

*Economics, Mathematics, 'defect on reasoning' and Chaos**

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Introduction

Right after the transmission of the Nobel Prize award to the economist Amartya Sen, in 1998, a lot of journal's articles and others periodicals have contributed to spread out his fame as 'sociologist of poverty', 'economist of poverty'; a leftist periodical has insinuated that such a prize owed to two North-Americans (R.C.Merton and M.S.Scholes) awarded a year before whose studies were based on differentials equations to prospect the operations on stock market but their own enterprise (and many others) was bankrupted when the crisis erupted in Asia some months later. That means they developed something that themselves could not use; it had not even private utility. Anyway, the economic analysis based on utility only (one of the two aspect composing the commodity) is extremely pernicious.

Celso Furtado, a Brazilian economist and contemporary to Amartya Sen at the post-graduation course in Cambridge, comments that Sen – *On ethics & economics* – “intend to fly very high because he approaches the complex problem of the epistemological rupture between conventional economic science, which evolves toward the social engineering, and the system of values whose substratum is the ethic”. He also tells that “the book owns a British's elegance and it is not easy for beginners”.¹

The paper examines the similarity between the linear and positive transformation of the utilities functions immanent to Neoclassic or Conventional Economic Theory² and Marx's resolution of the antagonism within the commodity (uneven and combined development –we just formalize this process) and also call attention: a) to Amartya Sen's book - *On ethic & economics* – where the author, in an inelegance way, affirms that to think differently from the Conventional Economics means to hold defect on reasoning; b) to the (use and) abuse of mathematics (therefore the book carries on no mathematical formula) subjacent to the game theory arrangements (Lagrange function, Linear Programming) and others, to dissimulate the condition of this exuberant and dominant Economic Theory as contained into Marxist Economic Theory and; c) to the Chaos Theory (fractal geometry, strange attractors) as the 'bridge' between both Economics conceptions – apparently opposed to each other – in scientific research and/or Social Science.

Based on unconcluded antagonism within the commodity – use-value / utility = price – the criticized theory presents itself precluded to execute the linear and positive transformation needed to path from micro to macro, which is easily proposed by Karl Marx right at the beginning of his most known work: *Das Kapital*. Contained – “this theory is merely a paraphrase of the Marxian” - and precluded to develop itself ('interpersonal comparisons' are the bypath or a short cut to Marx), the Conventional Economics must abuse of the mathematics or depends on some mathematical sleight-of-hand to dissimulate this constraining situation.

The paper is finished with the 'referential family' as the 'strange attractor' (uncontrollable sequences of events) posing the harmony where the chaos or capitalist relations have established the empire.

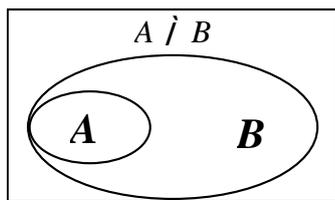
Everything between [brackets] is inclusion of the present text's author.

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¹ FURTADO, Celso. *O futuro da economia*. In: Folha de São Paulo, jornal de resenhas, november/13/1999, p. 1.

² It is one of many denotations: neoclassic, marginalist, positive economics, subjective theory of value, marginal utility theory, Rational Expectation, etc.

Conventional Economic Theory is contained into Marxist Economic Theory



Let us start it analyzing the second item – Conventional Economic Theory (A) is contained in Marxist Economic Theory (B). Amartya Sen begins his *On Ethic & Economics* quoting Adam Smith that wrote *Theory of Moral Sentiments* certainly because he wishes to present his analysis as based on that brilliant and herald book in terms of ethic and, immediately, pass to defend Smith from misinterpretations about the referred book. In

another words, Sen continues to find in Smith the prophet of the invisible hand and, if Smith had written something that attempts to another way to observe and to analyze the facts – i.e., about ethic – such writing should not be interpreted erroneously. Though Smith expresses vehemently the denial to an effort to elaborate an economic theory based on utility or use-value of the commodity and he makes clear that the qualities most useful to us are, first, the reason and the knowledge and, second, the self-domain. The union of these two qualities consists the virtue of prudence. It looks like Smith answers negatively to Jeremy Benthan’s supplication to elaborate another “treatise”, being this one based on utility and, by this way, to propitiate two paths for understanding the economic reality. Evidently, the advice was not accepted and now Smith is being vilified.

Neoclassic Economic Theory - which is based on utility – finds itself in tight spot; this situation gets worse all the time that theorists attempt the scientific induction, i.e., to pass from the part (individuality, microeconomic³) to the totality (society, macroeconomic⁴). That means the Conventional Economics do not hold a macroeconomic of itself; it uses microeconomics variables’ aggregation needed of clarity (FEIJOO, 2000). Therefore it is impossible to construct the social welfare function. Varian, very carefully, just say that it exists but he refrains himself from philosophical comments (VARIAN, 1992, 333). Arrow talks about the ‘(im)possibility theorem’.

To get the Neoclassic Economic Theory (and its prophets/theorists) out of this tight spot – micro/macro and welfare social function construction problems – the unique way out possible is the linear and positive transformation of the individual utility functions⁵. This unique path is mathematical, there is no correspondent in human practice. Some theorists talk about “transferability” which could mean something like this: if you find someone feeling very cold and if

³ “Since de problems of individual price determination are assumed away in macro theory, the relationship between individual units and the aggregates is not clear. If it were, the analysis would be classified as micro theory” (HENDERSON & QUANDT, 1980, 3).

⁴ “The modern macroeconomic is obtained aggregating, or adding, all the families and private enterprise decisions that composes the economy. The typical private enterprise and family behavior [sic!] is ‘multiplied’ by some appropriated way (this is a controversy economic matter), to get the aggregate behavior”. (SACHS & LARRAIN, 1998, 4).

⁵ “The aggregation quasi-ordering. Let X be the set of alternative social states, x . Every individual i has a set L_i of real-value welfare functions, W_i , each defined over X . If individual welfare is ‘ordinal measurable’, then every element of L_i is a positive monotonic transformation of every other element, and furthermore every positive monotonic transformation of any element of L_i belongs to L_i . If, on the other hand, individual welfare is ‘cardinally measurable’, then every element of L_i is a positive linear transformation of every other element, and every positive linear transformation of any element of L_i belongs to L_i [footnote 8]. We shall assume cardinal measurability of individual welfare, but it can be shown to be an unnecessarily strict requirement for the approach to partial comparability outlined in this paper.” Sen affirms that ‘it can be shown to be unnecessarily’ because he is doing the ‘quasi ordering’, i.e., ‘almost-ordering’. To get the ‘total ordering’ it sure is necessary.

[footnote 8]: “Chipman (3) points out that the terms ‘ordinal’ and cardinal’ as used in economics ‘bear scant if any relation to the mathematicians’ concept of ordinal and cardinal numbers; rather they are euphemisms for the concepts of order-homomorphism to the real numbers and group-homomorphism to the real numbers’ (p. 216). Further, by convention ‘cardinally’ has been associated with the *additive* group of real numbers (i.e., a cardinal utility function is assumed to be group invariant under affine transformations), rather than with the *multiplicative* group, even though Frisch’s pioneering paper (9) revealed a preference for the multiplicative representation. We shall stick to the conventional usage of the terms, after sounding this note of warning. It may also be noted that in this branch of the literature, an affine transformation, such as $U^1 = a + bU^2$, is called a linear transformation, which algebraists would reserve for homogeneous transformations of the type $U^1 = bU^2$.”

(3) Chipman, J.S.: “*The foundation of utility*”, *Econometrica*, 28 (April 1960).

(9) Frisch, R.: “*Sur un probleme d’Économie Pure*”, *Norsk Matematisk Forenings Skrifter*, Series 1, 16(1926).

In: SEN, Amartya. *Choice, welfare and measurement*. 2nd. ed., New York: Harvard Univesity Press, 1998, p. 207 and footnote n° 8.

Let us take a point $(1,4)$, out of the bisector. This point generates a ratio $\frac{1}{4} = 0,25$, which represents a factor for transforming this inequality

$\frac{1}{4} \neq 1$ into equality $\frac{1}{4} = 0,25 \rightarrow 1 = 4 \cdot 0,25 \rightarrow 1 = 1$. By this way, b may be the factor to transform heterogeneity into homogeneity or 1, if the point is on the bisector line.

