

FROM MAN TO MACHINE: RATIONALITY AND AGENCY FROM J. S. MILL TO W. S. JEVONS

Emmanuel de Oliveira Boff

Professor Adjunto - Pensamento Econômico – UFF

Área 1: Metodologia e História do Pensamento Econômico

Subárea 1.2: História do Pensamento Econômico

Resumo

O artigo explora as diferenças entre as concepções de racionalidade e agência entre J. S. Mill e W. S. Jevons. Embora ambos utilizem a concepção de “homem econômico”, a adoção da psicologia associacionista por J. S. Mill e da psicofisiologia por Jevons tornam suas concepções sobre racionalidade e comportamento econômico substancialmente distintas. O artigo conclui mostrando que, em comparação com J. S. Mill, a concepção de “homem econômico” de Jevons é menos sujeita a influências sociais e mais baseada na fisiologia humana.

Palavras-chave: J. S. Mill, W. S. Jevons, homem econômico, racionalidade, agência

Abstract

The article explores the differences between J. S. Mill's and W. S. Jevons's conceptions of rationality and agency. Although both use the conception of “economic man”, the adoption of associationist psychology by J. S. Mill and of psychophysiology by Jevons make their conceptions about rationality and economic behavior substantially different. The article concludes showing that, in comparison to J. S. Mill, Jevons's conception of “economic man” is less subject to social influences and more physiology-based.

Keywords: J. S. Mill, W. S. Jevons, economic man, rationality, agency.

FROM MAN TO MACHINE: RATIONALITY AND AGENCY FROM J. S. MILL TO W. S. JEVONS

1. Introduction

J. S. Mill is usually credited with the first use of the concept of economic man in political economy. After him, the concept gained currency among economists, its use being subsequently widespread. Though this assessment cannot be said to be incorrect, it overlooks many differences in the notion of rationality and agency of economic agents since J. S. Mill introduced this concept.¹

This article aims to help clarify such differences – at least in two important authors in the English tradition of economic thought. So, as an object of inquiry, we chose the notions of human rationality and agency underlying the works of logic and political economy of J. S. Mill and W. S. Jevons. The objective of this investigation is to show that, despite its apparent simplicity, the concept of economic man is flexible enough to encompass significant differences regarding the functioning of the human mind and the actions of agents. If these differences are successfully shown to be relevant, then the notion of economic man as a precise representation of the behavior of economic agents can be called into question. Why is that? Because the precision of this representation is marred by distinct notions of rationality and agency, at least as far as J. S. Mill and W. S. Jevons contributions are concerned.

The argument of this article will be developed in three sections: *the first one* will present the notions of agency and rationality in J. S. Mill, showing how it affects his idea of economic behavior. *The second section* will do the same for W. S. Jevons, showing how he is part of an intellectual movement in Victorian England that tries to understand thought and action in a mechanical way. A *third section* will highlight the main differences between Jevons's and J. S. Mill's conceptions of rationality and agency. This comparison will lead us to a *final section*, where two consequences of the differences between Jevons and J. S. Mill are briefly commented.

¹ Although J. S. Mill used the *concept* of “economic man” he did not use the *term* “economic man”. See Persky (1995: 222).

2. Rationality and Agency in J. S. Mill

2.1. Rationality and Associationism: the operation of the “laws of mind” according to J. S. Mill

Before we start, I guess it would be useful to explain what is meant by “rationality” in J. S. Mill, since neither this term, “rationality”, nor the idea of rationality as consistent behavior, associated with modern microeconomics, are much present in his oeuvre.²

We will try to find a clue about the concept of rationality in J. S. Mill in his book about scientific logic – the “System of Logic”. In the sixth book of his “System”, J. S. Mill describes the proper method of research for the moral sciences. Key to this method is the “laws of association” of ideas. According to the English philosopher, the study of these laws belongs to the realm of psychology. “Psychology”, for its turn, is understood as the science that investigates the relation of cause and effect between different states of mind.

I guess the notion of “laws of mind” is a good clue about what rationality might mean to J. S. Mill. The reason for this assertion is that these so-called “laws of mind” can explain how humans think and ratiocinate. Let us elaborate this point a bit further.

J. S. Mill teaches us, in book I of his “System of Logic” that the conditions for us to know something begin with the impressions which external causes impinge on our minds. These impressions can be called *sensations*, and different sensations can be associated in our minds so as to form *thoughts*. These thoughts, in turn, can be represented by words and sentences³. When we correctly organize, analyze and classify these words and sentences we can be said to be *reasoning and producing knowledge*.

² J. S. Mill uses the word rationality a lot in chapter 6 of the first book of his “System of Logic”, in order to show how the idea of man is linked to the concept of “rationality”. However, he does not discuss this concept in depth in the remaining of his “System of Logic” nor in his “Principles of Political Economy”.

³ However, at the beginning of chapter 2 (titled “Of Names”) of the first book of his “System of Logic”, J. S. Mill argues that “there seems good reason for adhering to the common usage, and calling (...) the word *sun* the name of the sun, and not the name of our idea of the sun.”. This seems to contradict what we just said. We can defend our point by noting that J. S. Mill can be considered a *phenomenalist*, that is, someone who believes that *sensations* are the basic constituent of reality (see Hamilton, 1998: 139). In other words, when he says “sun”, he probably means the sensation this external object – the sun -- gives to our senses.

Two things are worth remarking in this rather brief account of J. S. Mill's process of reasoning and production of knowledge. *First*, introspection is considered a valid procedure to arrive at serious, scientific knowledge. The method of observing one's own mental states to determine the laws that govern them is taken as empirically valid.

Second, J. S. Mill's view about the study of mental phenomena – known as Associationism -- is heir to the tradition of the English empiricists⁴: J. S. Mill believes that true knowledge must begin and be circumscribed by what can be apprehended by the senses. He rejects Kant's transcendental method both in his *System of Logic* and as a base for a moral theory in the first chapter of his *Utilitarianism*.

