Fuzzy Sets and the formalization of institutional issues

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In social investigation and measurement, it is undoubtedly more important to be vaguely right than to be precisely wrong (Sen, 1989).

… the principle of incompatibility – a principle which asserts that high precision is incompatible with high complexity (Zadeh, 1975).

… change is always in the last resort a change in habits of the thought (Veblen, 1898).

Abstract: Veblen (1914) proposes a concept of human life in terms of instincts and habits of thought that provides an analytical structure to treat ambiguous concepts - like institutions – an its nuances of significations in Economics. Zadeh (1979) suggests that the Fuzzy Set Theory could be better applied to study different social phenomena than the mathematical and scientific formalization of binary logic, which ignores the ambiguity and complexity of the social world. We argue that the language of fuzzy logic, with its emphasis on an *Approximate Reasoning*, can be of help when the objective is to deal with the *Sequential Rationality* present in Veblen´s complex concept of the human material in Economics. In the same line of thought, the meaningful nuances of the habits of thought and action can be organized by the use of Fuzzy Set Theory.

Key words: Veblen, Zadeh, fuzzy sets, formalization, Economics.

Introduction

One common critique to the institutionalist approach, especially those designed by Veblen, is a possible lack of a consistent and formal theoretical organization and a rigorous analytical method for analyzing the different social phenomena. However, a certain lack of knowledge of the paradigmatic break down that an evolutionary science, as proposed by Veblen, can provide in terms of method of description and explanation in social sciences seems prevailing. If the objective of research is to study phenomena in social and complex environments, it is important to note that classifications, direct causalities and generalizations are not part of the intent of the researcher.

Veblen deals which dense descriptions, rich in linguistic nuances and with prolonged causalities, which are mediated by changes of symbols and other social manifestations. This analytical and conceptual richness is relevant, but it implies serious difficulty for identifying and synthesizing regularities in complete *formal* terms. Veblen´s approach suggests a change in how to produce a science that is not taxonomic, hedonistic and teleological like the classical and neoclassical ways of thought in his time.

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It can be argued that the act of theorizing is to synthesize and articulate a structure of components to identify and interpret the regularities of the social world. Classical and neoclassical economics reduced, *a priori*, the degree of diversity in human economic behavior; its objective was to study human material by the way of precise methods. Examples of this type can be found in the marginal evaluation of pain and pleasure and in the opportunistic behavior of the Transaction Cost Theory proposed by the New Institutional Economics. These approaches cannot consider the variety and ambiguity present in the social world and become incapable of studying themes that are ambiguous in nature, like the case of the different concepts present in social science.

This paper suggests that the Fuzzy Set Theory can be a mathematical instrument capable of formalizing institutional arguments without losing the complexity and ambiguity of the socioeconomic environment. Our argumentation has been based on some similarities of problems of study and understanding about what science is between Veblen´s approach and Zadeh´s Fuzzy Set Theory.

Our line of argumentation follows what was pointed out by Sen (1989), in which he refers to the importance of capturing the ambiguity of many concepts in social theories. For Sen (1989), if an idea has an ambiguity, its precise formulation must try to capture that ambiguity. In numerous contexts, the formal representations will take the form of partial orderings, or of overly determined rankings, or of *fuzzy* relations. The important point to note is that it may be, for substantive social theories, both terribly limiting and altogether unnecessary to avoid ambiguities. "Even when precisely capturing an ambiguity proves to be a difficult exercise, it is not an argument for forgetting the complex nature of the concept and seeking a spuriously narrow exactness" (Sen, 1990: 45).

Veblen (1914) proposes a concept of human material in terms of instincts and habits of thought that provides an analytical structure to treat ambiguous concepts - like institutions - with nuances of significations in Economics. Zadeh (1975) suggests that the Fuzzy Set Theory could be better applied to study different social phenomena than the mathematical and scientific formalization of binary logic, which ignores the ambiguity and complexity of the social world. We believe that the method proposed by Zadeh can be of help for social sciences that study institutions as habits of thought. It could be argued that this method could be used to organize institutions and behaviors that are present in a complex and uncertain environment.

In order to develop this argumentation, the paper presents: some remarks on science, method and human behavior in Thorstein Veblen´s theory (section 1); discusses the passage from empirical classes to fuzzy sets (section 2); makes some appointments on diversity and causal complexity (section 3); and proposes an expectations index to organize cultural-cognitive elements shared by experts in one science-based economic sector (section 4).

1 Science, Method and human behavior in Thorstein Veblen: some remarks

Thorstein Bunde Veblen developed an interesting agenda of research; his main interest was to understand how individuals formed habits of thought through the

common instinct to survive – how habits of thought are adequate for the material conditions of surviving – how to use the material means for surviving.

It is possible to discover in Veblen´s writings on economic theory, socio-historical analysis, psychological argument, radical political commentary and satire. The discussion of Veblen´s work in the past century focused on his critiques on the habits of the rich and powerful and on the intellectual gyrations of the academic apologies for the socially privileged (Camic; Hodgson, 2011: 08).

Veblen´s main contribution is his theoretical critique on the foundations of neoclassical economics; he undermines its crucial assumption that individuals are rational utility-maximizers and its orientation toward the analysis of equilibrium outcomes. These assumptions – rational maximizer men and equilibrium –defined the method of analysis in Economics – a deterministic method of explanation which is called pre-evolutionary science by Veblen (1998).

Veblen (1998) was interested in studying economic life in a constant process and developed an alternative perspective that is mainly influenced by the instinct-habit psychology of William James[3]. Having in mind his attacks on rationality that is the basis of human material in traditional analysis in Economics, it is possible to argue that Veblen introduces the uncertainty (possibility) in human thought, which is, like habits of thought, guided by different instincts.

Veblen (1998) emphasized the pre-evolutionary character of the method of analysis the Economics of his time – especially classical and neoclassical (marginalists). In "The limitations of marginal utility" (1909), Veblen detached some restrict points: i) inadequate conception of human nature (hedonism); ii) taxonomy and deductive method and iii) teleology. Veblen intended to break out with all these lines of thought; all of them follow teleology in lines of determinism.

His interest was to propose an evolutionary method that could comprehend the *process* of economic life in the community, which involves understanding the *action* presented in this process and not relying only on understanding different points in time, like what occurs with the equilibrium *dictatum*. The interest is how human nature, accepted as instincts and habits of thought, answers to different material necessities according to the development of technology, without believing in a complete rationality or in a fixed and immutable human nature.

The question that remains is how Veblen could propose a different method of doing theoretical analysis in Economics. In order to study the *action* in the economic *process*, it is necessary to use the instinct-habit psychology in place of a given passive human nature that dominates the traditional Economics. In doing so, the concept of instinct could be interpreted as a central category (analytical concept) for understanding what Veblen proposes by evolutionary science.

