CONSUMER CHOICE THEORY AND SOCIAL LEARNING

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Anaïs Carlin

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Abstract: In this paper we formalize learning as a determinant of individual choice. We model economic agent as an individual who makes her choice according to a specific set of experiences, which evolves over time as the agent learns from both her personal history and her social environment. We link preferences to choices through the notion of hierarchy of wants. We present an axiomatic characterization, inspired by Georgescu-Roegen (1950, 1954), of the individual choice mechanism in a social environment. Following these axioms, we show that an agent may change her choice from one period to another and remain nonetheless rational. The learning mechanism allows for the modification of individual preference ordering over time as well as it implies irreversibility, in the sense that economic changes leave a mark in the decision making process.

Keywords: Preference formation; preference change; learning; path dependency.

JEL classification: D01, D11, D83.
1 Introduction

In the neoclassical theory, preferences are assumed to be given exogenously, revealed to the agent. Hence, preference ordering is static all along the agent lifetime, neglecting thereby the role of learning process and the influence of social environment on individual choice. Including these concepts in a formal theory of consumption choice remains a challenge for economics. Framing a dynamical theory of creation and evolution of preferences within a social environment has attracted attention in recent research.

We find models of changeable preferences in Sen (2002), and Kirman & Teschl (2006). In these models individual decision process includes both the agent’s personal identity and her social identity. In Sen’s approach, the process of choice is parametrized over context and chooser identity. Using complexity theory, Kirman & Teschl (2006) provide a model of endogenous identity and preference formation where each agent considers not only what she is but also who she wants to be, and where, or in which social groups, she wants to participate. The who criterium creates a dynamical frame, allowing for deliberate change in the agent’s self. In the who-identity model, the participation to a social group is a stochastic rather than a deterministic choice. This choice process cancels out context and history dependency of preferences. More over these two approaches remain vague on the impact of ongoing social norms on individual choices.

Gul & Pesendorfer (2010) propose models of interdependent preference based on intentions. Agents are described by their characteristics, which are attributes such as wealth or education, and by their personality, i.e. how do they react to the characteristics and personalities (altruism, desire to conform, willingness to reciprocate or inclination to be spiteful) of others. Within their framework a person’s ranking of social outcome is evolving, inasmuch as ranking depends on the characteristics and personalities of others. Dietrich & List (2013a, 2013b) treat the issue of individual choice using both the philosophical and the economic approaches. In ’A Reason-based Theory of Rational Choice’, individual choices and actions are motivated by reasons. A change in the agent’s set of motivating reasons can bring about a change in her preference order.

In the present paper, we put the emphasis on an individual learning process in a social context and its consequences on consumption choice. Recently, Cynamon & Fazzari (2008) use the concept of consumption norm, which they define as ”the standard of consumption an individual considers normal based on her group identity” (Cynamon and Fazzari 2008 p.6), which is determined by both the social circumstances in which an individual is situated at any point in time and the individual’s personal history. However they do not formalize this concept. We claim that Georgescu-Roegen’s works on theory of choice (1950, 1954) may be used in order to build a formal representation of Cynamon and Fazzari’s concept of consumption norm. Based on Georgescu-Roegen (1950, 1954), we propose a formal model.
of consumption choice in which preference ordering is evolving over time as individuals learn from their social environment and personal experiences. To the extend that an agent has several preference orderings when referring to different contexts, our model follows Sen’s approach. What we add is the fact that an agent’s preference ordering is changing all along the agent’s lifetime as she learns from her personal experience, which are influenced by social environment.

The remainder of the paper is organized as follows. Section 2 focuses on learning mechanism as an explanation for changes in individual choice. We consider economic agent as an individual who makes her choice according to a specific set of experiences, which evolves over time as the agent learns from both her personal history and her social environment. We link preferences to choices through the notion of wants, which here are treated on a hierarchical basis. Section 3 present an axiomatic characterization, inspired by Georgescu-Roegen (1954), of the individual choice mechanism in a social environment. Following these axioms, we show that an agent having hierarchic wants and learning abilities may change her choice from one period to another and remain nonetheless rational. The learning mechanism allows for the modification of individual preference ordering over time as well as it implies irreversibility, in the sense that economic changes leave a mark in the choice process. Section 4 offers some concluding remarks.