When it comes down to laws of society, the philosopher-economist believes that they should be seen as *regularities* derived from the laws of human nature – of which the “laws of mind” are just one part. These regularities – just like the laws of nature, by the way -- must be analyzed and classified in the form of cause and effect. In his canons of Induction, J. S. Mill teaches us how to analyze relations of succession between phenomena so they could be classified as relations of cause and effect⁵. In doing so, we are able to ratiocinate and generate knowledge. “*Knowledge*”, then, *is produced by the discovery, using inference from our senses and the canons of Induction, of the natural and social causal regularities which links different phenomena*.

What about the laws of mind, specifically? J. S. Mill states that the laws of mind are those pertaining to the relations of cause and effect between different states of mind. Because there are “uniformities of succession” between different states of mind -- and these uniformities can be studied by “experience and observation”, that is, by introspection -- a science of psychology is possible. J. S. Mill then gives us elementary Laws of Mind: *the first* affirms that once a state of mind is excited in us for the first

⁴ Though J. S. Mill can neither be accused of defending idealist positions like that of Berkeley nor be considered a skeptical, like Hume. The knowledge we have *only begin* with our sensations, and, if it is correctly organized and analyzed by the canons of induction, it must lead to proper knowledge – not just “habits” of thought, like Hume defended. On the other hand, the fact that J. S. Mill considers matter the permanent *possibility* of sensation does not mean that matter must be sensed to exist: matter can exist without ever being sensed – and this goes against Berkeley's claims regarding the existence of the external world. However, for J. S. Mill, the possibility to be apprehended by the senses must be there.

⁵ J. S. Mill speaks of the “law of universal causation” as the law of succession between different phenomena (CW, VII, p. 290). According to him, there are four methods to identify cause and effect between phenomena: the method of agreement, of difference (and also the combination of these), the method of residues and the method of concomitant variations.

time, it can be reproduced in our minds in a lower intensity, without the presence of the original cause. *Secondly*, he presents the *Laws of Association*. Because they are important for us, I think it is worth quoting them:

“These ideas, or secondary mental states, are excited by our impressions, or by other ideas, according to certain laws which are called Laws of Association. Of these laws the first is, that similar ideas tend to excite one another. The second is, that when two impressions have been frequently experienced (or even thought of) either simultaneously or in immediate succession, then whenever one of these impressions, or the idea of it, recurs, it tends to excite the idea of the other. The third law is, that greater intensity in either or both of the impressions, is equivalent, in rendering them excitable by one another, to a greater frequency of conjunction. These are the laws of ideas (...).” (CW, VIII, p. 161)⁶.

The importance of these laws cannot be understated: without them, there could be no correct reasoning and production of knowledge. But there is also a caveat in this definition: these laws of association do not guarantee that all the possible associations our minds can make produce knowledge. That is, it is not guaranteed that all associations are the product of correct ratiocination. Some of them can be said to produce knowledge, some not. In order to properly reason and produce knowledge, the associations must be in a non-spurious causal relation of succession. As to all other associations, they do produce new ideas in our minds, but these are just habits of thought, prejudices and so forth, not capable of being put in a relation of cause and effect (that is, they did not represent scientifically valid knowledge). So, only certain types of association are considered to be properly rational – all others are prejudices or simply habits of thought.

By the description given above, we can say that, depending on the social, cultural and historical circumstances surrounding us, certain impressions will be etched into our minds and, consequently, only certain associations of ideas will blossom. So, the specific associations of ideas one happens to have is also dependent on one’s social milieu. If we consider that the character of a person is formed not only due to the

⁶ The method of citation of J. S. Mill’s follows Robson and Stillinger’s edition of his Complete Works. So, when we say CW, VIII, p. 161, we are referring to page 161 of the 8th volume of J. S. Mill’s collected works, as indicated in the References.

structural laws of association of ideas the person makes (the form that allows us to know), but also to the impressions which are patterned on the person's mind (the content of knowledge), then J. S. Mill's theory must be complemented. That is why he proceeds to the delineation of the *science of ethology*, the science of the formation of the character. It aims to study how, given the laws of mind and the circumstances one is placed in life, the character of a person or of a group appears (CW, VIII, p. 172).

So, one can say that the millian "human nature" is the result of the contact of the laws of mind with specific (social, historical, cultural) circumstances. It can be said to be, therefore, *dual*. J. S. Mill (CW, VIII, p. 167) pictures the situation like this:

"Even if they [observations concerning human affairs] were universally and exactly true within the bounds of experience, (...) still they are not the ultimate laws of human action; they are not the principles of human nature, but results of those principles under the circumstances in which mankind have happened to be placed".

Mattos (2005: 33) also stresses this point when she says: "At first glance we can relate Mill's universal 'primal' human nature to the science of psychology, and the 'historical' concrete human nature to ethological considerations."⁷ As we will see next, this dual view of human beings has implications for the discipline of political economy.

2.2 Implications of J. S. Mill's Laws of Mind for Political Economy

Despite the fact that political economists should be acquainted with the laws of matter and the physical world -- because the economic process deals with natural objects, like iron, coal, vegetables, animals -- that is only half of what they should study, according to J. S. Mill. The other half is related to the inquiry into the laws of the mind that are involved in the production and distribution of wealth (see CW, IV, p. 283).

But even this double-edged definition of political economy is not precise enough. This happens because not *all* laws of the mind should be taken into account in political economy. And, besides, political economy involves the search for wealth by individuals in a *social state, not in isolation*. As a consequence, only a certain portion of

⁷ See also Mattos (1997).

the laws of mind is to be considered by the political economist. Because they are psychological laws, we naturally know them by experience – that is, by introspection. The laws the political economist must be interested in involve the desire to acquire as much wealth as possible with a minimum effort. In the very famous definition of J. S. Mill, these are the drives present in humans that the political economist should take into consideration. This definition comprises one of the first formal definition of the behavior of “economic man”:

“[Political Economy] is concerned with him [human beings] solely as a being who desires to possess wealth, and who is capable of judging of the comparative efficacy of means for obtaining that end. It predicts only such of the phenomena of the social state as take place in consequence of the pursuit of wealth. It makes entire abstraction of every other human passion or motive; except those which may be regarded as perpetually antagonizing principles to the desire of wealth, namely, aversion to labour, and desire of the present enjoyment of costly indulgences”. (CW, IV, p. 285).