We intend to discuss Veblen's perspective on science and method with his emphasis on instincts and habits of thought that form the human material in the analysis

[3] Hodgson (2007) argues that the understanding of the dual and complementary role of instinct and habit in the formation of preferential dispositions was central to the psychology of William James (1890), which was influential for Veblen (1914).

of social sciences. The proposal is to present Veblen insights on science and method for detaching importance to a different kind of explanation in Economics. Following Hodgson (2007:337), it is relevant to emphasize that Veblen´s mission of a "pos-darwinian economics may at last be conceivable in a fuller and richer sense. Also, the many different themes that appear from Veblen´s proposal involve a paradigm shift in substance rather than in technique.

We argue that Veblen´s insights on method consider human rationality and human behavior are in line with his defense of studying the *process* denoted by a prolonged sequence of events. This means that human rationality is not complete because it proceeds by proximity with different contexts in a sequence of events and not in a fixed and immutable manner like is supposed in traditional analyses in Economics. This new understanding of human rationality requires a formal method that allows for capturing the ambiguity present in terms like institution and human behavior. Our main argument is that Veblen´s approach and the Fuzzy Sets Theory share the same understanding of science and the method of analyzing the action in the *process*. Zadeh wants to approximate the computing of artificial intelligence to human thinking; this implies learning during the processes, and adapting inferences to new information and reoriented objectives.

Veblen´s main critiques on different schools of thought in Economics are in his *The place of science in modern civilization* (1906). His critical arguments on foundational assumptions adopted especially by classical and neoclassical Economics permitted him to structure his theoretical proposal of analysis and explanation of the economic process, which is presented in his *The Instinct of workmanship and the State of the Industrial Arts* (1914).

Following Coats (1954), we argue that in order to present the crucial features of Veblen´s methodology, it is necessary to examine the "preconception" underlying his work and to contrast it with the preconceptions attributed by him to the orthodox economists. Our paper will focus especially on the second topic – Veblen´s critiques on traditional Economics which respect human material and how it is possible to formalize this complex theme with the Fuzzy Sets Theory.

Science and Method

For Rutherford (1999), Veblen in his *Place of Science* understands science as an expression of "idle curiosity" (one of the different instincts discussed by Veblen); an uninterested enterprise that rejects a notion of science that could focus or be judged by its practical success or application. "…the system of knowledge, even in so far as its motives are of a dispassionate or idle kind, falls into like terms, because such are the habits of thought and the standards of discrimination enforced by daily life"(Veblen, 1919, p. 11)

With this idle character, Rutherford (1999) argues that Veblen made his first attack on orthodox economics which refers to natural laws and normal cases. For Veblen, the use of a normalized plan implies a lack of success to follow out an elusive chain of causal sequence and results in an analysis in which the forces, causally at work in the economic life process, are avoided (Veblen, 1898 in Rutherford, 1999: 4).

> Economics consists of laws of normal cases, but the normal case does not exist in concrete fact so that the laws of economics are hypothetical and apply to concrete facts only as the facts are interpreted and abstracted from, in the light of the underlying postulates (Veblen, 1900:199 in Rutherford, 1999: 04).

Coats (1954) claims that the orthodox economists analyzed their data in terms of a preconceived "normal", but such a mistake was not committed by the evolutionary scientists. The great asserts of the evolutionist thinkers, Veblen said:

> …lie, on the other hand, in their refusal to go back of the colorless sequence of phenomena and seek higher ground for their ultimate syntheses, and, on the other hand, in their having shown how this colorless impersonal sequence of cause and effect can be made use for theory proper, by virtue of its cumulative character (Veblen, 1906: 61 *apud* COATS, 1954: 532).

For Rutherford (1999), the second attack of Veblen was on hedonistic psychology accepted by orthodox Economics. "…the human material with which the inquiry is concerned is conceived in hedonistic terms, that is to say, in terms of a passive and substantially inert and immutably given human nature" (Veblen, 1998: 411).

This view of a passive, inert and immutable human nature acknowledged by the adepts of orthodox Economics fails to provoke an analysis that could happen in the evolutionary terms of a cumulative causal sequence. For Veblen (1998), another comprehension of human nature is important and necessary which implies that to recognize that "the change is always in the last resort a change in habits of thought" (Veblen, 1998: 412).

As emphasized by Rutherford (1999), economic evolution is an issue of the evolution of instincts and habits of thought; evolutionary Economics has to deal, in causal terms, whit cumulative change in these habits of thought and cannot handle with the objectives of human action as constant and unchanging, like is assumed by orthodox economists.

An evolutionary Economics, as proposed by Veblen (1998), is a theory of the process of the economic life of one race or community. In light with this view, the economists that accept hedonistic assumptions about the human nature:

> … do not afford material for a theory of the development of human nature. Under hedonism the economic interest is not conceived in terms of action. It is therefore not readily apprehended or appreciated in terms of a cumulative growth of habits of thought, and does not provoke, even if it did lend itself to, treatment by the evolutionary method (Veblen, 1998: 413).

Veblen (1998:414) points out that the economists, in order to make Economics evolutionary must change their position in terms of the method to be used; that is to say, they have to change their attitude towards science and method of explanation. For Veblen (1998), the demands of industrial modern life require that the habits of thought concerned which normality go to habits of thought that comprehend the facts in terms of a cumulative sequence. There is a change in the way people take thought on facts; they comprehend these events within a process of thought in a *cumulative sequential rationality*, which means that human thought proceeds by proximity to its environment.

> The economic life history of the individual is a cumulative process of adaptation of means to ends that cumulatively change as the process goes on, both the agent and his environment being

> at any point that outcome the past process. His methods of life carried over from yesterday and by the circumstances left as the mechanical residue of the life of yesterday (Veblen, 1998: 391).

This discussion points out to the argument, presented by Veblen (1919), that in modern times the change in idle curiosity, that motivated the scientific enquiry is related to analogous modifications in institutions and habits of life, especially changes in modern times of industry and in the economic organization of society.

> Industry in early modern times is a fact of relatively greater preponderance, more of a tone-giving factor, than it was under the regime of feudal status … this early-modern industry is, in an obvious and convincing degree, a matter of workmanship. The workmanship is a central figure in the cultural situation in times and so the concepts of the scientists came to be drawn in the image of the workmanship (Veblen, 1919: 13)

According to Veblen (1919), the changes in industry are implied in the changes in the cultural situation and have consequences for the methods and scientific inquiry. The workman was the main figure in the cultural situation of that time and inspired the concepts of the scientists that came to be drawn in his image.

Veblen (1919) argues that the workmanship progressively supplanted differential dignity as the reliable accepted principle of scientific truth, even on the levels of speculation and research. The law of cause and effect was given the first place, as contrasted with dialectical consistency and authentic tradition. This early-modern law of cause and effect – called efficient causes – has an anthropomorphic character. Like causes produce like effects, in much the same sense as the skilled workman´s product is like the workman; "nothing is found in the effect that was not contained in the cause, in much the same manner" (Veblen, 1919: 14).

The emphasis here is in the nature of human characteristics presented in the cause and effect relation under the image of the workmanship. That is to say that the product (object) manufactured by the workman has his human attributes and nothing is in the effect that is not in the cause.