2 The axioms of consumer choice

We assume a social homo economicus HOS who is able to learn from her experience, adapt her behavior according to the social context and have hierarchic wants. Based on the standard representation of individual preferences (Mas-Collel et al. 1995) but adding contributions of Georgescu-Roegen (1950, 1954, Gowdy & Mayumi (2001)) we start from the following set of axioms:

**Axiom 2.1.** HOS is confronted only with alternatives represented by combinations of various commodities that involve no risk and no uncertainty. The commodities are quantity-measurable and every point \( C(x_1, x_2, \ldots, x_n) \) in the commodity space is an alternative.

**Axiom 2.2.** When confronted with two alternatives \( C^1, C^2 \), HOS will either prefer one to the other, or regard the two alternatives as indifferent. Indifference is a symmetric relation, preference is not. We write \( C^1 PC^2 \) for preference and \( C^1 IC^2 \) for indifference.

**Axiom 2.3.** The preference of HOS is the same every time he is confronted with the same \( C^1 \) and \( C^2 \).

**Axiom 2.4.** Around the origin of coordinates, there is a region where \( C^1 \) is preferred to \( C^2 \) if \( C^1 \) is obtained by adding \( C^2 \) more of at least one commodity.

**Axiom 2.5.** The relation \( \overline{P} \) of non-preference (the negation of \( P \)) is transitive, i.e., if \( C^1 \overline{PC}^2, C^2 \overline{PC}^3 \), then \( C^1 \overline{PC}^3 \) (\( C^1 \overline{PC}^2 \) means either \( C^2 PC^1 \) or \( C^1 IC^2 \))
Axiom 2.6. If $C^1P^2C^2$, $C^1P^3C^3$, then $C^1P[\alpha C^2 + (1 - \alpha)C^3]$, where $0 \leq \alpha \leq 1$.

Although axiom 2.2 allows for a region of indifference, it is not sufficient to guarantee the existence of an indifference region. Axiom 2.7 offers both this guarantee and a definite procedure for obtaining an alternative indifferent to any given one (Georgescu-Roegen, 1936, 1954, Gowdy & Mayumi, 2001).

Axiom 2.7. A set $(C^\alpha)$ is called a preferential set if $\alpha$ takes all the values of an interval of real numbers and if $C^\beta PC^\gamma$ whenever $\beta > \gamma$. If the preferential set $(C^\alpha)$ contains $C^\beta$ and $C^\gamma$, and if $C^\beta PC$ and $CPC^\gamma$, then the preferential set contains a combination indifferent to $C$.

3 Preference formation as a learning process

In this section we explore the individual learning process, its social determinants and its implications in terms of choice. We consider economic agent as an individual who makes her choice according to a specific set of experiences, which evolves over time as the agent learns from both her personal history and her social environment. We discuss the role of reference groups and social norms in the mechanism of choice. Finally, we show how changes in individual choices, every thing equal, can be rationalized in a hierarchic wants framework.

3.1 Commodity space and set of experience

In Cynamon & Fazzari (2008) preferences are path dependent, i.e. individuals have a memory of their previous experiences, what Georgescu-Roegen calls irreversibility. This requires to include time and chronology into the model. The point is to differentiate the commodity space from the set of individual experiences.

Individual’s personal history appears in Georgescu-Roegen (1950) in the ‘hereditary’ postulate, stating that “the indifference varieties [i.e. indifference curves] depend upon the economic experience of individual” (Georgescu-Roegen, 1950, p.130). This will be taken as basic axiom for individual choice in the present analysis.

Hypothesis 3.1. The indifference curves depend upon the economic experience of individual.