As Persky (1995: 233) comments on the passage above, the man studied by J. S. Mill has four main motivations: a drive for accumulation of wealth, luxury, leisure and also procreation (which J. S. Mill adds in CW, IV, p. 286). The human beings studied by J. S. Mill are not, therefore, simply represented by “money-hungry monomaniacs” that people usually associate with the *homo economicus*⁸. After having clarified what motivations should be taken into consideration by the political economist, J. S. Mill defines political economy: “The science which traces the laws of such of the phenomena of society as arise from the combined operations of mankind for the production of wealth, in so far as those phenomena are not modified by the pursuit of any other object.” (CW, IV, p. 286).

So, based on these basic psychological laws, the economist can deduce how people will behave in society when they are pursuing wealth. But, of course, that is not enough, because, in reality, people are motivated by a myriad of drives – not only the desire for wealth. So, although the laws of political economy are true, political economy itself cannot be an exact science. There will always be disturbing factors (in the form of “other laws of human nature” or the historical circumstances in which we are placed)

which will make the expected results of our deductions deviate from reality. Here is where the other side – the concrete, historical side – of human nature appears, according to Mattos’s account of J. S. Mill’s human nature. For J. S. Mill, the so called *method a posteriori* is also important in the study of political economy, because, by means of it, we can verify the extent to which the disturbing causes are interfering with our deductions:

“Having now shown that the method *a priori* in Political Economy, and in all the other branches of moral science, is the only certain or scientific mode of investigation, and that the *a posteriori* method, or that of specific experience, as a means of arriving at truth, is inapplicable to these subjects, we shall be able to show that the latter method is notwithstanding of great value in the moral sciences; namely, not as a means of discovering truth, but of verifying it, and reducing to the lowest point that uncertainty before alluded to as arising from the complexity of every particular case, and from the difficulty (not to say impossibility) of our being assured *a priori* that we have taken into account all the material circumstances.” (CW, IV, p. 292).

By the remarks above, the psychological laws that govern J. S. Mill’s economic man must be qualified by the circumstances in which he is placed. Man has a dual nature, and both must be considered in studying political economy. That is, depending on the concrete society in which a certain individual lives, his or her drive to accumulate wealth can be greater or smaller. *This means that the supposed universality of the psychological laws that govern the economic actions of humans should be always put into perspective: historical circumstances can always change its force.*

2.3 Agency in J. S. Mill: Utilitarianism

The importance of *Utilitarianism* for this article lies in its being an essay where J. S. Mill sketches his views on moral agency: right actions are those who obey the principle of utility. Although *Utilitarianism* deals specifically with moral action, one can say there is a link to economic action: *since the production and consumption of goods and services involve a balance of pleasure and pains, certain economic activities can generate more or less pleasure or pains.* It is therefore important for our aims to see how J. S. Mill fares trying to define and defend the principle of utility regarding moral human action and its consequences for economic action.

After presenting us in the first chapter of the book with the “general remarks” of the project of a moral theory (in which he criticizes Kant’s deontological view in the

Metaphysics of Ethics), J. S. Mill moves to the definition of utilitarianism. I reproduce below what he takes to be the core of the creed:

“The creed which accepts as the foundation of morals, Utility, or the Greatest Happiness Principle, holds that actions are right in proportion as they tend to promote happiness, wrong as they tend to produce the reverse of happiness. By happiness is intended pleasure, and the absence of pain; by unhappiness, pain, and the privation of pleasure. (CW, X, p. 266).

J. S. Mill also holds that the ultimate end of human life is the search for happiness, and, as a consequence, pleasures (CW, X, p. 263). He is, however, fully aware of the implications such a view might entail: his friend, writer and historian Thomas Carlyle often referred to utilitarianism as a “pig-philosophy” because it supposed that human beings would have pleasures that were no better than those of other animals. In order to escape these accusations, J. S. Mill defends a version of utilitarianism that allows for what he calls *higher pleasures*: “Human beings have faculties more elevated than the animal appetites, and when once made conscious of them, do not regard anything as happiness which does not include their gratification”. (CW, X, p. 263). It is the appreciation of what J. S. Mill calls higher pleasures – like reading philosophy, engage in intellectual conversations, studying science -- that can differentiate humans from other animals (see also Mattos, 1997). There is no trade-off in terms of quality between pleasures of higher order and pleasures of lower order: the former are always preferred to the latter.⁹ Here is where the qualitative aspect of his moral theory enters: if, in Bentham’s utilitarianism, pleasures and pains could be compared by means of their intensity, duration, certainty and propinquity that would not be valid for J. S. Mill.

This division of higher and lower pleasures has also consequences for economic action: the accumulative behavior of the economic man could diminish if people regarded the pursuit of arts or knowledge (higher pleasures) more valuable than the simple enjoyment of goods like, say, cars or clothes (lower pleasures). This kind of analysis is corroborated one reads book IV of the “Principles of Political Economy”:

⁹ Even though, as J. S. Mill admits, our lives must comprise both kinds of pleasure. Anyway, a good, virtuous life for him would also be a very serious and intellectual life, since most bodily pleasures are seen as inferior by J. S. Mill. (see Crisp, 1996: 41)

there J. S. Mill envisages a future society where the drive for accumulation weakens as society evolves and people continually substitute higher pleasures for lower ones.

But how does J. S. Mill differentiate pleasures of different qualities? Who must be capable of drawing the line between pleasures of higher and of lower order? He states:

“If I am asked, what I mean by difference of quality in pleasures, or what makes one pleasure more valuable than another, merely as a pleasure, except its being greater in amount, there is but one possible answer. Of two pleasures, if there be one to which all or almost all who have experience of both give a decided preference, irrespective of any feeling of moral obligation to prefer it, that is the more desirable pleasure. If one of the two is, by those who are competently acquainted with both, placed so far above the other that they prefer it, even though knowing it to be attended with a greater amount of discontent, and would not resign it for any quantity of the other pleasure which their nature is capable of, we are justified in ascribing to the preferred enjoyment a superiority in quality, so far outweighing quantity as to render it, in comparison, of small account.” (CW, X, p. 263).