See also:

VARIAN, Hal R. *Microeconomics Analysis*. 3rd. ed., New York: W.W.Norton & Company, 1992, p. 175.

SHUBIK, Martín. *Teoría de juegos ne las ciencias sociales: conceptos y soluciones*. 1st. ed., México: Fondo de Cultura Económica, 1992, p. 187.

MAS- COLELL, Andreu; WHINSTON, Michael D. & GREEN, Jerry R. *Microeconomic theory* 1st. ed., New York: Oxford University press, 1995, p. 205.

MICHELETTI, V.D. *A irracionalidade contida na expectativa racional*. Maceió (Brasil): Edufal, 2000.

you have two coats, than you could ‘transfer’ utility to the freezing one (even though you could embrace and transfers much more ‘human warm’), but they prefer to dissimulate the problem (ARROW and HAHN, 1977, 244).

This positive and linear transformation can be explained using the quadrant I of the coordinates and tracing the bisector line from southeast to northeast (45° or $tg\theta = 1$). Any point out of the bisector line represents a difference ratio; if we trace a vertical line from any number on x -axis till the bisector line, and then we trace another horizontal line till the y -axis, we will find the identity of that number, its equal, i.e., the reason / ratio of the equality. The positive and linear transformation – related to Neoclassic Economic Theory - means to move from any point out of the bisector to the bisector line, from the heterogeneity to homogeneity, from the inequality to the equality, from the asymmetry to the symmetry. Martin Shubik, commenting the Kenneth Arrow’s dissimulation when introducing what could be called “principle of the social revealed preference”, refers to an anthropomorphic trap relating to the groups’ preference (SHUBIK, 1992, 125). The “anthropomorphic trap” is very adequate denomination because who is able to transform linear and positively the own utilities function is not caught by the trap; otherwise is called “anthropomorphic” because he/she confuses “preference” with “pretermision”; he/she pretermits an alternative and better and/or superior theory for the Neoclassic Economic Theory. More specifically, these ‘anthropomorphic’ are not able to get the isomorphism between latent traits and behavior, although the former are not determining the later but the commodities (or things) that are deteriorating the former; this way, the ontological nature gets itself removed of human characteristics; realizing the anthropomorphic or ontological deteriorated persons or ‘one-sided-economists’ because they are able to deal with appearances only and “ruminate without ceasing on the materials long since provided by scientific economy, and there seeks plausible explanations of the most obtrusive phenomena, for bourgeois daily use, but for the pedantic way, and proclaiming for everlasting truths, the trite ideas held by the self-complacent bourgeoisie with regard to their world, to them the best of all possible world” (MARX, 1986, vol. I, p. 85, footnote 1).

The Conventional Economics requires the “rational” person should not decide, prefer or choice the cooperative, the group, the collective. He/she should look for selfish interests only. The group or cooperative maximizes; the selfish practitioner needs to appropriate the others’ part to get about the group’s maximization.⁶ Amartya Sen refuses “to see the problem in terms of a necessity *a priori* to homogeneous descriptive of what should be valued” (SEN, 1999, 78), even though he confirms that “the fact, on utilitarian approach all of diverse commodities are reduced to a homogeneous descriptive magnitude (as suppose to be the utility), than the ethic evaluation simply assumes the form of a monotonic transformation of this magnitude...” (SEN, 1999, p. 77).

Sen knows the abyss between Neoclassic Economic Theory and ethic, but he keeps believing that the unique way to comprehend person’s behavior, economics, is by the private-interest (in detriment of the collective action, cooperative, association), and also that the game theory contributes mainly for that. On game theory (and others) these one-sided-economists (use and) abuse of the mathematics.

To show off this “use and abuse” of the mathematics we will make use of the quadrant I and the bisector line ($tg\theta=1$), in another words, we will use an easier and faster method – the area-sum method. On bisector line x and y meet each other. Even though they are different letters, they are equals as symbols: $x \neq y$ (apparently), $x = y$ when $x = 3$ and $y = 3$. When x and y are equals, i.e. (5,5), the area formed is 25. On the other hand, if we wish to form a rectangle with the same area we need just to move to a point (10, 2.5), which turns possible the appropriation by x of the biggest part of the area if we take the bisector line as divisive line and (2.5,10) if y . Any point out of the bisector line represents that some player is getting a bigger part of the area and the other one is getting a smaller

⁶ “The common sense defines this anthropomorphic as the one who says: ‘me first, me second, me third, me last; after me, myself. The others shall make another row, under my control, of course’, making no sense if the objective of the row is to sit down on the big wood spoon. By the other side, if the objective is very clear, the way out to it is very strange: ‘it is just like the players on the transferable game, they introduce money from a help-account to the rational trade. Treating their personal utilities as commodity, consumable only by themselves, they establish the price of it in a way that all the accounts get miraculously balanced’ (SHUBIK: 1992, 189)...*Anthropomorphic = f(Rational Expectation)*” In: MICHELETTI, Vladimir D. *A irracionalidade contida na Expectativa Racional*. Maceio (Brasil): Edufal, 2000, p. 46.

It is easy to note that Sen corroborates to the ‘area-sum method’⁹, that is, a squared area means cooperative strategy; a rectangular area means non-cooperative strategy; both areas may be equals but parts appropriated certainly are different on this latter one. Cooperative games results in better situations for all players; non-cooperative games, just for some.¹⁰ A non-cooperative game’s equilibrium is a rare phenomenon (SHUBIK, 1992, 240). If we consider equilibrium as an equitable distribution, we can affirm that a non-cooperative-equilibrium does not exist. By the way, Sen’s affirmation on the last phrase into the last quotation is untrue.

The present proposition – area-sum method - only makes it easier and faster to predict the result of a game than using Lagrangian function and/or Linear Programming calculus. The similarity of the players’ *pay offs*¹¹, $\Sigma v_i = [43,785 \ 31,285]$ and areas’ sum (37,375 26,625) requires another analysis. It looks easy but we should never forget that dissimulation, obliquity, pretermission, are the basic features of these anthropomorphic, that is, one-sided-economists. A point out of the bisector line means to be on one of its sides; when Karl Marx wrote to F.Engels about the mathematical manuscripts, Engels answered him this way:

“Yesterday I found the courage to study your mathematical manuscripts even without reference books, and I was pleased to find that I did not need them. I compliment you on your work. The thing is as clear as daylight, so that we cannot wonder enough at the way the mathematicians insist on mystifying it. But this comes from the one-sided way these gentlemen think”¹².

To by-pass this linear and positive transformation problem or micro/macro problem Amartya Sen uses the example of *Lady Chatterley’s lover*, which is disposed to a) the prude, Mr. A or to b) the lascivious, Mr. B or to c) both of them. These three alternatives define three social states. Sen affirms that 0 (zero) or ‘c’ would be better ‘social’ choice, but ‘a’ would be ‘Pareto superior’.¹³

Therefore, to understand this ‘painful problem’ and, at the same time, the embryonic form of the ‘referential family’, we will use an example from Marx’s *Philosophic and Economic Manuscripts of 1844*, which also refers to love, but the true love. In another words, we not only preclude traps, but also catch sight of the antidote to any trap.

“Every one of your relations to men and to nature must be a *specific expression*, corresponding to the object of your will, of your *real individual life*. If you love without evoking love in return – that is, if your loving as loving does not produce reciprocal love; if through a *living expression* of yourself as a loving person you do not make yourself a *beloved one*, then your love is impotent – a misfortune” (MARX, 1982, 124).

Surely, it is not love the relation presented by Sen. By the other side, this act of love and, at the same time, to evoke love in return seems to be a common practice of those who resist or oppose the capital’s logic or the power of private property.¹⁴ This love preclude ontological remove of

⁹ When using the definite integral to determine area, the point (0,7) which implies in (0,142857|42857, 7) results: player 1 = $\int_0^{0,142857|42857} x dx = 0,010204086$;

player 2 = $\int_0^{0,142857|42857} 7 - x dx = 0,989795918$. .

¹⁰ “Game theory is divided into two branches, co-operative and non-cooperative game theory...If individuals happen to undertake behavior that in common parlance would be labeled ‘co-operative’, then this is done because such co-operative behavior is the best interests each individual singly; each fears retaliation from others if co-operation breaks down.” (KREPS, 1990, 9).

¹¹ One of various terms used in *game theory* and *information economics*. “The terms of information economics, such as moral hazard, adverse selection, hidden action, hidden information, signaling, screaming, and so on, are used somewhat differently by different authors, so you must keep your eyes open when you see any of these terms in a book or article.” (KREPS, 1992, 578, footnote 1).