For each time period, all combinations of flows of commodities $C$ can be distributed in two different groups: (a) the combinations that have already been experienced with by the past, plus those that are implicitly covered by these past experiences, (b) and those which are “new relevant experiences” (p. 131), representative of an individual’s learning process. While the first two groups will not modify the indifference map of the individual, the latter will. Call $\mathcal{S}$ the complete set of the individual’s experiences (a), $\mathcal{S}$ is a complete
set of individual experience at a given time. $\mathcal{S}$ is changing over time as individuals meet new relevant experiences (c). At a given point of time, a consumer’s indifferent map is thus defined by Georgescu-Roegen (1950) as:

$$\phi[C, \psi(\mathcal{S})] = \text{const}$$ (1)

In this framework, when the individual has no economic experience ($\mathcal{S} = 0$), she has no indifference map at all (the set function $\psi$ is indeterminate). If between time $t_1$ and time $t_2$ an individual experienced a new relevant combination, say $C^2$, the sets $\mathcal{S}_{t_1}$ and $\mathcal{S}_{t_2}$ will be different, the set $\mathcal{S}_{t_2}$ including the new relevant experience. Thus, the indifference map $\phi$ is not necessarily constant over time, so are not necessarily the ophelimity ordering between two combinations $C^1$ and $C^2$. In fact, Georgescu-Roegen differentiates between the “mentally projected comparison” between $C^1$ and $C^2$ based on $\mathcal{S}_{t_1}$ and the comparison between $C^1$ and $C^2$ based on $\mathcal{S}_{t_2}$. According to Georgescu-Roegen (1950) change of price or income are circumstances which can make the individual learning new relevant combinations, altering thereby the indifference map. If such a change happens, let us say, an increase in income, “no new shift in [income] alone could bring the consumer back to [her] former position” (p. 134). An increase in income allows the individual to buy says higher quality goods, while a decrease in income can force the agent to buy very low quality goods he has never experienced with beforehand. At this stage an interesting question is which forces will influence the choice of an individual toward a particular new product? The question is which are the available sources of information for an individual? How does the individual learn the existence of new product (whether new to him or entirely new in the sense of product innovation)?

**Hypothesis 3.2.** The evolution of $\mathcal{S}$ is influenced by reference groups.

According to Cynamon & Fazzari (2008), social environment plays an essential role in the learning process. In a social context, people learn not only from their personal experiences but also from observation of reference groups. These latter provide information about not already experienced products, in a sense they act as a compass to guide individuals within the increasing set of consumption goods. Reference groups can be real such as neighbors or co-workers, or virtual, provided by the mass media.

*Reference groups - virtual or real - are an important source of information: first, they introduce an individual to new products so that choice sets are influenced by one’s reference group; second, they provide experience and knowledge in how to appreciate, enjoy (and consequently desire) new products.*

(Cynamon & Fazzari, 2008, p. 5) Advertising and observation of one’s own social environment is not only a means of discovering products that are new to the individual but also an indirect way of experimenting
these new products. Information from the reference groups directly act upon the “mentally projected comparison”, influencing thereby the agent’s choice when having to explore a new relevant combination. Advertising, but also television shows, and any type of mass media are therefore part of the consumers’ learning process.

3.2 Consumption norms

Georgescu-Roegen (1950)’s conception of the hereditary mechanism excluded ”the influence upon individual tastes due to exogenous (from the point of view of the individual) economic actions taken by others, such as advertising, conspiracy for creating false social distinction, etc” (p.128). Several points should be made here. First, we should not confuse (1) the influence of exogenous economic actions on individual taste, with (2) the availability of different sources of information. While (1) is in some sense ‘invasive’, meaning that, although the individual would have preferred one alternative to another, social forces distort her choice, (2) only acts on the set of individual choice, as stated above. Note that advertising and observation of one’s own social environment can be part of both, depending on whether the individual regards it as information or as behavioral prescriptions in the sense of Akerlof & Kranton (2000) dictating what should or should not be chosen.

What Georgescu-Roegen calls exogenous economic actions can be assimilated to consumption norms in the sense of Cynamon & Fazzari (2008), that is “the standard of consumption an individual considers normal based on his group identity” (p.8).

As highlighted by Akerlof (2007), norms are the missing motivation in the standard conception of decision making in macroeconomics. ‘Sociologists describe consumption as largely determined by the norms regarding what people should consume. These norms, in turn, are dependent upon the individuals situation and also who she thinks she is.” (Akerlof, 2007, p. 15) Consumption norms are produced “by references to neighbors, coworkers, and models provided by the mass media” (Cynamon & Fazzari (2008), p.24). An individual in isolation may have some preferences, but when merging into a social context her preference ordering may be modified as her reference groups influence her “opinions as to how [she] should, or should not, behave” (Akerlof, 2007, p. 8), as her reference groups influence her standard of consumption. In this case, information coming from the reference groups become behavioral prescriptions.