So, J. S. Mill affirms that there are competent people who are acquainted with both higher and lower pleasures, and, because of this, can tell which pleasures should be preferred. The point to keep in mind here is that the distinction between the pleasures associated exclusively with human activities and those associated with humans and animals must be decided only by a group of competent people, who would be impartial so as not to be biased towards lower order pleasures.

Anyway, is it not possible for a person acquainted with both kinds of pleasures to consciously choose the lower pleasures? Yes, it is, and J. S. Mill says that this is possible because their character is not strong enough or because society does not favor the choice for higher pleasures, as the passage below illustrates:

“Men often, from infirmity of character, make their election for the nearer good, though they know it to be the less valuable; and this no less when the choice is between two bodily pleasures, than when it is between bodily and mental. They pursue sensual indulgences to the injury of health, though perfectly aware that health is the greater good. (...) Capacity for the nobler feelings is in most natures a very tender plant, easily killed, not only by hostile influences, but by mere want of sustenance; and in the majority of young persons it speedily dies away if the occupations to which their position in life has devoted them, and the society into which it has thrown them, are not favourable to keeping that higher capacity in exercise”. (CW, X, p. 264-5).

So, it is not enough to find people who are competent to judge for us which pleasures are worth cultivating, for there is no guarantee that people will actually choose them. This introduces other difficulties in J. S. Mill's ethical theory of moral agency as compared to that of his father, James Mill, and Bentham: pleasures and pains are not simply apprehended by introspection and then analyzed and classified as it was for his predecessors. First, there are ideal, competent judges to tell us which pleasures are higher and which are lower. Second, *even if we know* what pleasures are higher, we may forego their enjoyment in favor of lower pleasures, due to social influences and our occupations in life.

But how can J. S. Mill try to escape the problems identified in the previous paragraph? He makes a difference between *passive sensations* (like desires) and *active sensations* (what he terms *volitions*). Volitions (or wills) are an offshoot of the former and can be detached from the original desires, so as to become habits:

“Will, the active phenomenon, is a different thing from desire, the state of passive sensibility, and though originally an offshoot from it, may in time take root and detach itself from the parent stock; so much so, that in the case of an habitual purpose, instead of willing the thing because we desire it, we often desire it only because we will it.” (CW, X, p. 285).

Based on the idea above, J. S. Mill gives a hint of how one could be made to act virtuously, that is, how one can be made to choose only higher pleasures: by the process of association of ideas, when we reinforce higher pleasures with the idea of “doing right”:

Let us take into consideration, (...), him in whom that virtuous will is still feeble,... [B]y what means can it be strengthened? (...) Only by making the person *desire* virtue—by making him think of it in a pleasurable light, or of its absence in a painful one. It is by associating the doing right with pleasure, or the doing wrong with pain (...) that it is possible to call forth that will to be virtuous, which, when confirmed, acts without any thought of either pleasure or pain. Will is the child of desire, and passes out of the dominion of its parent only to come under that of habit. (CW, X, p. 285-6, J. S. Mill's italics).

So, in order to act so as to choose only higher pleasures, a person should be put in a situation so that those pleasures are associated with doing right. In the end, there

will come a time when choosing higher pleasures becomes a habit, so that people will naturally prefer them to lower order pleasures.

How convincing is this solution? One can imagine at least two objections to it: *first*, once an action becomes a habit, it can be separated from the fact that it gives us pleasure or pain, as he himself put it in the passage quoted above. In this case, we crucially depend on the rightness and impartiality of the “competent judges” who can tell us which actions are truly going to give us pleasures of a higher kind (see also Crisp, 1996, pp. 35-43).

The *second objection* is that his determinism takes us to an infinite regress in the case of volitions. As Alan Ryan (1990:127) explains this point,

“To get a volition going I have to put myself under the appropriate influences; but to put myself anywhere at all I have presumably to have the volition to be wherever it is; but to have this volition in turn requires that I should put myself under the appropriate influences – and already we are trudging down an infinite regress”.

So, it seems that J. S. Mill is stuck between a determinist view of humans (as when people’s actions and reasoning are determined by the social circumstances they happen to be put) and the possibility of breaking free of these determinations by means of the power of the will (see also Thilly, 1923:10).

These are some of the troubles involved in J. S. Mill’s ideas about rationality and human moral action. Of course, his position did not go unchallenged. The next section will show how Jevons’s very different notion of rationality and human action aimed to escape from J. S. Mill’s predicament. As we will see, this escape involved a mechanization of thought and of human behavior.

3. W.S. Jevons and rationality

3.1 The mechanization of thought

As was the case with J.S. Mill, Jevons’s concept of rationality has no equivalent in today’s usage in economic theory. Jevons’s ideas about human thinking and logic are mainly found in his 1873 book “Principles of Science” (henceforth PS). With this book,

Jevons tried not only to overcome J. S. Mill's influence with his "System of Logic" but also to propose a new conception of what it means to correctly reason in order to find rigorous, scientific knowledge. Just like J. S. Mill, Jevons would also start his work with some laws – in his case, "laws of thought". Their definition and their basic operations are represented below (see Schabas, 1990: 60; Jevons, 1958 [1874]: 35, 73-8):

Law of Identity: $A = A$

Law of Contradiction: $Aa = 0$ (zero)

Law of Duality: $A = AB \cdot \mid \cdot Ab$

Law of Commutativity: $AB = BA$; if $A = B$, $B = A$; $A \cdot \mid \cdot B = B \cdot \mid \cdot A$

Distribution: $A (B \cdot \mid \cdot C) = AB \cdot \mid \cdot AC$

Transitivity: $A = B$ and $B = C$; therefore $A = C$.