¹² Marx comments about the several denotations of the derivative of a function: $\frac{dy}{dx}$; $\frac{d}{dx}[f(x)]$; y' ; $D_x y$; $D_x[f(x)]$; $f'(x)$; he says that the

denotation $\frac{0}{0}$ would be enough, and he proofs it. (MARX, 1983, xxviii).

¹³ “Liberty, Unanimity and Rights” is the chapter 14’s title where Sen explains the conflict between ‘Condition L’ or ‘weak libertarianism’ and ‘Condition P’ or ‘Pareto principle’, using the example commented before in “Choice, Welfare and Measurement” (SEN, 1997, 292).

¹⁴ “Private property has made us so stupid and one-sided that an object is *only ours* when we have it – when it exists for us as capital, or when it is directly possessed, eaten, drunk, worn, inhabited, etc., - in short, when it is *used* by us. Although private property itself again conceives all these direct

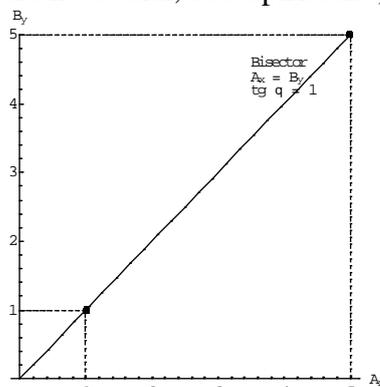
characterization; it also contributes to the self-development. In graphics terms, it is easy to observe that if A_x loves B_y , the A_x 's love cannot be a vector with $tg\angle < I > tg\angle$. The first case, $tg\angle < I$, A_x would be demanding too much of B_y ; by the other side, if $I > tg\angle$, A_x would be suffocating B_y , this is the frenzy. By this way, A_x 's love would have to produce, to incite love reciprocal; this exchange of equivalents locates at the bisector line; it is the 'fixed-point'.¹⁵ This exchange is taken as referential - as 'logic coin' - to realize the resistance before 'unequal [interpersonal] exchange', before inequality, before obliquity attitudes, before any dissimulation. In another words, it realizes the 'strange attractor' that brings serious problems and/or obstacles to these dissimulations, obliquities; to the definitive consummation of the chaos put by capital's relations (mains and adjacent) as 'normality', as unique way of life: the estrangement.

It is extremely important to remark this love relation not as a function: $B_y = f(A_x)$. The reciprocal foundation precludes it to be a simple function where x is the domain and y is the image; x is the independent variable and y is the dependent variable. This love relation is similar to that wrote by Antoine Saint-Exupéry, in *Le Petit Prince*, as 'to captivate by promoting one's freedom'. Shakespeare also brings some interesting examples about this very rare relation. Maybe the *one-to-one correspondence* function; identity function or bijective function explains this relation that most of time is confused with sacred family by the church-members or G.K.Chesterton (*Brave New Family: men & women, children, sex, divorce, marriage & the family*), eloquent defender of the sacredness of the home (the families' problems though are not social, but 'spirituals').

	B_y		
	I_x	I_y	0_x 0_y
A_x	0_x 0_y	5_x 5_y	

Basically, there are of presenting the Game data: strategic or normal the extensive form. The the normal form are beside.

A_x and B_y are to date. Initially, both get utility 1. Sequentially, insinuations increase utilities, for example 5. Parallel say no or 0 (zero). Something very similar in terms of very different in terms of content is presented by 'battle of the sexes' (VARIAN, 1992, 267). Using



two forms Theory's form and graphic and

insinuating others matters both calculus, but Varian as Lagrange

function both get *pay offs* 5/6 or 0.83333; by Linear Programming problem both get 1.2; by the area sum method, they get 13 each. The utility's measure or quantitative matter is problematic, we all know that, but this fact does not impede the judge to decide for 10 or 5 years of reclusion for accused; teachers keep evaluating their students' performances; we all establish prices (forms of value); etc.

Meanwhile Sen uses game theory to explain the misfortune, that is, the *Lady Chatterley's lover*, he also confirms that "experimental studies about behavior characterized by game theory also tended to chase away from the choice guided by the self-interest (see Lave, 1962; Repoport & Chammah, 1965; Axelrod, 1984). This driving away was clearly observed also in real life experiments based on economics and social questions. There are signs that persons follow settled behaviors' rules that contradict the main objectives they really want to maximize. Sometime this kind of behavior happens although these persons have not attached any *intrinsic* importance to. These rules may guide to benefit the group [married couple] and the objective of *each one* may be better expected, therefore each person could get their own interest better satisfied following a different strategy. Recent literature shows that cooperative behavior is prevalent in games as Prisoner Dilemma...Therefore, is that cooperation seems to emerge on these games" (SEN, 1999, 99-100).

realisations of possession only as *means of life*, and life, which they serve as, means is the *life of private property* - labour and conversion into capital. In the place of *all* physical and mental senses there has therefore come the sheer estrangement of *all* these senses, the sense of *having*. The human being had to be reduced to this absolute poverty in order that he might yield his inner wealth to the outer world". (MARX, 1982, 94).

¹⁵ "Let $g \in C[a,b]$ and suppose that $g(x) \in [a,b]$ for all x in $[a,b]$. Suppose, in addition, that g' exists on (a,b) with $|g'(x)| \leq k < 1$, for all $x \in (a,b)$. If p_0 is any number in $[a,b]$, then the sequence defined by $p_{n+1} = g(p_n)$ para $n \geq 0$ converges to the (unique) fixed-point p in $[a,b]$ and $|p_n - p| \leq \frac{k^n}{1-k} |p_0 - p|$ for all

$n \geq 1$. The iteration sometimes converges even if all the conditions are not satisfied (ZWILLINGHER, 1996, 672). Another path, easier and faster, to get the fixed-point is using the dual of the Linear Programming. If the dual and the primal become equals, than there it is.

The phrase before the two last one in this Sen's quotation does not find mathematical approval: if someone gets more (than the necessary); some other loses what this one has appropriated. Still about the quotation, the contradiction to the established order or behavior rules may be explained by the bijective function: "in one mode of such reciprocity, one individual may meet another's needs simply for the sake of getting the other to meet the needs of the first. The motive for the reciprocal actions of each may therefore be limited to what each sees as his or her own interest or benefit and the form of such exchange may be characterized as 'tit-for-tat'. In this mode, although there is a tacit recognition of the other as an agent insofar as the other is free to respond in kind or not, one agent does not yet recognize the other's interest except as it serves his or her own. The other is therefore viewed only as an instrument or means to realize one's own purposes or ends, and indeed the entire relation may be characterized as instrumental reciprocity" (GOULD, 1995, 73).

The evidences that persons love (and are reciprocally loved) disregarded completely the 'self-interest-model'. These evidences are countless.¹⁶

To finish this part of the text, we quote Hardt & Negri about *immaterial labor* or *affective labor*.

"We can distinguish three of immaterial labor that drive the service sector at the top of the informational economy. The first is involved in an industrial production that has been informationalized and has incorporated communication technologies in a way that transforms the production process itself. Manufacturing is regarded as a service, and the material labor of the production of durable goods mixes with and tends toward immaterial labor. Second is the immaterial labor of analytical and symbolic tasks, which itself breaks down into creative and intelligent manipulation on the one hand and routine symbolic tasks on the other. Finally, a third type of immaterial labor involves the production and manipulation of affect and requires (virtual or actual) human contact, labor in the bodily mode. These are the three types of labor that drive the postmodernization of the global economy. We should point out before moving on that in each of these forms of immaterial labor, cooperation is completely inherent in the labor itself, Immaterial labor immediately involves social interaction and cooperation. In other words, the cooperative aspect of it was in previous forms of labor, but rather, *cooperation is completely immanent to the laboring activity itself*. This fact calls into question the old notion (common to classical and Marxian political economics) by which labor power is conceived as 'variable capital', that is, a force that is activated and made coherent only by capital, because the cooperative powers of labor (particularly immaterial labor power) afford labor the possibility of valorizing itself. Brains and bodies still need others to produce value, but the others they need are not necessarily provided by capital and its capacities to orchestrate production. Today productivity, wealth, and the creation of social surplus take the form of cooperative interactivity through linguistic, communicational, and affective networks. In the expression of its own creative energies, immaterial labor thus seems elementary communism." (HARDT & NEGRI, 2000, 293-4)

'Defect on reasoning' and dissimulations

If cooperation maximizes the utility functions and, by the other side, self-interest's choice or egoist's interest does not maximize as much as; why does Amartya sen attempt to "explain the emergence of cooperation by means of an introduction of some 'defect' on reasoning of the players"? (SEN, 1999, 100).