Choices are context dependent. In the case of consumption choice, we call this dependence consumption norms. An example of how a social context may influence individual consumption behavior is that of non-religious people, or even muslim living in an historically catholic country who offer gifts to their children for Christmas. A second example could be found in the dress codes.

Axiom 3.1. The consumer is able, at any moment of her life, to choose between two combinations of flows of commodities $C^1$ and $C^2$, meaning by such a choice that there is a definite theoretical frequency (or probability), $p(C^1, C^2, l)$ connected with the choice of $C^1$
in preference of $C^2$. By $l_t$ we represent the social context(s) in which the individual has experienced with $C^1$ and $C^2$ up to time $t$.

\[
C^1PC^2 \text{ if } p(C^1, C^2, l_t) \equiv 1 \\
C^1PC^2 \text{ if } p(C^1, C^2, l_t) \equiv 0 \\
C^1P_lC^2 \text{ or } C^2P_lC^1 \text{ if } 0 < p(C^1, C^2, l_t) < 1
\]

where $C^1PC^2$ means that $C^1$ will be preferred to $C^2$ irrespectively of any context, $C^1P_lC^2$, that, although the individual makes a choice, there would be some room for context-adaptative changes in this choice.

$p(C^1, C^2, l) \equiv 1$ and $p(C^1, C^2, l) \equiv 0$ are choices representative of individual taste, while $C^1 \sim C^2$ or $C^2P_lC^1$ if $0 < p(C^1, C^2, l) < 1$ are choices constraint by the individual’s social environment, or social identity \(^1\). This choice mechanism corresponds to what Sen (2002, chap. 4) refers as maximization (in opposition to optimization), that is the fact that an agent may choose a combination which may not be in accordance with her personal-preferences. Sen proposes several motivations for such a behaviour: reputation and indirect effects, social commitment and moral imperative, direct effect on welfare (for example judgement by other agents may directly impact the returns of a choice), pursuit of a conventional rule (such as a social norm).

In section 3.1 we highlighted that advertising and other types of mass media were part of the consumers’ learning process. However, as highlighted by Schor (1998), when compared with the real reference groups, the virtual ones are less likely to comprise people who all earn approximately the same amount of money. She states that “our real-life friends […] have been joined by our media ‘friends’. We watch the way television families live, we read about the lifestyles of celebrities and other public figures we admire, and we consciously and unconsciously assimilate this information” (Schor, 1998, p.5). The problem with these new reference groups lies in the fact that “while the real demonstration effects in a neighborhood are constrained by budgets, the fictional demonstrations in the media are not” (Cynamon & Fazzari, 2008, p. 10). Combinations, which are not in accordance with her budget constraint, are thus likely to appear in the individual’s consumption norm, when based on virtual reference groups. In this sense, consumption norms may distort the agent’s choice mechanism, who may be tempted to operate a relaxation of her budget constraint using consumer credit.

\(^1\)As Kirman (2000) says that “for an individual whose decisions are related to his social environment and influenced by his social interactions with other people. These are generally summarized as choices based on a person’s social identity” p. 303
3.3 Wants and choices

Georgescu-Roegen (1954) argues that individual behaviors are defined on the basis of needs, wants and uses of each individual, rather than by a single element such as utility. Referring to different authors, Georgescu-Roegen notes that the existence of a hierarchy of needs and wants is known and has long been recognized. The study of this literature allows him to establish that this hierarchy implies the existence of four fundamental principles of wants: (1) The subordination of wants, (2) the principle of satiation of wants - the former, meaning that the satisfaction of high priority want allows a lower priority want to manifest itself, implies the existence of the latter-, (3) the growth of wants - reflecting the absence of absolute saturation- and finally, (4) the principle of irreducibility of wants - illustrated by the example that “bread cannot save someone from dying of thirst” (ibid., p. 516).