A, B and C are what Jevons calls *terms*. According to Mosselmans (1998: 86), a term "is a name for a collection of objects and it may be interpreted in two ways. Interpreted as regards intension, a term is a group of qualities. Interpreted as regards extension, a term is a group of objects possessing those qualities" (see also PS: 24-30). A *proposition*, according to Jevons, "expresses the relation between two or more terms" (PS: 24). Lowercase letters (a, b, c) represent the negation of the term. The symbol $\cdot \mid \cdot$ represents the logical connective "or", which, for Jevons, is taken to be the inclusive "or". Controversially, Jevons takes the symbol " $=$ " to denote identity, as Boole had done before him. He does so, because he thinks there is an analogy between mathematical equations and logical propositions. This is an important difference between Jevons and previous logicians like J. S. Mill and Herschel, and we will come back to it in this section.

When Jevons puts terms side by side, like in AB, or AC, or BC, he means that the first letter is a subset of the second letter. Following Schabas (1990: 60), let $A =$

copper, and B = metal. We can say that $A = AB$, that is, “copper is a metal”. The symbol “0” (zero) means “nothing” or something that is logically impossible.¹⁰

With these explanations, we can use the symbols above to make inferences about sentences. For example, using the classical syllogism, we can use the symbols A, B and C to make a direct deduction:

A = Socrates

B = man

C = mortal creature

By saying that $A = AB$ (Socrates is a man) and $B = BC$ (man is a mortal creature), we can write $A = ABC$ (Socrates is a mortal creature).

The job here seems uncomplicated because we are dealing with propositions of only three terms. But Jevons soon came up with the idea that one could make series of combinations of many more distinct terms. For example, a series with two terms (say, A and B) could have four possible combinations (AB, Ab, aB and ab). A series with three terms (say, A, B and C) would give us eight possible combinations (ABC, ABc, AbC, Abc, aBC, aBc, abC and abc). Accordingly, a proposition with \underline{n} terms would give us 2^n possible combinations. Jevons named the set of all possible combinations of a sequence of \underline{n} terms the *Logical Alphabet*.

Once we have in front of us the logical alphabet, it would be interesting to know, beginning with certain premises, which of the possible logical combinations are consistent with the given premises. In order to carry out this task, Jevons conceives of two instruments: the Logical Abacus and the famous Logical Machine. What is the objective of those instruments? To make inferences like the ones exemplified above mechanically, saving our mental job. Their great advantage is that one could insert in them certain premises and, after pressing some keys, the machines would give us the combinations of letters which were logically consistent with the premises in question.

¹⁰ Jevons also uses the symbol \sim to represent non-identity between terms (PS: 45), but he does not give much attention to it because non-identity can also be represented by an equation sign. For example $A \sim B$ can be written as $A = Ab$. See Schabas (1990: 61).

One can see in the operation of the Logical Abacus and the Logical Machine the germs of a conception of a machine which, by separating consistent from inconsistent logical combinations, could actually *think* – or, at least, to replace human process of reasoning. However, one might argue that there is a difference between carrying out a set of mechanical operations and the process of human thought. *The whole point is to understand how human thought and mechanical calculation are becoming interrelated in Jevons's time.* As we will see, this will also have implications for Jevons's conception of economic action.

So, now that we have sketchily explained how Jevons's logic works, we must investigate how Jevons's discourse is embedded in a mechanistic conception of thought. The importance of this analysis is to show how the old associationist psychology of the Mills was being replaced by a different kind of discourse on human rationality and its relation to mechanical rationality. In order to carry out this job, I will resort to papers and book by Maas (1999; 2005a, b) and also Cook (2005).

Maas (1999: 589) objective is “to show how Jevons's work on the Logical Abacus is embedded in an emerging discourse on mechanical rationality”. Following the idea of mechanical rationality is the possibility to unify methodologically the natural sciences and economics, and also “to conceive of ‘economic man’ as similar to a machine, and to analyze his behavior with the same formalism”.

The development of machines that could calculate must be seen as part of the effort to calculate tables necessary for the new occupations coming up with the English industrial revolution (like insurance and navigation companies). The development of these machines initiated a discussion about the “possibilities of representing the human mind by means of mechanics” (1999: 589-90). Going after the project of mechanizing physical work (that had been going for several decades in the first wave of the Industrial Revolution) there came also a project of mechanizing the mental work of people who had to calculate numerical tables. It is in this context that we must understand Charles Babbage's project of building a Difference Engine, in the 1820's. When properly programmed, this Difference Engine could count series of numbers. Nowadays this might seem trivial to us. But at the time, Maas reports on how people “fell in amazement” with the machine.

The discussion that appeared with the Difference Engine regarded the ability to explain all facts of nature – physical or psychic – as obeying mechanical laws. As Maas (1999: 593) explains: “What reason was there to suppose that the human mind functioned in a *different* way from the calculating machine? (...) consciousness could be the by-product of the invariable mechanical laws of nature.” (Maas’s italics).

The next step in the discussion came with George Boole’s work on logic. Boole “suggested that logic was not merely an abstract, formal discipline, but described laws inherent in our mental constitution” (Maas, 1999: 596). Because association psychology still held sway of many important scholars in England, Boole’s claim about the similarities between logic and the laws was not readily accepted – or else were accepted in a different version.¹¹ Another possible reason for this is that this reticence can be found in the implication for the breaking down of the frontiers between “traditional mental categories” (like laws of mind and associations of ideas): following Boole and Babbage, all mental categories could be reduced to algebraic operations. This claim was controversial to the point of being criticized in other english universities, like Cambridge (see Cook 2005: 347).

The big difference, though – the “true revolution” in logic, according to de Morgan, came with the attempt to “quantify the predicate” (Maas, 1999: 598). What does this sentence mean? Well, in aristotelian logic, syllogisms were made out of a relation between genus and species. Thus, in the syllogism presented a few pages before, in which we deduce that the man Socrates is mortal, mortal beings is a class, and men are a subclass of mortal beings.