For Veblen (1919), the role of cause and effect and its causal relation were modified throughout the centuries. In eighteenth-century science, natural laws specify the sequence of cause and effect, and produce characterization as a dramatic interpretation of the activity of the causes at work, and these causes are understudied in a *quasi-personal manner* – an anthropomorphic kind. In modern times, the formulation of causal sequence lost the anthropomorphic nature, became more impersonal (more objective) and more *matter-of-fact*. But, Veblen (1919) emphasizes that the imputation of activity (more subjective) to the observed objects never ceases. Activity continues to be imputed to the phenomena with which science deals; and activity is, of course, not a fact of observation, but is imputed to the phenomena by the observer (Veblen, 1919: 15).

Scientific knowledge seems to acquire a practical use (a matter-of-fact) which interest seem to be outside scientist concern and it has received influence from the development of technology. Moreover, the results of scientific knowledge are available for technological purposes, that is to say, following Veblen (1919), that under modern conditions the scheme of life is largely machine-made.

In light of this view that the scheme of life is influenced by machines, Veblen (1919) makes clear that during the nineteenth century, with the advances in machine technology, the characterization of science made another movement to the direction of impersonal matter-of-fact (more objective). The workman was supplanted by the machine process as the original model in the image of causation.

This replacement of the workman by machine process favors an interpretation of natural phenomena in a less anthropomorphic way; "it constructs the life-history of a process in which the distinction between cause and effect barely is observed in an itemized and specific way, but in which the run of causation reveals itself in an unbroken sequence of cumulative change" (Veblen, 1919: 16)

It is important to note that this change in the role of cause and effect means that explanation in science follows what can be called "sequential rationality" and not a complete rationality as supposed by classical and neoclassical mode of explanation. This argument seems to be similar to the Fuzzy Sets Theory, which is concerned to explain social phenomena by a prolonged sequence of events that implies consideration of the ambiguity. This sequence occurs in a cumulative manner and involves a process of habituation and apprehension of reality that is not apprehended by a cause and effect relationship like was supposed to exist before the development of technology in earlier times.

This it is a crucial difference between Veblen and classical economics, that is to say, the role of a causal relationship. For Veblen, it is necessary to impute causal relation, but it is not deterministic in the same way of the classical – like natural laws.

Camic and Hodgson (2011: 12) argue that it is important to understand Veblen´s philosophy in order to comprehend his contribution to our knowledge of economic processes. Veblen believed in metaphysical principles and emphasized causality. This is different from Positivism, who originally rejected metaphysics and defends a view that science operates through a collection of evidence, with the goal of prediction rather than causal explanations[4].

For Coats (1954), Veblen in his *The Place of Science* was not in favor of the direct observation of causes; he criticized some economists for having attempted to dispense with metaphysical premises. The main principle of modern science, "causal sequence", is not a fact of observation, and cannot be stated of the facts of observation except as a characteristic imputed to them. It is so imputed, by scientists and others, as a matter of logical necessity, as a basis of systematic knowledge of the facts of observation[5].

Veblen did not disregard metaphysics on the scientific enterprise in contraposition of Positivist's that denied metaphysics whit relation to science. For Camic and Hodgson (2011), he believed that some metaphysical presuppositions were necessary and unavoidable for science. Veblen (1919) identified the preconception of causation as necessary for the actual work of scientific enquiry. Moreover, Veblen

[4] For a discussion on different views of positivism, see Boland (1991) and for a discussion on positivist philosophy and the methodology of economics, see Caldwell (1980).

[5] In Economics this view was greatly accepted after Friedman´s (1953) that argued that a theory is more scientific the more it power of prediction.

(1914) repeated that the principle, or law, of causation is unproved an unprovable. “No man has ever observed a case of causation” (Veblen, 1914: 13).

For Coats (1954), Veblen considered that in pre-evolutionary sciences there was a “second degree of imputation”, the resort of an absolute ground of economic legitimacy, lying beyond the causal sequence in which the observed phenomena are conceived to be interlinked. This second degree occurred as a result of the role assigned to rationality and was expressed in terms of the principle of sufficient reason (intentionality).

Veblen (1909c in Camic; Hodgson, 2011) emphasizes that the relation of sufficient reason runs by way of the interested discrimination, the advance planning, of an agent who takes thought of the future and guides his present activity by consideration for this future. It runs from the apprehended future into the present, and it is of an intellectual, subjective, personal, teleological character. However, the imputation procedure adopted by modern scientists, involving the methodological principle of “efficient cause” (cause and effect - materialistic), runs in the contrary direction, and it is of an objective, impersonal, materialistic character.

> The modern scheme of knowledge on the whole, rests, for its definitive ground, on the relation of cause and effect; the relation of sufficient reason being admitted only provisionally and as a proximate factor in the analysis, always with the unambiguous reservation the analysis must ultimately come to rest in terms of cause and effect” (Veblen, 1909c in Camic; Hodgson, 2011: 517).

There are two principles – efficient cause (material) and sufficient reason (intention) – in Veblen´s perspective on science, but the principle of sufficient reason is, like defended by Veblen, admitted as provisionally and not enough to explain the different events; the development of scientific knowledge depends upon the efficient cause.

According to Hodgson (2004b), Veblen was not proposing a dualism between intentionality (sufficient reason) and materiality (efficient cause). This seems to make clear his emphasis of the fact that Economics is teleological in the sense that man always seeks to do something. But, the fact that such purposeful behavior itself can be revealed through evolutionary selection does not mean a denial of the reality of purposeful behavior. Hodgson (2004b: 349) defends that Veblen tried to reconcile a notion of individual purposefulness (sufficient reason) with his materialist idea of causality (efficient cause).

For Camic and Hodgson (2011,p. 14), Veblen used the term sufficient reason but he refused the opinion that human reason is sufficient to explain events. He understudied sufficient reason as practical in the limited sense that some events are consequences of reason, but regarding this as partial and inadequate. Veblen upheld that every event has a cause, but he never used the term sufficient reason to give an account of this proposition. For Veblen (1909c), hedonistic economics is restricting to sufficient reason:

> …the contrary is true of modern science, generally (except mathematics), particularly of such sciences as have to do with the phenomena of life and growth….the two methods of inference – from sufficient reason and from efficient cause – are out of touch with one another and there is

> no transition from one to other; no method of converting the procedure or the results of the one into those of the other (Veblen, 1909c, in Camic;Hodgson, 2011: 14)

This passage reveals that Veblen was not interested in a dualist way of explanation that set apart intentionality (sufficient reason) from materialist causality (efficient cause). Because of this understanding on this dualism between intention and materiality, "the resulting economic theory is of a teleological character – deductive or a priori as it is often called – instead of being drawn in terms of cause and effect (Veblen, 1909b:625 in Hodgson, 2004b: 349).

For Hodgson (2004b), Veblen considered intentionality (sufficient reason); he acknowledged that the relation of sufficient reason enter into human conduct and it is this element of discriminating forethought that differentiates human conduct from brute behavior.

