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Quantification = objectivity?

1. Introduction : common sense has a manichean view of quantitative data

Importance of quantification is attested by the controversies about numbers. These controversies are superficial because talking about the use of data and not of the relation between data and knowledge. It's for this reason that the debate is caricatural: over or under evaluation of the qualities of numbers.

1.1. Overevaluation

In a debate sometimes we hear « the data are there », and it's quite an end. Data « are » like if they were a reality, like if they were transcendent. It's a kind of fetichism : the number by themselves would be the objective reality, and users would have to accept them as they were god's gift.

We are to see that it's not true : data are a production of human spirit, not really different of the others.

1.2. Excessive critique

Two main objections are made, abusive simplification and manipulation.

1.2.1. Abusive simplification

People say « we cannot measure that », « your indicator forget that…». Often they find a smart and evident counter example. This position expressed a bad understanding of scientifical and statistical approaches.

Numbers simplify, but they use rational methods for that, and the residual mistakes are small.

1.2.2. Manipulation

Manipulations are supposed to be easy: « data say what we want they say ».

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– it's a naive view : the tricks are visible for a warned person;
– it's not different from language.

• La statistique et les statistiques

In English, "statistics" as a plural form is used for a part of mathematics. In French we use the singular. In English too we can say statistics (the same that in French) for the results of an investigation, but we often prefer to say data.

In any case, we have two words only, so our vision of "statistics" lack of all what is concerning the **conceptual** investment made during the production of data.

1.3. How to break with these misconceptions?

We have to think that quantitative data are essentially similar to other kind of knowledge. Why? Because, like other knowledge, it is the produce of human brain, and can suffer from the same failures.

With that proposal, we have to **evaluate** the conditions of production of data, mainly **three** aspects:
– the **needs**: as we have seen in the first conference exogenous needs can be prejudicial to objectivity;
– the **tools**: data are costly and external control can influence the result; institutional analysis and knowledge sociology can help us on these two aspects.
– The third aspect, **the only under review** here, is epistemological; if data are a kind of knowledge, what are the main conditions of objectivity for all knowledge.

We will look a the **two senses** of the verb "know":
– the first is: I know that population is growing at x% a year. This knowledge is a kind of information, which supposes observation (2Data are a formalisation of reality);
– the second is: "I know what are the factors which determine the growth of population". Here we understand, perhaps we can foresee or modify the future (Data do not).

2. Data are a formalisation of reality

Data are not an obviousness like observation is not an obviousness: every time we look at something, we make some (implicit) choice. An example (An analogy with photography) shows us the main problems of objectification; we study the method problems (Is objectification impossible?) and the context problems (A critical problem in social sciences: the reaction of a).

2.1. An analogy with photography

2.1.1. The wrong objectivity of image

Numbers are often assimilated to photography: they reflect the reality. This analogy is useful, if we know something about photography.

• We find the same critiques than above for statistics: a photo can be blurred, improved, perhaps altered. Quite the same words that for statistics.

• Here begin the real problems: an honest photograph does not give a "reflect of reality", but a staging of reality, a part of reality:

– it's evident with infrared photo ("thermal view");

– it is easy to give a specific impression (inaccurate, excessive, oriented, etc.) using the properties of framing, focal length, light.

The legend of the photo can have an important influence on your perception.

2.1.2. Observe is to choose

• As said F. Saussure "The point of view is creating the object": there is no difference between a "simple" observation and an analysis. The reality is so complex that we cannot look at it without selecting facts. When we talk of "facts" we talk of the facts that we have selected: the facts do not speak, but you give speech to some of them, so you speak.

• In brief, any kind of observation is the result of a specific view on reality; everyday life can show us a lot of examples (ask two friends to sum up a film…), but in this case we have coexistence of two visions. It's not the same if you have two concurrent explanation of the same fact…

• To sum up, we can take the advice of P. Bourdieu:

> "La mesure et les instruments de mesure et, plus généralement, toutes les opérations de la pratique sociologique, depuis l'élaboration des questionnaires et le codage jusqu'à l'analyse statistique, sont autant de ***théories en actes,*** au titre de procédures de construction, conscientes ou inconscientes, des faits et des relations entre les faits." (Bourdieu et alii, 1968, p 59, souligné par moi MC)

For P. Bourdieu, all the stages of a quantification protocol are influenced by choices, which can be conscious or unconscious.