As Maas (1999: 598) elucidates, a proposition like “all humans are mortals” could be made identical to “some mortals are humans”. Propositions like “all humans are some mortals” are also seen as valid. That is, propositions of syllogisms could be reversed, as Jevons suggested in his uses of symbols by the Law of Commutativeness: $AB = BA$, or $ABC = BCA = ACB$ etc. Here it is possible to understand the use of the symbol “=” to indicate identity: a logical proposition now could be expressed as an algebraic equation. Now, if logic deals with “thoughts and things, and immediately of the signs which stand for them” (PS: 9), *and* if these signs can be operated as an

¹¹ More on the attack of psychophysiology against association psychology can be found in Maas (2005: 629-32).

algebra, one can say that, according to this idea, there is no specific quality in the working of a mind that cannot be compared to the working of a machine. Jevons assures us that “signs, thoughts and exterior objects” are all “parallel and analogous”. That is, “to treat any of the three series [signs, thoughts and exterior objects] is equivalent to treating either of the three series” (PS: 9). There we have it: minds and machines operate according to the same pattern, and this pattern involves the use of algebra, at least to some extent.¹²

But that is not the case anymore with Babbage, Boole, de Morgan and Jevons. The task of comparing similarities and differences among terms A, B or C is left out – it is only assumed that the mind has the ability to detect identity and difference. The principle of the substitution of similars – the act of the intellect in charge of finding similarities between terms – is not analyzed by Jevons. It is “an inexplicable gift which was starkly to be contrasted with calculative, mechanical rationality”, according to Maas (1999: 613). That is, this gift was left out of the game as something inscrutable.

The implications of this new view of logic are directly opposed to J. S. Mill views. *For J. S. Mill the logical copula – the sign of predication indicated by the verb to be – could not be regarded as the equal sign in an equation.* It was no simple task finding similarities and differences between different terms: the operations of analysis and categorization in J. S. Mill were meant to show that the processes of reasoning involved sifting through impressed ideas in our minds until we could reach some proper knowledge. In other words, it involved identifying prejudices and other spurious habits of thought which could infest our minds because of wrong mental associations socially reinforced.

The problem with Jevons’s logic is that he takes it for granted that “signs, thoughts and exterior objects” are all “parallel and analogous”. That is, “to treat *any* of the three series [signs, thoughts and exterior objects] is equivalent to treating *either* of the three series” (PS: 9, my italics), as I wrote a few paragraphs before. There is no need of analysis and classification of terms: the capacity of the mind to identify similarities and differences between them is given.

¹² Note, however, that Schabas (1990: 61) observes that Jevons “upheld certain parallels with algebra (...) But in general, he was less prone to import elements of algebra into his logic”.

Two consequences stem from this new approach to understanding the mental activities of humans: *the first* is that scientific language, according to Jevons, will assume a mathematical expression. Propositions of everyday language should be transmuted into symbols, so that their logical, mechanical operations could be analogous to human thought. Jevons himself does not think that the attempts to use quotidian language are proper in science (see his TPE: 29).

Now, because Jevons approach “gives rise to a symmetry between logic and mathematics”, his equations, consequently, “have both a logical and a mathematical nature”, according to Mosselmans (1998: 90). From this moment on, the insights and ideas of previous economists, in order to be useful for economic science, would preferably have to be understood in algebraic terms. The reason is that thought is somehow expressed in algebraic terms. The operations of the mind and of a machine are similar. And, if that is so, what *cannot* be expressed by symbols and numbers might be considered imprecise, or, even worse, meaningless. At the same time, if economic science was supposed to deal with quantities – and Jevons thought it was – then, it should be a mathematical science. Logic would be the foundation of mathematics, and physics, just like economics, should be a mathematical science.

The second consequence of Jevons’s approach to the human mind is that the behavior of economic man is not related anymore to the social milieu in which he acts. Remember that in the end of subsection 2.2 we observed that J. S. Mill’s economic man had a dual nature: concrete, historical circumstances could interfere in the association of his ideas regarding the pursuit of wealth, strengthening or weakening the drive to accumulate riches. As we will see in the next subsection, the situation is different with Jevons. *The key difference is that J. S. Mill’s social considerations regarding economic behavior were replaced by biophysiological laws.* If we follow Jevons, there are mainly two possibilities to study economic behavior scientifically: 1. to search into the biophysiological functioning of the human brain and body so as to find in there the basis for economic laws; and 2. To develop mathematical models of the economic behavior of humans.

3.2 From Associationism to Psychophysiology: agency in Jevons

Roughly from the second half of the nineteenth century, advances in psychophysiology showed that it was possible to understand states of mind produced by

the interactions of the body – its organs of perception, the nerves and the brain -- with its surrounding environment. According to historian and Jevons scholar Michael White (1994a: 197-230), the ground zero for understanding Jevons's ideas regarding the human mind and human behavior must be found in Richard Jennings's 1855 book, "Natural Elements of Political Economy" (henceforth NEPE). For our purpose, what is interesting about Jennings's ideas is that they do not fit *at all* J. S. Mill's ideas regarding the laws of mind and their role in political economy. We have already seen that, for J. S. Mill, the laws of the human mind could be found by introspection. The basic motivation for economic activity -- the desire to acquire as much wealth as possible with a minimum effort -- is found to be a true psychological law by means of introspection, according to J. S. Mill. That is, pleasures and pains would be impressed on our senses, and we would make an idea of them. After that, we would classify those pleasures and pains with names and would analyze them so as to fit them into a moral theory. Objective knowledge about the morality of human actions was produced by a thinking subject by dint of introspection.

This is not the case any longer. Although Jevons liked to praise Bentham's definition of utility (which was more amenable to quantification, depending solely on intensity, duration, certainty and propinquity of the sensation in question¹³) compared to J. S. Mill's (which was both quantitative and qualitative, with lower and higher pleasures), this does not mean that Jevons was simply rehashing Bentham's ideas. It is true that Jevons explicitly found Bentham's version of utilitarianism more scientifically apt than that of J. S. Mill's. However, in Bentham's time there was no allusion to the discourse of psychophysiology, which makes all the difference for the study of the agency of humans in Jevons.