> …explanation could not be confined to the rationalistic, teleological terms of calculation and choice because the philosophical beliefs and mechanisms that lay behind deliberation and preferences had also to be explained in terms of a sequence of cause and effect, by force of such elements as habituation and conventional requirements. (Veblen, 1909b:626 in Hodgson, 2004b: 350).

By acknowledging the need for such causal explanations, Veblen rejected both the assumption of the given and passive individual in neoclassical economics and the opposite view, which regards human agency as an outcome of mysterious social forces (Hodgson, 2004b: 350).In place of an immutable human nature with hedonistic principles, Veblen (1914) proposed that instinct(s) and habits of thought are central to understanding the human material in Economics.

Instincts and Habits of thought

Veblen´s view of science is directly related to his critique on human material with which the inquiry is conceived in hedonistic terms (passive, inert and immutable human nature). His proposal of an evolutionary economic science requires another understanding of human nature, a new comprehension that could be used to clarify the agency aspect of the individual who acts in a certain context. As he emphasizes that evolutionary economics should be a theory of the *process of economic life* of a race or community, he also implies to study the development of human nature.

Camic and Hodgson (2011) argue that Veblen adopted William James' concept of instinct and habits as distinct and central categories; instinct is seen as an innate propensity or predisposition. For Veblen (1914), instinct, as contra-distinguished from tropismatic action, involves consciousness and adaptation to an end aimed at; it denoted the conscious pursuit of an objective end which the instinct in question makes worthwhile.

For Veblen (1914), institutions are "conditioned by both the material environment and by the innate and persistent propensities of human nature and for the latter "no better designation than the time-worn instinct is available. Instinct involves consciousness and adaptation to an end aimed at" (Veblen, 1914, in Camic; Hodgson, 2011:538-9).Instinct is associated with intelligence. Veblen (1914 in Camic; Hodgson, 2011: 540)…"it is only by the prompting of instinct that reflection and deliberation come to be so employed"…."intellectual functions themselves take effect only on the

initiative of the instinctive dispositions and under their surveillance" (1914 in Camic; Hodgson, 2011: 553).

For Veblen (1914 in Camic; Hodgson, 2011: 538, 544), instincts were innate and persistent propensities and hereditariness characteristics, but "all instinctive behavior is subject to development and hence to modification by habit" (ibid, 557). Camic and Hodgson (2011) emphasize that some authors have seized on this latter sentence as evidence that by instinct Veblen did not mean fixed and inherited dispositions. Instead, he seemed to suggest that an individual´s instinct could be altered by an individual´s development and environment. This would seem to contradict the earlier statement that instincts were "innate and persistent".

However, Camic and Hodgson (2011) point out that this apparent contradiction disappears when it is realized. In the first passage, Veblen refers to instinct and, in the latter, he refers to instinctive behavior. They argue that the instincts of an individual cannot be changed, but instinctive behavior can. Behavior promoted by instincts can be modified or repressed by counteracting habits or constraints (ibid, 19). In his writings, Veblen generally understands instinct as an innate and persistent propensity and it is distinguished from habit, which is a propensity that is molded by environmental circumstances (Hodgson, 2004c: 164).

For O´Hara (2002: 81), Veblen was able to combine influences from biology (from his colleague Jacques Loeb, 1859-1924) and psychology (especially from William James, 1842-1910) in order to synthesize his own view on the relationship between instincts, habits and conscious reasoning. Considering the instincts, O´Hara (2002) presents that it is possible to find out two kinds of instincts in Veblen: positive instincts and negative instincts.

The positive instincts are those of workmanship, idle curiosity and the parental bent. Workmanship disposes (people) to look with favor upon productive efficiency and on whatever is of human use. Idle curiosity is the creation of the most important attainment of the race – its systematized knowledge of things. And the parental instinct attends to the potential for people to care for one another. (O´Hara, 2002)

The negative instincts are those of pecuniary, predatory and emulative instincts. O´Hara (2002) claims that Veblen understood a type of dialectical linkage between the positive and negative instincts; they influence and conflict with each other, which provide an important source of human action, change and motion. In a general manner, when the positive dominate the negative, cultural developments or the quality of life of the community is improved; when the negative dominates the positive, the culture declines; and when the two are in an uneasy balance, the status quo prevails (O´Hara, 2002: 81).

Veblen (1914) retained both instinct and habit in his explanations of human behavior and saw habits, like instincts, as essential for conscious deliberation. Habit is not opposed to reason but part of the act of deliberation itself. In turn, the habit-driven capacity to reason upon the situation could result in new behavior and new habits.

> In man... habit takes on more of a cumulative character, in that the habitual acquirements of the race are handed on from one generation to the next, by tradition, training, education, or whatever

> general term may best designate that discipline of habituation by which the young acquire what the old have learned. (Veblen, 1914: 38-39).

This emphasis on the role of instincts and habits denotes the different conception of an individual and his relation with his environment. Also, it could be noted that this individual, whose behavior is formed by instincts and habits - both relevant for conscious deliberation - is crucial for understanding many phenomena in social sciences like Economics.

For Veblen (1914), habits were the mechanisms through which the individual was able to perceive and understand the world. According to Camic and Hodgson (2011), habits are obtained through socialization and give a mechanism by which institutional norms are pressed upon the individual. "Instinct reflects the phylogenetic evolution of the human population. Habituation is the mechanism through which the weight of social institutions can make its mark on the ontogenetic development of each individual" (Camic; Hodgson, 2011: 21).

> Man´s life is activity; and he acts, so he thinks and feels. This is necessarily so, since it is the agent man that does the thinking and feeling. Like other species, man is a creature of habits and propensities. He acts under the guidance of propensities which have been imposed upon him by the process of selection to which he owes his differentiation from other species.(Veblen, 1898: 193).

Following this line of thought, Veblen (1898) emphasizes the fact that men can do without difficulty what they do habitually and this decides what they can think and know easily. A habitual line of action gives place to a habitual line of thought, and constitutes the point of view from which facts and events are apprehended and reduced to a body of knowledge. "What is consistent with the habitual course of action is consistent with the habitual line of thought, and gives the definitive ground of knowledge as well as the conventional standard of complacency or approval in any community" (VEBLEN, 1898: 195).

Camic and Hodgson (2011) argue that the term habit in Veblen´s writings suggests a propensity or disposition, not behavior as such. This view is consistent with pragmatist philosophers and instinct psychologists, who saw habit as an acquired proclivity or capacity, which may or may not be actually expressed in current behavior (p. 21). "Repeated behavior is important in establishing a habit. But habit and behavior are not the same. If we acquire a habit we do not necessarily use it all the time. It is a propensity to behave in a particular way in a particular class of situation (Camic and Hodgson, 2011: 21).

For Camic and Hodgson (2011:23), instinct is prior to habit, habit is prior to belief, and belief is prior to reason.[6] That is the order in which they have evolved in our human ancestry over millions of years. Veblen followed Darwin and James in regarding habit and instinct as the basis of motivation; they imply and dominated any rational calculation of individual interests or objectives.