It is very strange. For Sen, people that reveal preference to cooperation and logically set aside self-interest-model have defect on reasoning, are ignorant, and lack information. Others economists not lesser important or famous affirm that group's rationality equals the individual's rationality and, by this way, all of them get better. That means, are not the individuals that reveal preference for cooperation; each one observing just the self-interest, which may not be the cooperation, but the group's rationality makes all the same: "the core is the set of imputations satisfying 'coalition rationality' including 'individual rationality'...'group rationality', where the subset is the grand

¹⁶ "Both the commitment and implementation problems [sic!] suggest why relationships motivated purely by material self-interest might be less successful, even in material terms, than those motivated by irrational love [sic!]. Perhaps Shakespeare anticipated these arguments when he wrote [that] 'Love is not love which alters when it alteration finds, or bends with the remover to remove; O, no! it is an ever-fixed mark, that looks on tempests and is never shaken'. The question remains, of course, whether people really are motivated by feelings of the sort Shakespeare described. Do people in love relationships really set aside material self-interest? There is evidence that many do" (FRANK, 1988, 199).

coalition of all players; and the rationality of all intermediate size coalitions” (INTRILIGATOR, 1971, 125 and 128).

The evidence of mathematic promiscuity or the abuse of mathematic is empirically observable. It is worthwhile to check the Intriligator’s cleverness to dissimulate the bisector line out of the graphic that shows the solution of this ‘painful problem’. Martin Shubik does something similar when he affirms, “the new line has declivity +1” and also excludes the bisector out of the graphic (SHUBIK, 1992, 186). Henderson & Quandt also use this resource to explain a “Nash bargaining solution”: “neither duopolist need agree to accept a lower profit than that provided by his strategy. The aim of a cooperative solution is for the duopolist to select a point northeast of T [sic!] on the boundary of the feasible utility regions.” (HENDERSON & QUANDT, 1980, 22). Arrow Impossibility Theorem is strictly related to this ‘painful problem’ or ‘imputation’ or ‘dictator’s preferences’. Martin Shubik affirms “this ‘imputation’ is possible only if there are linear and positive transformations of the players’ utility functions, under which this ‘imputation’ is, at the same time, equitable and efficient” (SHUBIK, 1992, 187).

Ferguson and Gould use the Lagrange’s multiplier or ‘shadow price’ to solve this ‘painful problem’ (FERGUSON & GOULD, 1989, 462-3 note 4 and p.473). Perhaps this fact may explain what Kreps calls ‘theories of second (or lower) quality’ because “the best theories and models are those that pass (possibly complex) tests of consistency or validity and, at the same time, provide insights that are clear and instructive and don’t depend on some mathematical sleight-of-hand” (KREPS, 1990, 12). Therefore, the Lagrange’s multipliers (λ_i) have similar interpretations to the dual variables of Linear Programming. The latter if the results of the primal are equals of the results of the dual, and then we have a ‘fixed-point’ located at the bisector (if R^2).

Would this procedure be a mathematical sleight-of-hand?

The ‘shadow price’ when observed a little closer suggests question that Dorfman et al. classify as ‘noncommercial question’: “what is the ‘optimal’ pattern of world production of food and clothing between England and Portugal?... The scientist might be attempted to consider evaluating food and clothing by their ‘intrinsic worth’; but unless he had been contaminated by a course in heavy German philosophy, he would soon realize that is an indefinable concept for food and clothing in a world where some people are more like peacocks and others more like gluttons” (DORFMAN, 1986, 33). Before finishing their work, at the appendix, they make use of the ‘shadow’ as a determinant fact, that is, as the value posed by the ‘heavy German philosophy’. Not just the triple but, Henderson, Quandt (see footnote 19), Mas-Colell et al., Blanchard, Fischer, etc. make use of this sort of thing – money as bisector line (value) – to give a reasonable answer to following question: “why and how unbacked paper money which is useless, is valued?”.

By the other side, Mansfield (MANSFIELD, 1978, 410), Henderson, Quandt and others affirm that ‘the second best’ is directly or strictly revealed preferred to ‘the first best’, that is, “the Arrow Impossibility Theorem states that, in general, it is not possible to construct social preferences from individual preferences without violating one or more of the five axioms that most economists believe that social preferences should satisfy... The theory of second best states that if one or more of the first-order conditions for Pareto optimality cannot be satisfied because of institutional constraints, in general it is neither necessary nor desirable to satisfy the remaining Pareto conditions” (HENDERSON & QUANDT, 1980, 319). This is so because if Sen and us were to play a game – the Rational Choice game – Sen would get utility 5 and we 1 if we all had to choose Neoclassic Economic Theory; the payoffs would be the reversed if we all had to choose Marxist Economic Theory (free of any Keynesian, Ricardian and Sraffian garnishes). The resolution of this game is 5/6 each (Lagrange function) or 5 each (area-sum method). But Sen would get 7 and we still 5 (area-sum method) or 5/2 and 5/6 (Lagrange function) if he did not pretermite the ‘first best’ (to cooperate to) by the ‘second [not] best’ (to leave as it is). Kreps would “call irrational any behavior in the game that flies in the face of the player’s own ‘best interests’ as determined by the player’s payoffs” (KREPS, 1990, 480).

Thus it is not just a revealed preference to Marxist Economic Theory, it is a revealed preference, no doubt, but produced by someone “who is willing to learn something new and therefore to think for her/himself” (MARX, 1986, 19). This is the mathematical evidence that Neoclassic

Economic Theoreticians and followers are in a tight spot; they are afraid to be happy. This is an alienated attitude. Who do they think for?

These ‘gentlemen’ pretermit – they pass by it; they disregard the rational way for something vague - the self-development or social relations where reciprocity does not require self-sacrifice for a ‘second [not] best’ theory. Although these ‘gentlemen’ are free to make the choice to a scientific theory the ‘institutional constraints’ impose a ‘second [not] best’ to them. The same way you are free to make choice to travel around the world, but without the money to pay for the trip you are lacking one of the conditions necessary to act on your choice. “Thus your freedom remains merely formal. Concrete freedom requires not only the absence of external constraint but also the availability of the objective conditions that are necessary if choices are to be effected. Such conditions may be characterized as *enabling* conditions or positive conditions for action as distinct from the constraining conditions, the absence of which defines negative freedom” (GOULD, 1995, 37-8).

The ‘institutional constraints’ have been brought into being by decisions and actions of agents and can be changed by them; they are objectified forms of relations among persons, these latter one are the immediate form of the social relations. The problem seems to be that such institutions have an independent existence apart from social relations among persons (GOULD, 1995, 112). Something very similar to what happens with commodity and or fetishism of commodity.

Therefore, what we have to bring out is the dissimulation or one of the basic features of these one-sided-economists. Henderson & Quandt revealed preference to the ‘second [not] best’, but they affirmed that ‘the gap between theory and empirical work has narrowed’ by applying ‘the positive monotonic transformation’; that it carries on some ‘share’ parameters, very similar to that presented by Sen at the note 5.

Both examples and the one related to the inclusion of ‘money’ in the utility function (HENDERSON & QUANDT, 1980, 251) are the evidence that Neoclassic Economic Theory is contained in Marxist Economic Theory. The ‘share’ parameters presented by Henderson & Quandt have merely formal existence; if really used they must confirm the Marxist Economic Theory.

Anyway, Sen keeps his ground.

“The argument to accept the social behavior instrumental role [group, collective] opposes each persons’ dominant strategy [egoistic attitude, self-interest, auto-interest], it is not easy to discard and it is not absolutely clear why this kind of group rationality considerations could not inspires the real behavior without go over again on ‘defects’ on persons’ knowledge.” (SEN, 1999, 103)

If Karl Popper considers that any effort to ‘reunite around a common matter’ – as better as this matter could be – is an effort to violate the rational reasoning, then he believes the persons were born impregnated with this ‘rationality’ that does not maximize as much as the collective or cooperative rationality.