Before we go into the subject of political economy, I think it is necessary to sketch a brief account of what psychophysiology is. As the name itself suggests, psychophysiology tried to explain psychological events like knowledge and experience appealing to the physiology of our bodies. How is that? In the first decades of the nineteenth century, a scientific breakthrough was achieved in the realm of biology: the

¹³ It is necessary to say that this does not mean that Jevons was "naturally" following the ideas of Bentham. Peart (1996: 126) observes that the actual application of quantification of pleasures was much more complicated for Bentham than for Jevons. On the differences between Jevons and Bentham, see also Sigot (2002).

nerves responsible for the movement of our muscles and for the sensations we feel were properly identified and separated. We must remember that, in associationsism, knowledge and experience were generated by external stimuli that impressed our senses and the associations of ideas that come thereof. Remember from subsection 2.1 that the associations of ideas allowed us both to understand human action and the reasoning of people. As we saw, that includes the behavior and motivations of economic man.

Psychophysiology changes all that, because we do not need external stimuli to impress our senses to explain human action. As White puts it (1994a: 210),

“By stressing the importance of relation between movement, the nervous system, and ‘in-born’ patterns of coordination, it was also possible to provide an explanation for the body’s spontaneous movements that were prior to and independent of previous external stimuli and consequently mental ‘associations’”.

Let us compare this new idea of psychophysiology with J. S. Mill’s associationism to better comprehend their differences: for J. S. Mill there are external causes which impress our minds – sensations – which can be felt, thought and then named. In order to build a utilitarian theory, we would have to analyze the different types of sensations and organize them on a hierarchy from the lower-order feelings to the higher-order feelings. However, due to social influences, weakness of will or to our non-acquaintance with higher feelings, we might need the help of competent judges to help us make the right choices in the direction of the happiest possible life.

It was based on some basic laws of the human mind that we could know how men would behave. The desire to accumulate wealth, as we already pointed out, was considered by J. S. Mill one of the laws of the human mind that we can arrive at by introspection.

It is all different with psychophysiology: with this new knowledge, one needs not use the mental associations to explain human behavior: it was possible to explain it by the configuration of the nervous system and in-born patterns of coordination. Human behavior could be viewed as automatic, without the participation of our conscious mind. It would also be possible that our mental states were generated by our biological

nervous system, so that, in the end, our conscience could be grounded in the physiology of our brains.¹⁴

Psychophysiology enters our history by means of *two universal laws of human nature* that were important for economic science. According to Jennings, *the first law* stated that “the degrees of satisfaction do not proceed *pari passu* with the quantities consumed” (cited by White, 1994a: 201). As Jevons recognized, this definition was halfway to the law of the diminishing marginal utility.

The second law of human nature had to do with labor. According to Jennings, the effort people expended working could be “indifferent” or even “pleasurable”, but, eventually, that effort would lead to painful sensations. If labor continued to be performed in spite of these painful sensations, there would be a point in which the increase in work effort would make the pain unbearable. This explanation was also very similar to that presented in the “Theory of Political Economy” (henceforth TPE, ch. 5, p. 125). Jevons, in fact, quotes a lengthy passage of Jennings in the TPE (p. 124-5), endorsing Jennings’s principle of human nature regarding labor.

With these two principles, a scientifically valid explanation for human actions had been given, according to Jennings. If we wanted to understand how the wage rate was determined, we would have to take into consideration both the “toilsome feelings” involved in the exertion of labor and the pleasurable feelings associated with the consumption of goods allowed by a wage. That is basically the origin of Jevons’s “Theory of Labor”, in chapter 5 of his TPE.

As we have already remarked, the difference between J. S. Mill’s conception of human behavior and Jennings’s lies, effectively, in the fact that the latter’s pains and

¹⁴ Curiously, J. S. Mill also admitted that, in fact, our mental states and the laws of mind could simply be derived from our physiology (CW, VIII, p. 161, my italics):

“The relations, indeed, of that science [psychology] to the science of physiology must never be overlooked or undervalued. *It must by no means be forgotten that the laws of mind may be derivative laws resulting from laws of animal life, and that their truth therefore may ultimately depend on physical conditions*; and the influence of physiological states or physiological changes in altering or counteracting the mental successions, is one of the most important departments of psychological study.”

I believe that the fact that J. S. Mill did not lead his investigations in this direction must be credited, in part, to the fact that the neurosciences were not fully constituted as a field of research when he wrote his “System of Logic”.

pleasures were not to be found in the associations of ideas, but in the biology of the human body, as White stresses (1994a: 203).

So, the road taken by Jennings (and also by Jevons and Edgeworth thereafter) was that of basing the knowledge about human behavior regarding consumption and labor on the physiological functioning of the human body. Another consequence of the adoption of psychophysiology to explain human action is that it signaled another approach to the theory of consumption. Up until the nineteenth century, *commodities were classified hierarchically from necessities to luxuries, depending on the degree of want felt for a certain commodity*. In this context, there was the explicit possibility of comparison between different goods, so that the value of one good could be compared with and represented by the value of another. As White (1994: 203) explains, “in this account, the hierarchy was the most important component of the explanation”. That is, *a classification of goods by means of the analysis of how much they were wanted was the nub of explanation*. But now, as we have seen, this hierarchy as a form of explanation goes to the background, and the psychophysiological explanation comes to the fore.

As we suggested at the beginning of this section, analysis and categorization could no longer be trusted to produce certain knowledge. As a consequence, we have seen that scientific language should preferably be formal and mathematical, independent of any particular language. As we pointed out in the previous section, there is a need to find a logic independent of the possible dubiety present in concrete languages, like English or Portuguese. Jevons tried to do this. And he did so by conceiving thought in a mechanical way, as we saw in subsection 3.1.