This Veblenian understanding of instincts and habits as important and imbricate categories that form the basis of human motivation demonstrates the necessity of

[6] Hodgson (2005) presents a discussion on instinct and habit before reason and for a defense that instinct evolved before habits, to see Hodgson (2004).

different method of analysis; a method that could be used to capture the ambiguity present in our habits, understood as propensities and not as behavior. Our argument is that the Fuzzy Sets Theory could be a method that could capture the complexity of some concepts in social sciences.

2 From Empirical Classes to Fuzzy Sets

In his discussions about the formalization of social science problems using logical calculus, Schutz (1959) perceived the inadequacy of the use of classes (or sets) to portray some situations. "Lazarus belongs to the Social Party" may be a simple truth if one considers only the written registers; if one considers the conviction expressed by engagement to the Party´s causes, maybe Lazarus reveals himself not as a deep convinced socialist. In a social environment, only in trivial cases, or with huge simplified assumptions, can it be said with certainty that one individual has a complete membership to one class. Following the ideas of two philosophers, A. Kaplan and H. F. Schott, Schutz (1959) proposed the use of empirical classes to deal with the complexity inherent to social environments, i.e., to build classes to capture the vagueness proper of actual social situations in which the degree of vagueness is not minimal.

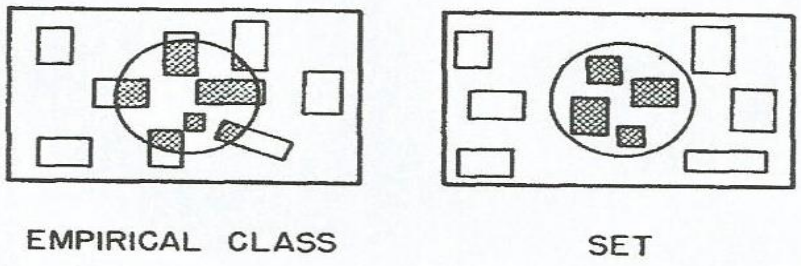

FIGURE 1
Diagrammatic Representation of Empirical Class and Traditional Set

Source: Schutz (1959), p. 75.

The idea of an Empirical Class, a gradation of the membership of an individual to the meaning of a set differs from the Traditional (Classical or Binary) Set represented on the right hand Figure 1. The complete membership or the complete non-membership are particular cases where ambiguities and complexity don´t exist.

In Schutz´s work, partial membership, portrayed by rectangles half white and half grey in the left side of Figure 1, are interpreted as probabilities, i.e., the weights of membership are some kind of probabilities. Thus we can express the membership of Lazarus to the Social Party as "The weight from Lazarus to the Social Party is *p*" or "The probability that Lazarus engage the Social Party is *p*".

The fact that the probability represents a partial membership implies substantial changes in the processing of some calculus. For example, one wants to measure the combined probability of an occurrence of 0,1 that Lazarus is a member of the Social Party and 0,5 that he is a husband. If the processing method treats it like a problem of randomness, of probability of frequencies, the events "member of Social Party" and "husband" are completely independent, and the probability of the combined event is 0,05, i.e., the multiplication of the probability of each event. But if one considers these

probabilities as grades of membership to a class[7], both are characteristics of Lazarus and are not independent events, they simultaneity define Lazarus, and the probability of Lazarus be "member of Social Party and husband" is 0,1, the minimum degree of membership to one of the classes. So, using probabilities to assign membership to classes has calculus consequences.

The meaning of Empirical Classes is very similar to the meaning of Fuzzy Sets. One relevant difference between them is that a membership of an individual to a Fuzzy Set does not necessarily represent a probability. It is just a perceived similarity, a possibility or, if it matters, a probability. Zadehs concept of Fuzzy Sets is designed to retract the approximate membership perceived by humans, well expressed by words and hard modeled with the Traditional Set. In many empirical cases, the main difficulty is not a matter of randomness but of uncertainty or of ambiguity.

Before Zadeh propose the Fuzzy Sets Theory, computers summarized short sequences of facts in a pre-defined environment, like "Lazarus is a Social Party member" or "Lazarus is not a Social Party member". Longer and qualified streams, like - "Lazarus was a convict Social Party member, but after he lost his employment in the Party shop, and he discovered many corruption cases involving Party chiefs, and his wife´s death, he changed his beliefs, and now he is a hesitating member" -, were not processed.

Lotfi Zadeh´s proposal implied a departure from the traditional scientific paradigm that dominated computing and engineering. The obsession on precision was overcome by system strength using *approximate reasoning*, a way to put the computers logical design aside the human thinking expressed by words as their subtle meanings. Zadeh wanted the computer to be able to interpret rich non-stereotyped situations, characterized by long sequences of events. At this time, machines summarized short and simple situations, inside pre-defined structures.

Zadeh´s main problem was the enormous distance between binary truth and precision, on one hand, and the richness and imprecision of the real world, on the other hand. Dealing with huge quantities of information, humans have the ability to discharge a great part and pay attention to the most relevant issues, thereby creating an amount that is compatible with their brain processing. Humans overtake this difficulty by translating linguistic quantifiers like "much", "less", "almost", "maybe" to qualitative sets to which elements or individuals, with their imperfect behavior, can be totally or partially associated like "much poorer", "less intelligent", "almost true", "maybe innovative".

Approximate reasoning is a process by which an imprecise conclusion is deduced from a collection of imprecise premises. It is processed with Fuzzy Logic (FL). Fuzzy Logic is an extension of multivalued logic, i.e. ,it adds to multivalued logic - a logic that admits infinite truth values between false (0) and certain truth (1) – the use of linguistic variables as a means to establish the graded truth. This kind of reasoning permits human beings to make rational decisions in complex and/or uncertain environments. About *approximate reasoning*, Zadeh (1979) wrote: "… Such reasoning

[7] Schutz (1959, p.81) called it nominal probabilities.

is, for the most part, qualitative rather than quantitative in nature, and almost all of it falls outside the applicability of classical logic".

Many objects in the real physical world and others in the theoretical world do not have precisely defined criteria of membership. So the "class of tall men" or "the class of numbers much greater than 10" do not constitute classes or ordinary sets; meanwhile this kind of imprecisely defined "classes" plays an important role in human thinking in domains like pattern recognition, communication of information and abstraction (Zadeh, 1965). This human thinking characteristic goes against the traditional important science principle that proposes that one phenomena cannot be considered understand before it is quantified, i. e., written in a formal and objective way using numbers and equations (Zadeh, 1987, Rutherford, 1994). The traditional scientific paradigm has been considered a huge expansion of the use of quantitative methods in different scientific streams, like computing and economics, reaching high standards in dealing with environments explained by regular laws, like part of mechanics and electromagnetism (Zadeh, 1987).

Unfortunately, the same does not apply to much of the humanistic systems, hard and ineffectively designed with traditional mathematics and computing. Zadeh (1975) defines humanistic systems as those whose behavior is strongly influenced by human judgment, perceptions or emotions, like economic, political, legal and educational systems. A single individual and his thought process may also be viewed as a humanistic system. In that kind of environment, another scientific principle exists – incompatibility between precision and complexity[8]. To make significant assertions about the behavior of humanistic systems, it may be necessary to abandon the precision we have become conditioned to expect of our mathematical analyses of well-structured mechanistic systems, and become more tolerant of approaches which are approximate.

