences (Deaton, 1998, p. 44) among other theoretical issues. Moreover, the measurements obtained with the selected measuring instruments reinforce the theoretical beliefs at stake. Any price index is a weighted *average* of price indices. Thus, by definition, it eliminates their dispersion, creating an illusion concerning the existence of a unique price for each good and of a single price level for the economy as a whole (Guerrero, 2021).

Lastly, we will accompany our arguments by quoting Fisher (1922) and Afrait (2005). On the page 2 of his book, Fisher (1922) wrote:

There would be no difficulty in such measurement and, hence, no need for index numbers if all prices moved up in perfect unison or down in perfect unison. But since, in actual fact, the prices of different articles move very differently, we must employ some sort of compromise or average of their divergent movements.

Afrait’s following words are dedicated to devotees of economic theories (2005, p. xxiv):

It should no longer be plausible, even to convinced “price level” believers, that the whole situation can be effectively summarised by a single number.

The “guru of price index” is right. The price level exists only in the imagination of economists. As scientists, it is time to look at ourselves critically.

Final thoughts

The main statistical measurement problems discussed here are present in the official data produced in any country and, accordingly, have been frequently analysed by insiders and outsiders –some of my favourites are Moulton (2018) and Kokoski (2013). The one we will explore now is rather theoretical in nature.

The axiomatic imposition of equilibrium (Arnsperger and Varoufakis, 2022 p. 23) forces statistical makers, in order to have not a dollar left over or missing, to use non-scientific methods. As the more visible case, let us recall the GDP, in which case the measurement by the three approaches yields the same numerical result, and an arithmetic difference is called “statistical discrepancy”.

To avoid applying non-scientific methods, firstly, agencies should post the data with the minimum adjustments, even if the equations at stake are not met. Secondly, share the adjusted data with users step by step. Simultaneously, authorities must document every decision made to build the final version of the NA. *As simple as that*. This would mean that the compilation of the system would cease to be an *ad hoc* construction and just as important, if not more important, would imply an improved approximation to the issue at stake.

In the introduction, we mention that the GDP constitutes a measurement “with theory” exercise, but, as a Marxist economist, I have to underline that only labour creates (new) value. The point being made here is straightforward: the aforementioned acknowledgement written in the *Handbook* (“Consumption of fixed capital is one of the most difficult items in the accounts to define conceptually and to estimate in practice”) shows the weakness of the theory of value that underpins the measurement of value added. Its difficulty in distinguishing between net and gross contaminates a number of key variables, including, once again, domestic product, national income, operating surplus, and fixed capital formation, etc. In this sense, our recommendation would be for agencies to report, as a first choice, the variables at play in net terms.

To close, let us now look at measurement as our *object of study*. To understand why in the sciences, among others in economics, measurement appears as an *obsession* (from the Latin *obsessio*, that is, siege), we will quote Karl Marx ([1857-61], 1973, p. 624 and p. 625):

The exchange of living labour for objectified labour, i.e. the positing of social labour in the form of the contradiction of capital and wage labour, is the ultimate development of the value-relation and of production resting on value. Its presupposition is, and remains, the mass of direct labour time, the quantity of labour employed, as the determinant factor in the production of wealth. But to the degree that large industry develops, the creation of real wealth comes to depend less on labour time and on the amount of labour employed than on the power of the agencies set in motion during labour time, whose ‘powerful effectiveness’ is itself in turn out of all proportion to the direct labour time spent on their production. However, it depends rather on the general state of science and on the progress of technology or the application of this science to production.

As soon as labour in the direct form has ceased to be the great well-spring of wealth, labour time ceases and must cease to be its measure, and hence exchange value [must cease to be the measure] of use value. The surplus labour of the mass has ceased to be the condition for the development of general wealth, just as the non-labour of the few, for the development of the general powers of the human head. With that, production based on exchange value breaks down, and the direct, material production process is stripped of the form of penury and antithesis. The free development of individualities, and hence not the reduction of necessary labour time to posit surplus labour, but rather the general reduction of the necessary labour of society to a minimum, which then corresponds to the artistic, scientific, etc. development of the individuals in the time set free, and with the means created, for all of them.

In short, although measurement is consubstantial to our market “society”, that is, it expresses a transhistorical need, under capitalism it is incongruous (Echeverría, [1986], 2017, p. 136), since it is based on “the impurity or concreteness of the magnitude ‘price’,” and not on the “purity or abstraction of the magnitude ‘value’.”

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