2.2. Is objectification impossible?

Fortunately not, if we do not refer to a kind of "god's objectivity". If the producer and the user of data evaluate their choice, they are able to detect the possible bias, and determine the conditions in which it can be troublesome. The question is not objective/subjective, but: what is the degree of objectivity. Is it sufficient for my purpose?

2.2.1. Analyse the underlying hypothesis

A positive effect of the idea that data are a production is to destroy an illusion: that we can give to a "super independent expert", isolated with a computer, the mission to elaborate data for the users.

This dissociation is harmful: the statistician is obliged to choose. If he is alone, he chooses using his own representation of reality. Now it is a statistician, not an economist or a sociologist: he will choose using "common sense" and not scientific approach.

A better idea is to give a large institutional independence to statistician, but an immersion in scientific community, to understand the needs, the theoretical streams, etc.

Moreover, all data should be documented, i.e. precise clearly the underlying conceptions, the exact definitions, etc., for the user.

2.2.2. Determine the degree of specificity of observation

Another consequence of our analysis is that "omnibus" data (universal data) do not exist. Data have always some specificity.

> "Il suffit d'avoir une fois tenté de soumettre à l'analyse secondaire un matériel recueilli en fonction d'une autre problématique, si neutre soit-elle en apparence, pour savoir que les ***data*** les plus riches ne sauraient jamais répondre complètement et adéquatement à des questions pour lesquelles et par lesquelles ils n'ont pas été construits." Bourdieu & alii (ibid. p 55)

• **Secondary analysis** is a particular use of data aimed to show information not incorporated by the statisticians who have designed the survey.

• Example: the use of AIDS survey to study sexuality.

• Note: why is the **vocabulary** of data always problematic?

2.3. A critical problem in social sciences: the reaction of agents

The statisticians are reticent to put their recipes in the scientific debate ("black box) for two main reasons.

– What we have seen above: they know the importance of choices (theoretical and practical) for the results and they have experienced inadequate critiques; at best they agree to talk about the most technical aspects (sampling design).

– Their scientific freedom is always threatened.

2.3.1. Social constraint is not the same for a physicist…

At the **individual level**, the nuclear physicist knows that it's financing is very politic (for example, military use). Sometimes it's a moral question for him, but it has no consequence on the objectivity of his results.

At the **global level**, the flow of research is influenced by social priorities: war, technological competition, etc., can give some advantage to some research fields. Nevertheless, in the middle or long term that external influence on the "shape" of knowledge is small:

– "specific" research must wait for fundamental discoveries;

– local innovations are applied to quite all fields.

In brief, the impact of social, political, etc., constraints on what we can call the "structure" of knowledge is small.

2.3.2. … and for a statistician

• For social sciences, data are supposed to "reflect" all human activities. Of course, as we have seen, the statistician has to define a viewpoint. But many **other actors** have their own viewpoint, and they **defend** it. The researcher has to justify his theoretical choice not only before **colleagues,** but before the society: he must establish a social trust, a **legitimacy**.

• What are the main **ways** to do that?

– The first is the **status** of data producers, which can guarantee the freedom of the choices and of the result's publication. For public statistics, we know that all the totalitarian states control the statistics and so dig their grave because they are blind. In a good information system (private or public), the statisticians consult, **negotiate**, but, at the end, they are **free** of choosing the best way to capture information.

– The second is to study how economic or social indicators have been **changing in the time**. That "relative" view of knowledge, help to understand why indicators became obsolete.

To conclude, objectivity of data is like objectivity of science, a perpetual **fight**. It's a **personal** challenge, but also a **social** challenge, implying **institutional and managerial** dispositions.

3. Data do not prove but can help to prove

Here we have to talk of a major **change in the status** of data and of its consequences.

• From argument to proof

– argument: data are used to give some **illustration** to a **logical** work;

– proof: data are used to **validate** theoretical propositions or justify decisions (no decision without calculating its impact).

• The main **consequences** are:

– the so-called confirmatory statistics are more sophisticated than descriptive statistics;

– remember that everybody **needs** (at the strongest sense: the need of food, of drug) data. If you really need water, you can drink dirty water; if you lack of good data, you use the worst, but perhaps you say they are "not too bad".