To deal with complexity, one way is working with linguistic variables. Their values are not numbers, but words or sentences that are more adequate to express the meaning apprehended by humans. Zadeh proposed fuzzy sets like a "class" with a continuum of grades of membership. Linguistic variables have the ability to serve as a means of approximate characterization of phenomena which are too complex or too ill-defined to be susceptible of description in precise terms. It is by the use of the extension principle that much of the existing mathematical apparatus of systems analysis can be adapted to the manipulation of linguistic variables. Fuzzy sets is the tool to develop an approximate calculus of linguistic variables which can be used in a wide variety of practical applications (Zadeh, 1975).

A fuzzy set translates common language into the meaning that defines a set. In this sense, the Fuzzy Set Theory approximates logical and mathematical language to everyday language, permitting an organized representation of the rich human cognition of the world.The theory is appropriate to deal with a great amount of information and with ambiguity, elements that characterize complex environments in which separation between classes or individual membership to classes are not clear. Linguistic variables (words or sentences) have approximate values to a set.

[8] Principle of incompatibility: the complexity of a system and the precision with which in can be analyzed bear a roughly inverse relation to one another (Zadeh, 1975).

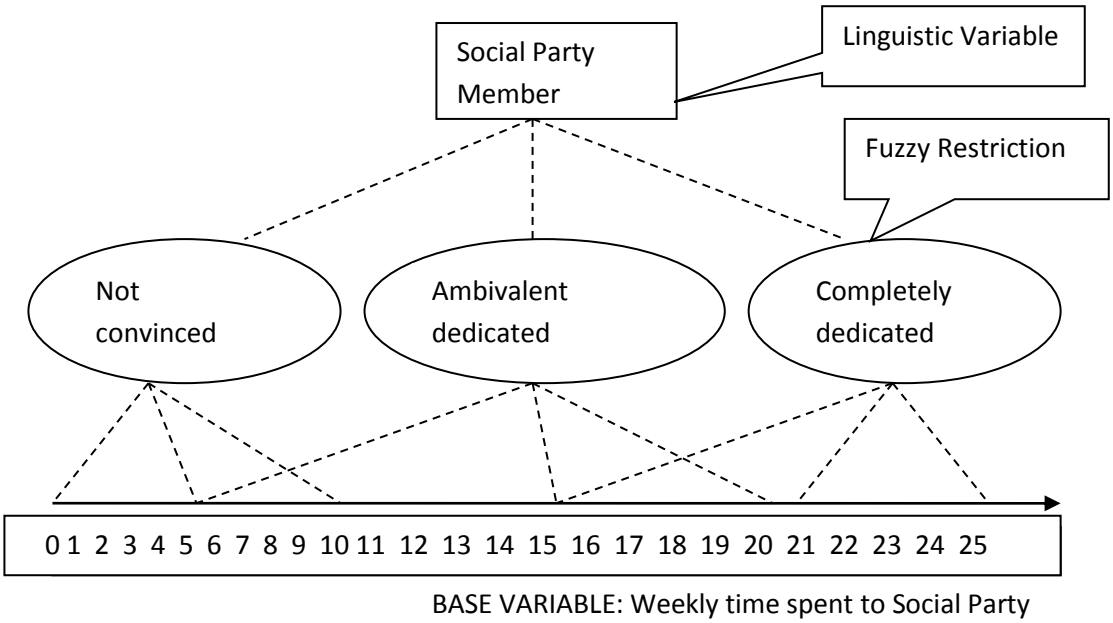

Figure 2 - Hierarchical structure of a linguistic variable

Source: Adapted from Zadeh (1975)

One fuzzy set is defined by the membership grades of a collection of individuals that pertain to a Universe of discourse. This membership grade represents the similarity of the individual to the set. Formally, a fuzzy set is defined by a fuction $\mu_A(x)$ that associates every individual (or element) of the Universe to a real number between the interval [0,1]. The $\mu_A(x)$ value represents the membership grade of *x* to *A*.

The link between the linguistic variables and the fuzzy sets is done by Fuzzy Restrictions that qualify the linguistic variables. In Figure 2, each Fuzzy Restriction is a fuzzy subset (completely dedicated, ambivalent dedicated, not convinced) of the Universe defined by the linguistic variable Social Party Member.

If $\mu_A(x)$=1, individual *x* is completely associate to the set *A*;

If $\mu_A(x)$= 0, *x* is not member of the set *A*;

If 0 < $\mu_A(x)$< 1 implies *x* has partial membership to *A*.

The membership functions are equivalent to fuzzy sets, and their forms – triangular, trapezoidal, normal, etc. - are designed in correspondence to the concept and to the context represented. Intersection, union and complement are fuzzy standard operations.

Possibility as Fuzzy Sets

"… Intuitively, possibility relates to our perception of the degree of feasibility or ease of attainment, whereas probability is associated with the degree of belief, likelihood, frequency or proportion. Thus, what is possible may not be probable, and what is improbable need not be impossible. …" (Zadeh, 1979). The concept of possibility is nonstatistical in character and is proper to use when the study object presents some theoretical and/or empirical ground which restrict variables or individual behavior; simultaneously, imprecision or uncertainty that avoid repeated experimentation and the use of probability exists.

A basic assumption which underlies approximate reasoning is that imprecision intrinsic in natural language is possibilistic rather than probabilistic. Zadeh (1979) proposes that the concept of a Possibility Distribution coincides with that of a Fuzzy Set and may be manipulated by Fuzzy Logic. Taking "Lazarus being a member of Social Party" defined as $X = a$, $a \in U$, and $\mu_F : U \rightarrow [0,1]$ as the membership function of a fuzzy set F, the possibility of the event $X = a$ given "X is F" is

$$\text{Poss}\{ X = a \mid X \text{ is } F\} = \mu_F a,\ a \in U.$$

The distinction between possibility and probability manifests itself in the different rules which govern their combination. Returning to the beginning of our discussion in this section, but now *reasoning approximately*, we can organize the combined possibility of occurrence of 0,1 Lazarus be a member of Social Party (μ_A = 0,1) and the possibility of 0,5 Lazarus be a husband (μ_B = 0,5) as

$$\text{Poss}\{ X = a \mid X \text{ is } A \cap B\} = (\mu_A a \wedge \mu_B a) = 0{,}1\ ,$$

Where $\cap$ means intersection and $\wedge$ means *min* operator.

3 Diversity and causal complexity

In "The Theory of the Leisure Class", Veblen describes the process by which humans beings developed social standards and created ways for an individual to sign to others his social status. Initially, individual and family leisure was the norm; after that, some rich people added employee leisure to family leisure as a status symbol; more recently, consumption power is the strongest evidence of social status. As old institutions resisted through high class conservatism, many signals can be found. There are different ways of showing status – family leisure, vicarious leisure, family consumptions; various combinations can produce a similar outcome and communicate a high social status. We believe, following Ragin´s (2000) developments on other social issues, that this kind of theoretic proposal could be organized with fuzzy sets.