Matt Ridley, looking for the origin of the egoistic attitude at the ‘selfish-gene logic’, explains that the origin of the cooperative logic is not at the reciprocity but at the ‘group selection’:

“Cooperative groups thrive and selfish ones do not, so cooperative societies have survived at the expense of the others. Natural selection has taken place not at the level of the individuals but at the level of the band or tribe...

...We are an extremely groupish species, but not a group-selected one. We are designed not to sacrifice ourselves for the group but to exploit the group for ourselves.” (RIDLEY, 1998, 188)

Ridley really explains the selfish action but actually attempts to disqualify Kropotkin by comparing this latter one to the ‘self-made-man’ and ‘meritocratic’ Huxley. Anyway, Ridley finishes his book prospecting the cooperation.¹⁷

¹⁷ “...The roots of social order are in our heads...We must encourage social and material exchange between *equal* for that is the raw material for trust, and trust is the foundation of virtue.” (RIDLEY, 1998, 265).

Kropotkin makes clear the evidence regarding mutual aid in animal life in these words: “happily enough, competition is not the rule either in the animal world or in mankind. It is limited among animals to exceptional periods, and natural selection finds better fields for its activity. Better conditions are created by the *elimination of competition* by means of mutual aid and mutual support [note 2: “One of the most frequent modes in which Natural

Sen's inelegance and others' dissimulations are subjectivities produced by their tormented minds; ratiocinations that are contained in a tight spot (never accommodated); they are exactly divided (one-sided) and afraid to develop themselves, to be happy.

This alien attitude, "this 'estrangement' ["Entfremdung"] (to use a term which will be comprehensible to the philosophers) can, of course, only be abolished given two *practical* premises. In order to become an "unendurable" power, i.e., a power against which men makes a revolution,¹⁸ it must necessarily have rendered the great mass of humanity "propertyless", and moreover in contradiction to an existing world of wealth and culture; both these premises presuppose a great increase in productive power, a high degree of its development. And, on the other hand, this development of productive forces (which at the same time implies the actual empirical existence of men in their *world-historical*, instead of local, being) is an absolutely necessary practical premise, because without it privation, *want* is merely made general, and with *want* the struggle for necessities would begin again, and all the old filthy business would necessarily be restored; and furthermore, because only with this universal development of productive forces is a *universal* intercourse between men established, which on the one side produces in *all* nations simultaneously the phenomenon of the "propertyless" mass (universal competition), making each nation dependent on the revolutions of the others, and finally puts *world-historical*, empirically universal individuals in place of local ones. Without this, 1) communism could only exist as a local phenomenon; 2) the *forces* of intercourse themselves could not have develop as *universal*, hence unendurable powers: they would have remained homebred "conditions" surrounded by superstition; and 3) each extension of intercourse would abolish local communism. Empirically, communism is only possible as the act of the dominant people "all at once" and simultaneously, which presupposes the universal development of productive forces and the world intercourse bound up with them...Communism is for us not a *state of affairs* which is to be established, an *ideal* to which reality [will] have to adjust itself. We call communism the *real* movement which abolishes the present state of things." (MARX, 1976, 54-57)

Chaos and harmony

Robert H. Frank has observed that the 'commitment model' or revealed preference to the group, collective – opposing the 'self-interest model' – incites us to an optimistic vision of the world; it incites us to benevolence; it incites us to altruism; he seems to insinuate that these features are immanent to human nature; he also recognizes that the 'self-interest model' carries on many serious problems.

Selection acts is, by adapting some individuals of a species to a somewhat different mode of life, whereby they are able to seize inappropriate places in Nature" (Origin of Species, p. 145) – in other words, to avoid competition.]. In the great struggle for life – for the greatest possible fullness and intensity of life with the least waste of energy – natural selection continually seeks out the ways precisely for avoiding competition as much as possible. The ants combine in nests and nations; they pile up their stores they cattle – and thus avoid competition; and natural selection picks out of the ants' family the species which know to avoid competition, with its unavoidably deleterious consequences. Most of our birds slowly move southwards as the winter comes, or gather in numberless societies and undertake long journeys – and thus avoid competition. Many rodents fall asleep when the time comes that competition should set in, while other rodents store food for the winter, and gather in large villages for obtaining the necessary protection when at work. The reindeer, when the lichens are dry in the interior of the continent, migrate towards the sea. Buffaloes cross an immense continent in order to find plenty of food. And the beavers, when they grow numerous on a river, divide into two parties, and go, the old ones down the river, and the young ones up the river – and avoid competition. And when animals can neither fall asleep, nor migrate, nor lay in stores, nor themselves grow their food like the ants, they do what the titmouse does, and what Wallace (*Darwinism*, ch. V) has so charmingly described: they resort to new kinds of food – and thus, again, avoid competition."

"Darwin was quite right when he saw in man's social qualities the chief factor for his evolution, and Darwin's vulgarizers are entirely wrong when they maintain the contrary" (KROPOTKIN, 1998, 72-73 e 6).

¹⁸ Gunnar Myrdal did not destroyed metaphysics – *Metaphysics must be destroyed*. Myrdal's last years were very hard; his last clear sentence before he died was: "in any case, I have never written anything that I have to be ashamed of". "He was also extremely hurt by the public attacks by his son Jan and kept rewriting what was to be his answer to these, a small book entitled *Jan is lying*." (MYRDAL, 1990, xxix).

Myrdal did not make any "revolution" even though he could answer (and practice it) correctly the question he himself brought out: "only if economists are modest in their claims and renounce all pretensions to postulate universal objectives, viz., to keep political arguments rational, that is to say, to base them on as complete and as correct a knowledge of the facts as possible. But is not the proposition that politics ought to be rational in this sense and that economists ought to support this endeavour itself a normative principle? And is it not arbitrary at that? Why not sacrifice 'truth' to higher value? The answer to this question is that the possibility of scientific endeavour depends upon the tacit assumption that rational argument is desirable" (MYRDAL, 1990, 206-7)

Myrdal paid too much for a 'deteriorated truth'. He did not understand anything about *The Theory of Shopping*. "What emerges clearly is that it is exchange, not love, that as it were 'makes the world go around'. Love, by contrast, tends to act as the very negation of this sense of movement, by confirming a stable and constant center to one's affective identity" (MILLER, 1998, 130).

“But as the philosopher Thomas Kuhm has stressed, a reigning theory is almost never displaced by mere contradictions in the data. If it is to be challenged at all, it must be by an alternative theory that fits the facts. The commitment model is a tentative first step in the construction of a theory of unopportunistic behavior. It challenges the self-interest model’s portrayal of human nature in its own terms by accepting the fundamental premise that material incentives ultimately govern behavior. Its point of departure is the observation that persons *directly* motivated to pursue self-interest are often for that very reason doomed to fail. They fail because they are unable to solve commitment problems [sic!]. These problems can often be solved by persons known to have abandoned the quest for maximum material advantage. The emotions that lead people to behave in seemingly irrational ways can thus indirectly lead to greater material well being. Viewed in these terms, the commitment model is less a disavowal of the self-interest model than a friendly amendment to it. Without abandoning the materialist framework, it suggests how the nobler strands of human nature might have emerged and prospered. It does not seem naïve to hope that such an understanding might have beneficial effects on our behavior. After all, the self-interest model, by encouraging us to expect the worst in others, does seem to have brought out worst in us. Someone who expects always to be cheated has little motive to behave honestly. The commitment model may not tell us to expect the best in others, but it does encourage a markedly more optimistic view.” (FRANK, 1988, 258-9)

The reverse of it seems to be the truth. We do not have to behave in seemingly irrational ways to maximize material (and immaterial) advantage. Love is not an irrational emotion.

It seems that Myrdal knew pretty well that linear and positive transformation path would take the practioner to Marx, and that the *interpersonal comparisons* were also a by-pass or short cut to Marx; he overran to Max Weber but he did not find any clarity; he attempted to reconstruct the field of economic interest (the ‘technology of economics’); he also commented of ‘refutation’; he looked up for patience before affirming that “we shall have to be content for a long time with somewhat vague generalization”; and finally said: “why not sacrifice ‘truth’ to higher value?” (MYRDAL, 1990, 196, 202-4, 207).