The last consequence, that I am to examine in this last part, is that you cannot forget the **conditions of use** of data.

There is a confusion between experience and experiment, and further on the signification of an experimental proof.

3.1. What is an experiment?

3.1.1. The low value of « natural » experiment

• Quite all scientists agree to say that experience was not very useful in scientific discovery. As Poincaré was saying: **« Les faits ne parlent pas »**, (facts do not speak). Koyré, a specialist in history of science, wrote:

> "l'expérience, dans le sens de l'expérience brute, n'a joué aucun rôle, sinon celui ***d'obstacle,*** dans la naissance de la science classique (souligné par moi MC)".

"L'expérience **brute"** whose Koyré is speaking is that we call more generally induction. It is when we infer a general conclusion from selected facts. It is no a demonstration, but it can be useful to formulate hypothesis.

Of course many big discoveries are beginning by an intuition or a haphazard. But a lot of intuitions never give anything…

On the contrary, experiment is a powerful tool

3.1.2. Experiment, quasi-experiment

a. Definition

Scientific experiment uses two main ways:

– experiment model, where the scientist can freely modify the parameters. In this case it is possible to test many configurations of the parameters selected in order to give unambiguous conclusions;

– indirect experiment. For example, in astronomy, we have no possibility to modify the parameters. Meanwhile, there is a lot of observations with different conditions, but in the same general context: the general laws apply at every time and everywhere.

b. The help of technics

We can easily see that there is no real experiment in social sciences, excepted some particular conditions (some experiment on random samples). We can only talk of "quasi-experiment", that are very difficult to use. Some techniques mainly statistical can help: it is possible to separate the influence of each explanatory variable (multivariate analysis, logit model, regression, etc.).

Nevertheless, as underlines Passeron, the researchers are fighting against interpretation mistakes, which are factual: omitted or masked variable. But they cannot do anything to solve the main problem: the multiplication of experiments is useful only if the contexts are the same. To have unicity of contexts (like in astronomy), we should work only on static society.

More generally, the data can be interpreted at very different levels. The wage gap between men and women (25%); a good statistical analysis can show that with the same work (everything equal) the wage gap is only 12%. Doing that, we evaluate the wage discrimination (same work, different wages), but we say nothing of what is under the employment structure: is it the result of a choice (the women want not some jobs) or of a complex selection (they cannot have the good jobs). More, is the choice a real choice: a survey would probably show that the women prefer not to be politicians, but can also enumerate all the motivations of this "preference" (many kinds of discrimination).

3.2. What is to prove?

Even with a good experiment, we must be cautious: an experiment is an isolated event, using underlying hypothesis. Scientist formalise the difference between infirmation and confirmation, but it is difficult to apply to social sciences and suggest a specific way to prove the validity of models.

3.2.1. Infirmation and confirmation

What do social scientists say about the value of experiment?

a. General principle

Popper developed a theory of knowledge for social sciences, but very closed to the classic scientific model. For him the difference between a

scientific proposal and an ideological proposal is that the first is falsifiable, i.e. if we can prove that this theory is true or false.

The proof is submitted to a rule: a confirmation gives a probability of truth, an infirmation creates a certainty.

Of course the difference is important: a successful test, even repeted, can only be "convenient" and result of haphazard.

b. A problematic application in social sciences

However, the status of infirmation is too strong. Newton neglected his theory for a long time, because it has been falsified by an experiment which he has tried. Some years later, a better measurement of the length of the earth meridian changed the conclusion of the experiment (Bourdieu & alii, 1968, p 271).

In brief, the power of falsification depends on the accurateness of observations. The measurement error can be controlled in hard sciences, but it is much more difficult in social sciences. As told Simiand in the 19th century:

> « Dans l'expérimentation matérielle des sciences positives, l'abstraction mauvaise, sans correspondance suffisante avec la réalité, sans fondement objectif, s'avère le plus souvent ***aussitôt telle*** par une évidence physique, matérielle ; en recherche statistique, au contraire, des chiffres comme tels ***ne refusent jamais*** d'être combinés avec d'autres chiffres […] » (souligné par moi MC)

To conclude, we can accept the idea of a hierarchy between falsification and confirmation, but "cum grano salis".

c. Theoretical meaning in social sciences

We can come back to an idea introduced above: the validity of a conclusion can be very limited. Popper separates the "common noun", which are universal statements and the "proper noun", which have a limited field. In the first case, falsification is quite absolute (excepted measurement problems); in the second we can always modify the limits of the universe and so, in many cases, make true a false proposition (or conversely).