Non-stereotyped situations are hard to synthesize because they reveal a huge amount of variety of behaviors and meanings. Variety and selection are one of the most important principles in understanding evolutionary processes. Cutting them from studies to reach a higher grade of formalization is like killing the subject of evolutionary sciences. Fuzzy sets permit them to be alive and compatible in an organized and formal design.

Charles Ragin (2000) developed a methodology using fuzzy sets which permits organized inferences in causal complex situations, respecting diversity of behavior. Ragin explored the interpretative capacity of fuzzy sets, which is a half-verbal-conceptual and half-mathematical-analytical language. He proposed a "diversity-oriented" approach in which the researcher admits a difference in terms of kinds and types – denoted by sets or membership degrees to the identity of a set. The different types are not interpreted as deviation from the mean, the traditional scientific treatment that homogenizes everything qualitatively around an idea of normality, bus as the richness of empirical qualities.

> … Most theoretical arguments, as verbal formulations, deal with set-theoretic relationships. Because fuzzy sets also address set-theoretic relationships, they offer the opportunity for creating a very close correspondence between theory and data analysis. In short, with fuzzy

> sets researches can analyze evidence in ways that directly reflect their theoretical arguments. …" (Ragin, 2000, p. 4).

In complex environments, causes may be combined in different and somewhat contradictory ways to generate the same outcome. The dialogue between ideas and evidence exploring set-theoretic relationships designed like logical relations between fuzzy sets allows for the exploration different lines of causality. It is possible to find diverse paths of fuzzy set antecedents that produce the same outcome; i.e., to infer different causal cumulative lines, each one with its own historical peculiarities, that produce similar ends.

Ragin (2000, p. 286 and succeeding) presents an inference in which causal complexity is organized using fuzzy sets. The scientific problem is to understand which causes produce variations in the social safety nets operated by different advanced-industrial, democratic countries (AIDCs). All AIDCs have some welfare programs, but the effective protection provided by these social safety nets differ between them. Scandinavian countries are in general identified as the most generous in welfare services, contrasting with the United States, Canada and Australia, commonly portrayed as less-generous. In the middle, there is an array of intermediary countries.

Based on scientific literature, Ragin (2000) proposed fuzzy sets for some of the consolidated explanations for the consequent, "generosity of the welfare state". This outcome variable is designed like a fuzzy set too. The popular explanations tested are *a*) the presence and the years of ruling (period) by a strong leftist party; *b*) strong unions; *c*) corporatist industrial systems which involve a constant bargaining between unions, employers and governments as a way to combine peace in the labor force with industrial international competitiveness; *d*) sociocultural homogeneity. Each of these causes, theoretically, has a positive contribution to a generous welfare state net.

Ragin (2000) argued that all of them were highly confounded empirically. To simplify the exercise, he accepted the view of the literature that the eighteen chosen cases chosen were good instances of AIDCs and proposed one fuzzy set to represent each of the five variables – four antecedents and the consequent. He used a scientific study that proposed indexes for each variable, discussed each variable theoretically and created criteria to grain the membership of each country to all of the variables. The membership scores are showed in table 1.

Ragin (2000) played two tests: one for necessity and the other for sufficient conditions to the outcome. The first one detected the proportion of cases with membership scores in the causal condition that were greater than or equal to their membership scores in the outcome. Eight tests were proceeded, four with each antecedent variable (strong leftist parties, strong unions, corporatist industrial systems, sociocultural homogeneity) and four with the negation of those variables (no strong leftist parties, no strong unions, no corporatist industrial systems, no sociocultural homogeneity). Using a significance level of 0,05 and a benchmark o 80% of cases explained, he did not find necessary conditions.

Table 1 – Fuzzy Membership for Analysis of Countries with “generous welfare states”

Country	Generous Welfare State	Strong Left Parties	Strong Unions	Corporatist Industrial	Sociocultural Homogeneity
Australia	0,26	0,25	0,40	0,17	0,25
Austria	0,72	0,70	0,64	0,83	0,67
Belgium	0,79	0,54	0,84	0,83	0,29
Canada	0,26	0,0	0,06	0,05	0,10
Denmark	0,86	0,85	0,81	0,83	0,86
Finland	0,76	0,56	0,86	0,83	0,72
France	0,57	0,12	0,10	0,33	0,31
Germany	0,68	0,43	0,20	0,67	0,30
Ireland	0,67	0,11	0,63	0,67	0,84
Italy	0,64	0,10	0,39	0,50	0,55
Japan	0,52	0,0	0,04	0,33	0,95
Netherlands	0,69	0,33	0,17	0,83	0,27
New Zeland	0,56	0,40	0,54	0,17	0,15
Norway	0,95	0,95	0,53	0,83	0,95
Sweden	0,98	0,98	1,00	0,95	0,70
Switzerland	0,53	0,34	0,13	0,67	0,10
United Kingdom	0,63	0,61	0,34	0,50	0,15
United States	0,09	0,0	0,04	0,05	0,05

Source: Ragin (2000, p. 292)

To assess sufficiency, researchers look for causal expressions (a cause or combination of conditions) that are subsets of the outcome. This kind of subset means that the combination is one of possibly several ways to generate the outcome. Ragin tested 80 causal expressions. After eliminating all redundancies inthe results (causal expressions that are subsets of others), at a significance level of 0,05 and a benchmark of 80% or more cases affected, he found four sufficient causal expressions:

Strong Leftist Party;
Strong Unions and Sociocultural Homogeneity;
Corporatist Industrial System and Sociocultural Homogeneity;
Strong Unions and Corporatist Industrial System and No Sociocultural Homogeneity.

The conclusion is that a formal institution like a welfare system can be built in different lines according to the long cumulative causal stream of events proper to every national history.

4 Cultural-Cognitive Institutional Elements: building a fuzzy index

As we argued previously, Veblen (1898b) emphasized the fact that men can easily do what they do habitually and this determines what they can think and know with ease. Habitual lines of action and habitual lines of thought reinforce each other, and constitute the point of view from which facts and events are apprehended and reduced to a body of knowledge. A similar approach is developed in neoschumpeterian works and theorized as technological trajectories. Scientific paradigms and Research and Development (R&D) routines that are used inside enterprises and shared with technological partners promote habitual lines of thought.

Over this shared perspective, people involved in R&D form their own expectations about future technological developments, including the main important variables in a technical device and the amount of increasing performance in these variables; they have knowledge to approximately foresee the time spent to reach some development level. Of course, the environment that involves these expectations is complex and uncertain, and one can only invoke a possibility of certainty of success in every expert bet.

From a veblenian perspective, human beings adjust their intentions and habits of thought to the material world, the technology in use, and to the long accumulated causality involving instincts and a set of institutions which overlap each other. A prospective over an animal performance index, grounded by the intentionality and the habits of thought shared inside the industry, can be interpreted as successive approximations of the intentionality and the habits of thought to the long causality involving instincts, institutions and technology.