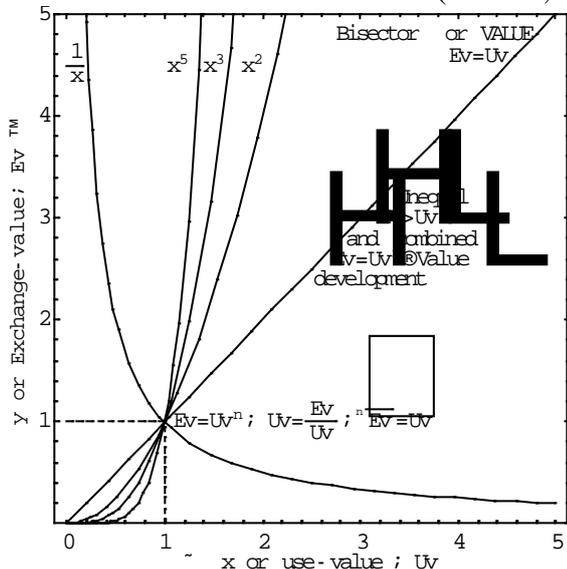
This tightness; this tension or conflict between two opposed poles – utility or use-values and exchange-values – contained in commodity had been surpassed or linear and positive transformed by Karl Marx right at the beginning of his most known work: *Das Kapital*. Max had observed that use-values or utility furnishes the material base for a special study, that of commercial knowledge of commodities; they constitute the substance of all wealth, whatever may be the social form of that wealth; they are also depositories of exchange-values (MARX, 1986, v. I, 44). Exchange-values do nothing more than express something equal; the phenomenal form, of something contained in it, yet distinguishable from it; they express the VALUE which determine the PRICE, that is, value or bisector line of quadrant I if we assume *x-axis* as use-values and *y-axis* as exchange-values. Therefore, the resolution of this antagonism is value (bisector).

A function that fits this relation between opposed poles is $y = 1/x$ or *exchange-values = 1/use-values*, because this function is the inverse or oppose proportionalities; as large *y* can be, *x* gets nearer to zero (0) or the complete nullification. Therefore, both dimensions of the commodity must exist to realize the commodity as such. This *y* or exchange-values only get to their plenitude by equating to *x* or use-values, i.e., on bisector line or value, inasmuch as the equation between the function of inverse proportionality and the bisector line ($y/x = x$; $y = x^2$ or $\square y = x$), exchange-values equal the potency or latent form potentate, that means, use-values equal the square root of exchange-values.¹⁹

This function seems to fit pretty well the ‘history of exchange-values’, i.e., “there was a time, as in the Middle Ages, when only the superfluous, the excess of production over consumption, was exchanged. There was again a time, when not only the superfluous, but all products, all industrial existence, had passed into commerce, when the whole o production depended on exchange... Finally, there came a time when everything that men had considered as inalienable became an object of

¹⁹ The Conventional Economics must do some logic inconsistencies to explain such facts extremely important as money and utility function’s linear and positive transformation: a) “Equation (9-39) postulates a mode of behavior that is logically, though not mathematically, inconsistent with utility maximization: the consumer desires to hold a stock of money from which she derives no utility rather than spend it on commodities from which she does...The rationale is that money stocks yield utility by facilitating exchange...”[sic!]. (HENDERSON and QUANDT, 1980, 251); b) Eaton & Eaton make juggling to explain how “many utility functions” become linear and positive transformed in one utility function or bisector line. It is worthwhile to check this juggling at the page 64 and footnote 6 of the Brazilian edition. (EATON & EATON, 1999, 64 note 6).

exchange, of traffic and could be alienated. This is the time when the very things which till then had been communicated, but never exchanged; given, but never sold. Acquired, but never bought – virtue, love, conviction, knowledge, conscience, etc. – when everything, in short, passed into commerce. It is the time of general corruption, of universal venality, or, to speak in terms of political economy, the time when everything, moral, or physical, having become a marketable value, is brought to the market to be assessed at its truest value.” (MARX, 1966, 29).



Other function that fits the relation between these two opposed poles is the potential function: $Ev = f(Uv^n)$. If we consider that each commodity is a use-value or utility; this use-value potentialized (second degree function, for example) results some exchange-values; for example, two commodities generate four exchange-values: two exchange-values by themselves and two exchange-values between themselves, one as numerator and other as denominator. There is no losing of generality if n become superior or inferior to two.

After all, “the decreasing rate of utilization negatively affects all three fundamental dimensions of capitalistic production and consumption, namely those of: 1) goods and services; 2) plant and machinery; and 3) labor power itself” (MÉSZÁROS,

1995, 575). First, as ‘built-in-obsolescence’ of most part of commodities and services. Second, as the chronic under-utilization of plant and machinery. Finally, third, as the substitution of men by the machine. So that we can conclude that exchange-values reign almost completely over use-values or utility. Both functions present this ‘decreasing rate of utilization’.

Both functions also express the *unequal development* between both opposed poles contained in commodity.

“This law enables us to observe how the new qualities arise. If society did not develop in a *differential* way, that is, through the emergence of differences that are sometimes so acute as to be contradictory, the possibility for combination and *integration* of contradictory phenomena would not present itself. Therefore, the first phase of the evolutionary process – that is, unevenness – is the precondition for the second phase – the combination of the features belonging to different stages of social life into distinctive social formations, deviating from abstractly deduced standards or ‘normal’ types.” (NOVACK, 1995, 99)

The positive resolution or *uneven and combined development* between utility or use-values and exchange-values results in value, which determine prices. Still in mathematical terms, it is important to express that ‘combining’ exchange-values, dependent variable when the function $Ev = f(Uv)$, with the use-value; the former seems to invert the function, $Uv = f(Ev)$ or $Ev = f^{-1}(Uv)$, though the production or “the industrial existence depend on exchange-value” (MARX, 1966, 29). Once more, the bijective function seems to explain this fact.

The function $Cc = f(-11Vc + 55)$ not only can represent the organic composition of a developed country (region, city, etc.), but also furnishes another curve (this one with positive inclination: $P = 1,2222V - 6,7222$) representing the price, which oscillate around value (left side under bisector line and right side above it).²⁰ The vertical distance between any point located at this latter curve (price) to the bisector line means the transference / absorption of value or wealth. The tendency is the latter overlaps the bisector line as soon as the former overlaps the y-axis.

²⁰ We should not forget that “the form of dependency between price, by one side, demand and supply, by other side, is not yet defined: in general, at first glance, the authors [Menger, Böhm-Bawerk, Wieser, Walras, Launhardt, Jevons, etc.] define it with precision. Price depends on the relation between supply and demand and also vary directly proportional to demand and inversely proportional to supply. But these definitions are only appearance, forasmuch as none of the authors understand the relation between demand and supply as a relation in mathematical terms... Nevertheless, the correction realized by J.S.Mill, which substitute the notion ‘equation’ by ‘relation’ to explain supply and demand (cf. Mill, Principles of political economy [1848], book III, chapters 2 and 4) gives little help to clarify the matter. (DMITRIEV, 1977, 167).

The antithesis between capital and labor is overcome within them.²¹ “The capitalist stock companies, as much as the co-operative factories, should be considered as transitional forms from the capitalist mode of production to the associated one, with the only distinction that the antagonism is resolved negatively in the one and positively in the other” (MARX, 1986, v. III, 440).

What is needed of explanations is how Chaos Theory (fractals, strange attractor, etc.) contributes as ‘bridge’ between these two apparently opposed theories as we have commented on this text.

Before anything, we should bring back the first paragraph of Adam Smith’s *Theory of Moral Sentiments*.

“No matter how selfish we suppose men can be, evidently there are some principles in their nature that make them interested in others’ sort, even though this interest is based on just the observation of the others’ happiness” (SMITH, 1999, 5).

In spite of the adjectives used by Sen to disqualify Adam Smith – “schizophrenia not much impressive” – surely Smith is reasonable.

Adam Smith’s two poles confirmation – the multitude’s egoistic or selfish behavior and the tiny portion of altruistic persons – can be represented in mathematical and graphics terms; the same way we did it with use-values or utility and exchange-values. We need to call attention to this relation – $P(x,y)$ or xRy – undergo a self-decharacterization of the function (one of the relation’s forms). That means, it makes the emergence of a new relation and/or different function (at least, the inverse function) that, temporarily, we denote it as dialectic – yDx .²² The more the egoistic person wishes to accumulate, to become a perfect selfish; more the increase in his/her need of this referential of happiness produced by the even more tiny portion of persons. In mathematical terms, this function has no defined limit (it cannot be zero), though it is impossible to nullify completely the tiny portion. So that this tiny portion becomes the north at which their magnetic needle must point to.

