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## CETERIS PARIBUS LAWS: CLASSIFICATION AND DECONSTRUCTION

**ABSTRACT.** It has not been sufficiently considered in philosophical discussions of *ceteris paribus* (CP) laws that distinct kinds of CP-laws exist in science with rather different meanings. I distinguish between (1.) *comparative* CP-laws and (2.) *exclusive* CP-laws. There exist also *mixed* CP-laws, which contain a comparative and an exclusive CP-clause. Exclusive CP-laws may be either (2.1) *definite*, (2.2) *indefinite* or (2.3) *normic*. While CP-laws of kind (2.1) and (2.2) exhibit deductivistic behaviour, CP-laws of kind (2.3) require a probabilistic or non-monotonic reconstruction. CP-laws of kind (1) may be both deductivistic or probabilistic. All these kinds of CP-laws have empirical content by which they are testable, *except* CP-laws of kind (2.2) which are almost vacuous. Typically, CP-laws of kind (1) express invariant correlations, CP-laws of kind (2.1) express closed system laws of physical sciences, and CP-laws of kind (2.3) express normic laws of non-physical sciences based on evolution-theoretic stability properties.

### 1. INTRODUCTION: COMPARATIVE VERSUS EXCLUSIVE CETERIS PARIBUS LAWS

Philosophers of the last decades have repeatedly pointed out that most law statements, especially those in the non-physical sciences, do not express strict (i.e., universal and exceptionless) laws. Rather, they express so-called *ceteris paribus* laws, in short CP-laws.<sup>1</sup> The scientific ‘dignity’ of CP-laws, however, is a controversial matter.<sup>2</sup> In this paper I will try to show that “*ceteris paribus*” is a deeply *ambiguous* notion. It is better to differentiate the possible meanings before starting the attempt of explication. First of all, one should distinguish between two (families of) conceptions of CP-law: comparative versus exclusive.

The comparative sense of CP-clauses derives from the literal meaning of “*ceteris paribus*” as “the others being equal”. A *comparative CP-law* makes an assertion about *functional* properties, henceforth called parameters.<sup>3</sup> It claims that the increase (or decrease) of one parameter, say  $f(x)$ , leads to an increase (or decrease) of another parameter, say  $g(x)$ , *provided* that all other (unknown) parameters describing the states of the underlying system(s) remain the same. Thus, a *comparative CP-clause* does not exclude the presence of other ‘disturbing’ factors, but merely



requires that they are kept constant. More precisely, a comparative CP-law compares the states of two systems of an underlying application class, one state where the parameter  $f$  has not been increased, and another state where the parameter  $f$  has been increased – and it requires both states to *agree* on all parameters which are causally *independent* from  $f$  (i.e., not affected by  $f$ ). In particular, the quantitative parameters being compared may be the *probabilities* of some qualitative properties (expressed by predicates). Here are three examples:

- (1) Ceteris paribus, an increase of gas temperature leads to a (proportional) increase of gas volume (Gay-Lussac's gas law).
- (2) Ceteris paribus, increase of rain leads to an increase in growth of vegetation.
- (3) Ceteris paribus, (an increase of) alcoholization of the driver leads to an increased probability of a car accident.

While in (1) a *quantitative* relation between the increases is known (the relation of proportionality), in (2) only an *ordinal* relation between the increases is predicted (i.e., increase leads to increase). Finally, (3) is an example of a probabilistic comparative CP-law, where the consequent parameter  $g$  expresses a probability increase.

In the philosophical debate, however, CP-laws have usually been understood in the different exclusive sense. An *exclusive CP-law* asserts that a certain state or event-type expressed by a (possibly complex) predicate  $Ax$  leads to another state or event-type  $Cx$  *provided* disturbing influences are *absent*.  $Ax$  is called the *antecedent* and  $Cx$  the *consequent* predicate. Thus, an exclusive CP-clause does not merely require keeping all other causally interfering factors constant; it rather *excludes* the presence of causally *interfering* factors. In agreement with this exclusive understanding, Cartwright has remarked that “the literal translation is ‘other things being equal’; but it would be more apt to read ‘ceteris paribus’ as ‘other things being right’ ” (1983, p. 45). Joseph (1980, p. 777) has spoken of “ceteris absentibus” clauses, and Hempel (1988, p. 29) calls exclusive CP-clauses “Provisos” (“... *provided* disturbing factors are absent”). Consider the following examples of exclusive CP-laws – (4) comes from physics and (5, 6) from psychology:

- (4) Ceteris paribus, planets have elliptical orbits (Lakatos op. cit.).

- (5) Ceteris paribus, people's actions are goal-oriented, in the sense that if person *x* wants *A* and believes *B* to be an optimal means for achieving *A*, then *x* will attempt to do *B* (Fodor, 1991; Dray 1957, pp. 132ff).
- (6) Ceteris paribus, frustration leads to aggression (Schurz 1995).

In (4), the CP-clause requires that other (non-negligible) forces on the planet except that of the sun are – not merely constant but – *absent*. Likewise, the CP-clause of (5) requires any factors causing irrational behavior to be absent. Note that (5) governs various special CP-laws, such as “CP people who want water try to get water” (Fodor 1991, p. 28). In (6), finally, the CP-clause excludes interfering factors of both psychological sort (e.g., depression) and physical sort (e.g., the influence of drugs).

The distinction between comparative and exclusive CP-laws is not disjoint. There are CP-laws which have both comparative and exclusive character, as in the following example from theoretical economy:

- (7) Ceteris paribus, an increase of demand leads to an increase of prices.

Not only must the compared economies agree in remainder factors; various interferes (such as political price regulations) must be excluded. We call these CP-laws *mixed* and treat them as (implicitly) governed by a comparative *and* an exclusive CP-clause; all what we say in the following about comparative and exclusive CP-clauses transfers to mixed CP-laws. The fact that comparatively formulated CP-laws are often mixed in character may explain why, historically, the two kinds of CP-laws have usually been conflated.

One may object to our distinction that some exclusive CP-laws can be reformulated in a comparative form, by interpreting *events* as *changes* in the values of certain parameters (cf. Gadenne 1984, p. 43f). In this way, the frustration-aggression law (6) may be reformulated as follows:

- (6\*) Ceteris paribus, an increase of frustration leads to an increase of aggression.

But this reformulation does not at all diminish the difference. (6\*) is *still* an exclusive CP-law, because interfering factors such as influences of certain drugs are not merely required to be constant, but must be absent. Otherwise, an increase of frustration will *not* lead to an increase of aggression. Generally speaking, if a CP-law “CP, if *Ax* then *Cx*” is truly



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