4. Comparing rationality and agency in J. S. Mill and W. S. Jevons

Section 2 showed how the comprehension of the “laws of mind” was important for J. S. Mill to explicate human reasoning and the generation of knowledge about the world. These laws, as we have seen, were discovered by introspection: the outside world would first give us impressions. These impressions could be then represented by thoughts, and these thoughts, in turn, could be represented by words and propositions. When we correctly analyze and classify these words and propositions – that is, when we reason -- we generate knowledge.

J. S. Mill tried to make something like this with his utilitarianism. However, the fact that he distinguished between higher and lower pleasures put him in trouble. The higher pleasures were to be determined by “competent and impartial judges”. However, this methodological procedure, as we saw, introduced problems regarding the mechanistic account of J. S. Mill’s laws of mind and the supposed freedom of the will we would all possess.

Jevons saw J. S. Mill’s version of utilitarianism as well as his logic as possessing many weaknesses: instead of studying the “laws of mind” and the inductive method in a psychological-associationist fashion (using introspection), Jevons set out to study how the “laws of thought” and the “powers of mind” allowed men to make inferences, direct deductions, indirect deductions, inductions and so forth, in order to produce knowledge. For Jevons, these laws were not given by the association of ideas, but by powers that were given in everybody’s minds¹⁵. In his “System of Logic”, J. S. Mill may have said that the moral sciences should use the methods of physical sciences “duly extended and generalized”, for sure. But he also stressed the difference between the social and natural sciences, showing that their laws were not of the same kind. Jevons, for his turn, suggested that the moral sciences should be reduced to the physical sciences.¹⁶ It is also important to notice that J. S. Mill considered the proper method for the moral sciences *to be deductive*, whereas Jevons insisted on its being *empirical*.

In the end, we can identify three interrelated modifications that Jevons operated on the scientific method as it was established by J. S. Mill. As we analyzed, these modifications had an impact also in Jevons’s conception of the economic agent. *The first modification* concerns the gradual abandonment of the association psychology in favor of psychophysiology in the explanation of the behavior of humans. This leads us

¹⁵ For Jevons, inspired by Alexander Bain, there are three *powers* of thought: power of discrimination, that is, the power to detect differences between different states of mind; the power of detecting identity, that is, the power to perceive similarities among the “disguise of variety and seiz[e] among the common elements of sameness” (1958 [1874]: 5); and finally, the power of retention, that is, the power to keep past states of mind in memory. The *laws* of thought are also three: the law of identity (whatever is, is); the law of contradiction (a thing cannot both be and not be); and the law of duality (a thing must either be or not be). (1958 [1874]: 6).

¹⁶ See, for example, this passage: “Are not plants and animals, and ultimately man himself, merely crystals, as it were, of a complicated form? If so, our boasted free will becomes a delusion, moral responsibility a fiction, spirit a mere name for the more curious manifestation of material energy. All that happens, whether right or wrong, pleasurable or painful, is but the outcome of the necessary relations of time and space and force” (PS: 736).

to *the second modification*, which deals with the separation between sciences of matter and sciences of mind – the latter could now be reduced to the former. Finally, *the third modification* has to do with the mechanization of thought proposed by Jevons when he conceived of the human mind as a machine.

4. Concluding Remarks

What is the upshot of the analysis above? There are two possibly complementary conclusions we can gather from our study.

First, when it comes down to the concept of economic man, it seems that the passage from J. S. Mill to W.S. Jevons marked a growing “biologization” and rigidity of economic behavior. That is, whereas J. S. Mill’s economic man was quite malleable the same cannot be said of Jevons’s economic man. At the same time – and this is our second conclusion – less than a “desocialization” of economic behavior, Jevons seems to have inaugurated a different perspective to look at social influences regarding economic behavior. Let us briefly comment on each of these conclusions.

As regards the malleability of human economic behavior, J. S. Mill inserted, for instance, a whole book into his “Principles” – book IV – showing how the economic development of society could change people’s characters (see, for example, CW, III: 227-9). This included the possibility that the drive for the accumulation of wealth could diminish in the men and women of a future society, as we tried to show.

However, for Jevons, such a study would be out of question in a *scientific* political economy¹⁷. And this study would be out of question because human nature would *not* be dual and malleable as it was for J. S. Mill. Quite the contrary: as Jevons remarked, criticizing J. S. Mill’s idea of human nature (1879: 536):

“Human nature is one of the last things which can be called ‘pliable’. Granite rocks can be more easily molded than the poor savages that hide among them. We are all of us full of deep springs of unconquerable character, which education may in some degree soften or develop, but can neither create nor destroy”.

¹⁷ This does not mean that Jevons thought that changes in people’s characters were unimportant. As Mosselmans (2003) remarks, Jevons considered political economy to be a narrow field of study, whereas concerns about character of people and institution should be left to a different field of study which he termed “economic sociology”.

At the same time, one might be tempted to describe this growing “biologization” and rigidity of economic behavior as an attempt to redefine the frontier of political economy. Jevons seems to have pushed this frontier closer to the discourse of biology and farther from the discourse of other social sciences. For example, he quotes approvingly of H. T. Banfield (the writer who, according to Jevons, best understood the basis of economic theory) as saying that: “The lower wants man experiences in common with brutes” (TPE: 48). He also calls lower-order needs (for example, for food, water and air) as “simple animal requirements” (TPE: 55). Schabas (1990: 94, 161) also observes that Jevons thought it was possible to trace the “action of the postulates of political economy among some of the more intelligent animals”.

One might be also tempted to assert that, instead of looking for social influences in human behavior – like J. S. Mill did -- Jevons would mainly look for biophysiological laws that might govern economic behavior. There seems to be some truth in this assessment, and the implications for the difference between Jevons’s and J. S. Mill’s conception of the agent are also important: for J. S. Mill, concrete social influences, by changing the pattern of mental associations of economic agents, *could also change people’s character and economic behavior*. For Jevons, that is impossible, because his “laws of thought” are mechanical and economic behavior is biology-based. *Consequently, they cannot be changed by social influences*. Once we know the laws that govern people’s thoughts and economic behavior, the most that social influences can do is to either repress or make room for these in-born, natural human propensities. Social influences may, perhaps, hinder the expression of these propensities, but cannot change them.

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