Before we clarify – in introductory way – what the Chaos Theory is all about, it is necessary to explain some correlate points. First, the metaphor ‘bridge’ used right at the beginning of this text may distort the actual relation between both Economics Theories. This relation may be thought as being disjoint or mutually exclusive sets ($A \square B = \square$). Therefore, ‘bridge’ may be a strange metaphor. Second, academically the relation between both theories is better described by the function, *Marxist Economic theory* = $f(\text{Neoclassic economic Theory})$, i.e., Neoclassic Economic Theory is presented as necessary and sufficient to the formation of economists. That is, Neoclassic Economic Theory is not only exuberant academically, but also dominates it at [almost] all. Third, Neoclassic’s theoreticians wishing to establish an incontestable theory and immune to objections or critics have adopted mathematics, widely known as the scientific language par excellence. Though, as we have seen, mathematics has been abused. Fourth, the social scientists have either gave up almost completely this analytical instrument very important to the science in general or adopted it but based on Conventional Economics. Finally, among Marxists we find “the argument that Marxist variables are non-quantifiable and non-operational in any absolute sense may be true, but it is also true for others theories...[in general] The most common [approach] is the attempt to use Marxist theory to explain

²¹ “Through the cooperative, the collective existence, and the communicative networks that are formed and reformed within the multitude, time is reappropriated on the plane of immanence. It is not given a priori, but rather bears the stamp of collective action. The new phenomenology of the labor of the multitude reveals labor as the fundamental creative activity that through cooperation goes beyond any obstacle imposed on it and constantly re-creates the world. The activity of multitude constitutes time beyond measure. Time might thus be defined as the immeasurability of the movement between a before and an after, an immanent process of constitution. The processes of ontological constitution unfold through the collective movements of cooperation, across the new fabrics woven by the production of subjectivity. This site of ontological constitution is where the new proletariat appears as a constituent power. This is a *new proletariat* and not *new industrial working class*. The distinction is fundamental. As we explained earlier, “proletariat” is the general concept that defines all those whose labor is exploited by capital, the entire cooperating multitude. The industrial working class represented only a *partial* moment in the history of the proletariat and its revolutions, in the period when capital was able to reduce value to measure. In the period it seemed as if only the labor of waged workers was productive, and therefore all the other segments of labor appeared as merely reproductive or even unproductive. In the biopolitical context of Empire, however, the production of capital converges ever more with the production and reproduction of social life itself; it thus becomes ever more difficult to maintain distinctions among productive, reproductive, and unproductive labor. Labor – material or immaterial, intellectual or corporeal – produces and reproduces social life and in the process is exploited by capital.” (HARDT & NEGRI, 2000, 402).

²² Evidently, it is problematic to regard the distinction between mathematical and formal logic. “But in our view, it is obvious that, however closely related the two maybe, mathematics stand apart from logic as a science whose distinctiveness is clearly marked” (WEYL, 1994, 50).

the movement in the orthodox statistics” (DUNNE, 1991, 7-10). Like Freeman, we believe that “future work will be able to refine procedure to create a Marxist set of value accounts with which to develop quantitative Marxism” (DUNNE, 1991, 105).

Inasmuch as the one-sided-economists and also the social-engineering keep themselves waiting till this whole process or data resulting from it, fits itself in the language of chaos and fuzzy sets – Chaos Theory. From now on, economic dynamic, family dynamic, projections, etc. may turn realizable or concrete.

But what is Chaos Theory, Chaotic systems or simply Chaos?

It is a still incomplete theory. Gleick, one of the pioneers in popularizing Chaos, affirms, “where chaos begin, classic sciences cease” (GLEICK, 1990, 3). Its incompleteness has provoked some positivist logics’ anxiety to accommodate next to, but this task has been impossible, remaining just the expectation that this ‘new epistemology’ assures them a little space (like a museum). That is because they do not realize that “scientific research has long relied on the linear paradigm of cause and effect that forms the basis for lawful, orderly, and predictable change. The search for the “x’s” that produce the “y’s” has guided science for the last century [$y = f(x)$]” (BÜTZ et al., 1997, 3). In another word, formal logic has had the rule over almost everything. Almost, that is the word.

Bütz et al give us a concise explanation about Chaos Theory:

- Main feature: “Initial differences result in errors that grow exponentially over time”
- Partial definition: “Chaos Theory, as an umbrella terms, describes a holistic process of adaptive transformation, where, over time, small instabilities may result in complex behavior, that may eventually appear random and is experienced as chaos by those accustomed to linear science. Though lengthy, this definition describes a process that begins with instability and ends with adaptive transformation. Chaos lies somewhere between these two points...”
- Commonly encountered terms associated with Chaos phenomena: **Attractor* – paraphrased for clarity. A place where trajectories converge. In essence, an attractor, for all the fancy language used to describe it, is basically what it sounds like. The sun is one big attractor for our solar system; **Perturbation* – introduction or deletion of energy or information to or from a system resulting in a change in state of equilibrium; **Point attractor* – common point or state to which a system moves after perturbation from a wide variety of starting position; They seem attract trajectories; **Bifurcation* – the branching, splitting, evolution of dynamics within a system; a process by which a dynamic equilibrium changes to a new equilibrium; it typically occurs when a system is moving from a linear behavior to nonlinearity, although many nonlinear system may appear to behave linearly for a time. Some have referred to it as a fork in the road; **Nonlinear* – circular, repetitive interacting, nondirectional process of a system or ‘getting more than you bargained for’; * *Period-Doubling Route to Chaos* – the time it took for system to oscillate back to its starting point doubled at certain critical values of the equation. Then, for example, ‘after several period-doubling cycles, the insect population in his model varied randomly, just like real insect populations, showing no predictable period for return to its original state’ – chaos; * *Chaos* – an erratic, nonprobabilistic, nonperiodic state or process that is not predictable, yet may be understandable through the analysis of previous evolutions; * *Strange attractor* – associated with chaotic dynamics, the position or set of boundary conditions to which a system gravitates as it moves from order to disorder [sic!] where it is able to pierce every arbitrarily small region in the attractive space; * *Self-organizing* – the spontaneous emergence of order out of chaos reflecting the capacity of all living systems to generate their own new forms from inner guidelines.
- History and social unrest: “problems occur, however, when we discuss data with phenomena that do not repeat themselves. History – notwithstanding occasional trends that are subject to much speculation – may be an example. The scientific analysis of social unrest is yet another. It is much easier to avoid a rigorous explanation of facets of phenomena that are essentially unrepeatable, specially since traditional science has learned to lump all its ignorance into the

omnibus terms ‘measurement error, randomness’ or worst of all ‘bad data’. (BÜTZ et al.,1997, 25-25, 38)

So that the tiny portion of persons problem [solution] is denoted by the mathematicians as chaos producers, strange attractors, Lorenz’s equations or simply Theory of Chaos (BOYCE & DIPRIMA, 1998, 325). The two graphics beside projections of the same Lorenz’s equations on R^3 and R^2 , the initial trajectories at (5,5,5) (BOYCE & DIPRIMA, 1998,

$$\begin{aligned} x' &= sx - sy \\ y' &= rx - y - xz \\ z' &= -bz + xy. \end{aligned} \quad \text{onde, } s = 10, r = 28 \text{ e } b = 8/3.$$

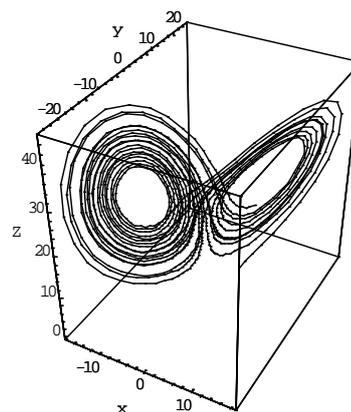
A group of scientists examines the “Habits of the individualism and commitment in American life”, and describes something very interesting.