For example in 1999-2000, before the growth of the Dow Jones, some people, using historical records, told that a crisis was to come. Some other told that the economic conditions were quite different (technological revolution) and that the growth can continue.

In these conditions, the value of experiment is limited and knowledge must include the limits of comparability.

For example, in economics:

– Kark Marx or more recently Robert Boyer, tried to define some common general conditions: production modes, accumulation regime;

– Maurice and Silvestre, comparing France and Germany, try to define for each a specific combination, explaining that the same rules have not the same effects.

• Of course, it is possible to have an extreme position and to refute the possibility of unicity:

> « Entre des groupes qui parlent du monde dans un langage différent, l'épreuve empirique ne tranche rien, elle n'est pas fondée sur des protocoles définissant identiquement les rapports sémantiques entre observations et interprétations conceptuelles. Les protocoles supposent des conventions faisant correspondre des états de choses et des énoncés. » Passeron, 1991, 361

Many explanations can be “true”, because each of them is a “point of view”. In this case, the experiments only prove the specificity of each “point of view”.

3.2.2. A proof strategy

All these difficulties must not discourage in our search for objectivity and for preparing good experiments to verify our hypothesis. The above critiques are a good way to define what we can call a proof strategy fitted to all theses cases where experiment is not convincing. For example Bourdieu & alii suggested that a proof in “extension” is better than an experiment protocol.

> "La preuve n'est pas apportée par une expérience cruciale, mais par la cohérence des indices que la théorie permet d'apercevoir dans des faits jusqu'alors dispersés et insignifiants." (Bourdieu & alii, 1968, p 277)

a. No crucial experiment

• In physics, we can use long chains of deduction (using mathematical expression). The consequence is that we can define very precisely an experiment (sometimes simple), which can give a decisive proof of the truth of an hypothesis. The answer on the question concerning universe can be found by numbering the neutrinos. In social sciences, the chains are very short (context, great number of parameters, etc.). It is difficult to define an experiment.

• For this reason, it is difficult to use the Max Planck’s proposal, **"l'hypothèse est un jugement de valeur sur la réalité"**, and to induce that we can take any kind of hypothesis plausible or not if it is useful. In social sciences, a non plausible hypothesis can be unfalsifiable, because of the weakness of experiment. Logical and theoretical (deductive) approaches must be used to found hypothesis.

b. The dangers of a perfect confirmation

• Perfect confirmation is suspicious: the “scattered” and “insignificant” facts are a guarantee against the “hand made” proof, the “ad hoc” model, perfectly fitted for a dataset and ineffective in all other cases.

• This is dangerous, because the data themselves can be contaminated by the theoretical framework. We saw above that to make good data, we have to adapt them to a specific use. There is some risk of tautology, which was well seen by Simiand:

> « on peut voir qu'on touche là à un risque de cercle vicieux ; c'est que souvent l'expression statistique est nécessaire pour dégager et, on peut dire même, pour constituer le fait statistique, et que pourtant il faudrait savoir déjà d'avance quel est, comment se comporte au juste ce fait statistique pour choisir avec pleine convenance la base et la nature d'expression statistique à employer. »

c. A guarantee : the use outside of the productions frame

Experiment supposes that we can control (know) all the parameter; in social sciences we know few and control nothing. In this case, a better proof is the capacity to use data, which are not involved in the production of the theoretical framework.

4. Conclusion

The social sciences uses frail reasoning, so they must try to give them some consistency with quantitative data. Nonetheless, no positive effect can be acquired if we overestimate the test. The test is also frail:

– the production of data implies many choices, and the measurement is always imperfect;

– we use of “naive experiment” with a very low control.

Of course, the imperfection of the tools have never impeached the progress of knowledge. The condition is that we are aware of the main errors, of their causes so that we can evaluate their influence and define the best knowledge strategy.