A Calibrated to Expectations Fuzzy Index

In a study about the technological trajectories of swine genetics, an industrial research-based segment linked to the pork processing sector, experts were asked to predict the main target points that would be reached in the next five years and what there values would be. The objective was to build a *Calibrated to Expectations for 2010 Index* to project values for the proportion of lean meat in carcasses.

The confidence manifested by the experts in 2005 to the expected value of a variable for 2010 was interpreted as the membership grade to the set “Expected” in line with the main technological trajectory.

A *Calibrated to Expectations for 2010 Index*, adapted from Guerrero *et al*. (1999), is represented by k and calculated in the next form:

- If the membership of the average of a variable Y in some year X to the Expected set (E) for 2010 is equal or greater the experts confidence in the average of Y expected to 2010, then k =1;
- If the membership of the average of a variable Y in some year X is less than the confidence in the value expected as average in 2010, then $k = 1 - \mu_E Y\ 2010 + \mu_E Y\ Year\ X$.

In the interviews, the experts manifested the same way of thinking; they shared similar "cognition patterns". To propose triangular fuzzy sets representing Expectations of 2010, the membership value 0 to the Expectations fuzzy set came from values of the base variable "proportion of lean meat in the carcass", which is associated to low or bad performance at the 2005 level. This implies that a 52% proportion of lean meat in the carcass has membership 0 in Expected to 2010 Set. The membership grade 1 was assigned to a variable base value in a way that content inside the triangle all experts answers; in practical terms, 62% have membership 1 to Expected to 2010.

In the first line Table 2 is the variable base value "proportion of lean meat in the carcass" to be reached at 2010 indicated by one of the experts. In the other lines, there are the confidence expressed by the experts E1, E2, E3 and E4 in their expectations.

Table 2 – Expected proportion of lean meat at the carcass in 2010 and experts confidence

Proportion of lean meat at the carcass	**59 %**	**60 %**	**62 %**
E1	-	-	0,7
E2	-	-	0,8
E3	-	0,8	-
E4	0,7[9]	-	-

Source: interviews

Considering the average proportion of lean meat 57,5% in the year of 2000, we can calculate the membership (μ_E) of the performance of the pork industry in this year to the Expected to 2010 as

$$\mu_E 2000 = (57{,}5 - 52)/ (62 - 52) = 5{,}5/ 10 = 0{,}55$$

Proceeding in the same line to years 1995, 1990 e 1985, we found

$$\mu_E 1995 = (52{,}5 - 52)/ 10 = 0{,}05$$
$$\mu_E 1990 = (50 - 52)/ 10 = 0{,}0$$
$$\mu_E 1985 = (48 - 52)/ 10 = 0{,}0$$

The membership of the average proportion of lean meat in the carcass of every year to the Expected to 2010 were used to obtain the *Calibrated to Expectations for 2010 Index* (*K*). Considering the adjustment of 2000 to Expected to 2010:

- if $\mu_E 2000 \geq \mu_E 2010$, $K\% = 1$;
- if $\mu_E 2000 < \mu_E 2010$, $K\% = 1 - \mu_E 2010 + \mu_E 2000$ (the major confidence μ_{2010} expressed by the experts was 0,8, this level was used to calculate *K* as follow).

[9] Expert 4 answer is meaningful of the Idea expressed by the Expected Set. He said that 62% of lean meat at the carcass were biologically possible to obtain, but that exists a *trade-off* between proportion of lean meat at the carcass and quality aspects like intramuscular fat and pH; in this context, his confidence to reach 59% in 2010 wasn't 1 but just 0,7.

For the 2000 average proportion of lean meat values, the *Calibrated to Expectations for 2010 Index* is

$$K_{2000} = (1 - 0{,}8) + 0{,}55/1 = 0{,}75$$

For the moreover years, we have:

$$K_{1995} = (1 - 0{,}8) + 0{,}05/1 = 0{,}25$$
$$K_{1990} = (1 - 0{,}8) + 0/1 = 0{,}2$$
$$K_{1985} = (1 - 0{,}8) + 0/1 = 0{,}2$$

The K = 0,2 index for 1990 and 1985, i.e., the years in which μ_E = 0, represents the distrust in the expectations and is the difference between the absolute certainty (1) and the major confidence in the expectations for 2010, that was 0,8 (1- 0,8 = 0,2).

μ											1										
μ										0,9	0,9	0,9									
μ									**0,8**	0,8	**0,8**	0,8	0,8								
μ								**0,7**	0,7	0,7	**0,7**	0,7	0,7	0,7							
μ							0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6	0,6						
μ						0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5	0,5					
μ					0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4	0,4				
μ				0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3	0,3			
μ			0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2	0,2		
μ		0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	
μ	**0**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
%	**52**	53	54	55	56	57	58	**59**	**60**	61	**62**	63	64	65	66	67	68	69	70	71	72

Figure 3: Lean Pork Percentage for 2010 Expected Set

Final remarks

Veblen and Zadeh proposed a change in the scientific way of thought. Veblen wanted to break down with the natural explanations, taxonomic descriptions and direct and teleological chain (short cause and effect) that are based on a set of assumptions that reduce variety in the human behavior, which is one the most important element in social sciences, especially in Economics. He intended to study the complex social environment and assumed a diversity of habits of thinking and acting that could be selected within a system of imbricated institutions. The interaction between instincts and institutions results in a tangled web of prolonged threads that can be contradictory. This can lead to a systemic result that is not determined *a priori* and is never stable.

Zadeh wanted to break down binary simplification, which is considered by him as incapable of interpreting and reproducing prolonged sequences of meanings. He believed that computers would acquire capacity in order to portray these situations if the language used in its programming became more similar with human thought. This leads to a rupture precision principle as the main criterion of scientific relevance and emphasizes the necessity of concern with the ambiguity in many concepts in social sciences that are not completely captured with formal methods.

It is possible to note that both Veblen and Zadeh were interested in breaking down simplification as a method of science. Their main concerns were to deal with

prolonged sequences of nonlinear actions and thoughts and the openness of other languages for constructing models of study.

Zadeh proposed a change in the method of discussion the reality translating the verbal language to graded belonging of an individual to a certain group. Fuzzy sets mix quantitative and qualitative elements. Veblen seemed not to be interested in constructing a completely defined economic and social theory; his concern was to realize dense descriptions as a basis for understanding systemic evolutions, which resembles the anthropological practice. The formal equations are replaced by verbal and dense descriptions as a means of absorbing and discussing the richness of behaviors that will be selected in a socioeconomic environment. The richness of the verbal language used to manifest human thought, one of the most important institutions in every societal group, is the main point linking the arguments of these authors.

We argued that the language of Fuzzy Sets Theory, with its emphasis on an approximate reasoning, can be of help when the objective is to deal with the sequential rationality present in Veblen´s concept of the human life – an ambiguous and complex concept – in Economics.

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