“For several centuries, we have been embarked on a great effort to increase our freedom, wealth and power. For over a hundred years, a large part of the American people, the middle class, has imagined that the virtual meaning of life lies in the acquisition of ever-increasing status, income, and authority, from which genuine freedom is supposed to come. Our achievements have been enormous. They permit us the aspiration to become a genuinely humane society in a genuinely decent world, and provide many of the means to attain that aspiration. Yet we seem to be hovering on the very brink of disaster, not only from international conflict but also from the internal incoherence of our own society. What has gone wrong? How can we reverse the slide toward the abyss? In thinking about what has gone wrong, we need to see what we can learn from our traditions, as well as from the best currently available knowledge [*]. What has failed at every level – from the society of nations to the national society to the local community to the family – is integration: we have failed to remember ‘our community as members of the same body’, as John Winthrop put it. We have committed what to the republican founders of our nation was the cardinal [sic! Why not capital?] sin: we have put our own good, as individuals, as groups, as a nation, ahead of the common good.” (BELLAH et al., 1996, 284-5).

To “reconstitute the social world”, the group of scientists suggests, although in a stuttering way, a “new social ecology”, a “restoration of the dignity and legitimacy of democratic politics” [sic!], a “revitalization of party systems”, a “return in a new way to the idea of work as a contribution to the good of all and not merely as a means to one’s own advancements”, etc. Although the group has encountered the ‘signs of the times’: “if there are vast numbers of a selfish, narcissistic ‘me generation’ in America, we did not find them, but we certainly did find that the language of individualism, the primary American language of self-understanding, limits the way in which people think” (BELLAH et al., 1996, 286-8, 290).

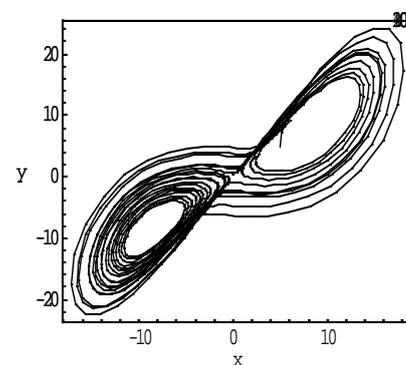
Be it *Grundrisse, Economic and Philosophic Manuscripts* and others work of Karl Marx, we always find not only a cram-full descriptions of the facts but also, at least, a path to a precise measurement of them.²³

So that what they call chaos can be explained as ‘general corruption’, as the world of commodities posed by capital’s relations, i.e., empire (HARDT & NEGRI, 2000); the ‘strange attractor’ or that tiny portions of persons carries the perfect harmony, being the referential.²⁴



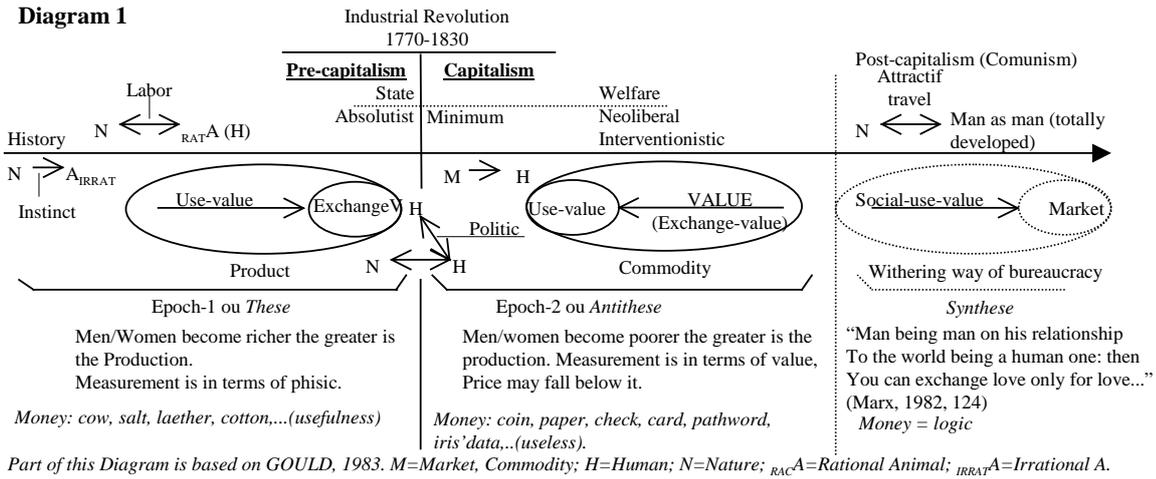
show being 376).

heart:



²³ “All the arguments [included the measurement or quantitative precision] in favor of a new paradigm discussed before are based on comparability between competitors’ abilities to solve problems. Such arguments are commonly the most persuasive to the scientists... Fortunately, there still is another kind of consideration that take scientists to reject an old paradigm in favor of the new one. I refer to arguments, rarely and completely explicit, that appeal, in individual, to the sentiments of what is appropriated or stylistic – new theory ‘is much more clear’, ‘more adequate’ or ‘simpler’ that the old one. Probably, such arguments are not so efficient in science than in Mathematics.” (KUHM, 1998, 195-6).

Diagram 1



A panoramic view of History, with three periods as Carol

C. Gould comments based on *Grundrisse* – pre-capitalism / capitalism / communism – makes it easy to observe the commodity’s inner and outer dialectic movement. Without Chaos Theory would be difficult to explain the reversion of interest, for example, a minority’s interest – merchant, traders, dealers, expelled out of the church by Jesus Christ (Matthews, 21:12-13) – reverted in general interest of actual epoch or capitalism. Although the forthcoming reversion – family’s dynamic seems to present evidence of it – is being based on referential families’ interest.²⁵ Family seems tending to extinction, but it is really forming the tiny portion of persons that is overcoming (transforming linear and positively their utility functions) the capitalism’s contradictions.

Sometimes Mézáros points to the right way with the forefinger straight as an arrow: “since capital can only function by way of contradictions, it both creates the family and destroys it; both produces the economically independent young generation with its ‘youth culture’ and undermines it; both generates the conditions of potentially comfortable old age, with adequate social provision, and sacrifices them to the interests of its infernal war-machinery. Human beings are both absolutely needed by capital and totally superfluous to it. If it were not for the fact that capital needs living labor for its extended self-reproduction, the nightmare of the neutron-bomb holocaust would certainly come true. But since such ‘final solution’ is denied to capital, we are confronted with the dehumanization consequences of its contradictions and with the growing crisis of the system of domination...[but] the virtual disintegration of present-day family – this cell of class society – presents a challenge to which there cannot conceivably be formal-institutional answers, whether in the form of ‘amending the law of trespass’ or in some more ruthlessly repressive form. The crisis of this institution assumes many forms of manifestation, from the hippy cults to widespread drug-taking; from the ‘Women’s’ Liberation Movement to the establishment of utopian enclaves of communal living; and from the much advertised ‘generation-conflict’ to most disciplined and militant manifestations of that conflict in organized action. Those who have laughed at them in the past had better think again. For whatever might be their relative weight in the total picture today, they are potentially of the greatest significance without one single exception” (MÉSZÁROS, 1995, 686 and 881).

So we neither wait nor laugh at this very important family’s fact because we make part of the tiny portions of persons that eventually cause deep changes in all.

The following is not an abuse of mathematics, just an ‘illegal’ but wealthy procedure to – in spite of the domain of ‘things’ and/or anthropomorphism over all [almost] of us – keep the life sparkle flaming. Meanwhile, we need safeguard all of those that reason ‘without defect on’ just to form

²⁴ Harmony = symmetry. “Symmetry means something like wee-proportioned, well-balanced, and symmetry denotes that sort of concordance of several parts by which they integrate into a whole. Beauty is bound up with symmetry.” (WEYL, 1989, 3)

²⁵ The tiny portion of persons or ‘referential family’ contributes to the formation of ‘dominant people’ (MARX, 1976, 57); it is ‘on-line’ or connected, but in loose-jointed way (BOTH, 1976); although it is losing track or function, it has found its own peculiarity and starts the new valorization (KÖNIG, 1994, 81); it is similar to the ‘relational family’ (CICHELLI-PUGEAUT & CICHELLI, 1999, 112). The ‘referential family’ is the ‘factory of subjectivities’, subjectivities of resistance and revolt, immaterial labor or affective labor; ‘the ethical cement of collective life’ (HARDT & NEGRI, 2000); “creates a new economic foundation for a higher form of the family and of the relations between sexes” (MARX, 1986, 460).

imperfections by providing the referential, the ‘north’ to their barbarized and electro magnetized, i.e., the hyper-sophisticated and high-tech needle.

In order that, Marx incites us to violate the fixed-point theorem airily commented before, because we can – among others attitudes – love and evoke love in return more and more so that the fixed-point moves toward northeast.

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