According to these principles, Georgescu-Roegen states that:

Choice aims at satisfying the greatest number of wants starting with the most important and going down their hierarchy. Therefore, choice is determined by the least important want that could be reached. This is why when we ask for the reason of choice we get answers which seem prima facie silly. An individual may give as the reason for which he bought a particular car “the nice emerald green color of the panel”; another would say that he bought her house because “it offered a nice location for a bird house.” But what both individuals mean is that after eliminating all available cars, and all available houses, by comparing them from the point of view of other more important wants they gradually came down to the color of the panel and to the bird house. No matter what we choose, houses, cars, or combinations of commodities \( C \), the procedure is the same. Between two combinations the choice will be made according to the lowest relevant want that can be reflected in any of the two combinations.

(Georgescu-Roegen, 1954, p.518)

Georgescu-Roegen (1954) points out that an agent having hierarchic wants can exhibit changes in choice while preferences remain constant, so that axiom 2.3 holds. This is possible because of the combination of the principles of subordination, satiation and irreducibility of wants. In fact, an individual will prefer a certain combination of goods \( C^1 \) to \( C^2 \) according to a priority want \( w_1 \) up to its satiation. From this satiation level, a lower priority want \( w_2 \) appears, which, when answered, may perfectly imply that \( C^1 \) is no longer preferred to \( C^2 \). However the tastes of the agent are constant in the sense that she will always prefer \( C^1 \) to \( C^2 \) when answering \( w_1 \) and \( C^2 \) to \( C^1 \) when answering \( w_2 \). Georgescu-Roegen (1954) introduces the term ”behavior curves” (Ibid., p. 519) to define indifference curves including hierarchic preferences. A behaviour curve can represent

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preferences between two commodities referring to a particular want, as well as preferences between two commodities for different wants. In the latter case, a behaviour curve is the aggregation of several indifference curves answering different wants.

4 Learning and irreversibility

Here we adapt Georgescu-Roegen (1954)’s postulates, presented in section 3.3, to describe the individual choice mechanism in a social environment. Following these postulates, we show that an agent having hierarchic wants and learning abilities may change her choice from one period to another and remain nonetheless rational. Then, we analyse how learning mechanisms not only allow for the modification of individual preference ordering over time but also implies irreversibility, in the sense that economic changes leave a mark in the individual decision making process.

4.1 Choice mechanism within a social environment

In this section we gather together all the points above. We assume a social homo economicus HOS who is able to learn from her experience, adapt her behavior according to the social context following axiom 3.1 and have hierarchic wants. Keeping the standard axioms of individual preferences, but modifying the third one.

**Axiom 4.1.** The preference of HOS is the same every time she is confronted with the same \( C_1 \) and \( C_2 \), locates in the same context (axiom 3.1) and refers to the same set of experience \( S \).

As in Cynamon & Fazzari (2008) assume, agents learn from their social environment. Especially, from their reference groups, which both influence the choice sets by “introduc[ing] an individual to new products” and create new desires by ‘provid[ing] experience and knowledge in how to appreciate, enjoy new products’ (2008, p. 5). Assume that individuals adapt their behavior according to the social context and have hierarchic wants. Here is a simple example, provided by Cynamon & Fazzari (2008), which we will use to illustrate our point.

Think of the preference for good wine less as an innate characteristic of individual utility but rather as a learned behavior conditioned by ones social reference group. An individual with a working class reference group is unlikely to sit around the table at expensive restaurants bantering with friends and sommeliers about tannins, complexity, oakiness, etc. Indeed, we argue that if the enjoyment technology for good wine is not typically part of ones social reference group, it may be difficult for that person to appreciate the difference between wine qualities. Should an individual experience a large rise in income, he will have the means to begin dining at places, and with other people, that take their
wine seriously. The association with higher income households in the new reference group will teach, at least implicitly, the person in the new social situation about the joys of fine wine and change his preferences.

(Cynamon & Fazzari, 2008, p. 5)

Imagine an *social homo economicus* HOS who would have at least the following wants: for drinking wine with diner alone, for offering wine to her friends at diner, and who would know only two commodities: $X_1$, cheap wine and $X_2$, *grand cru*. Let us also assume, for simplicity, that the “drinking wine with diner” as seen by our agent HOS in any combination $(x_1, x_2)$ is the corresponding savour-weighted quantity $q_\tau = \sum_{i=1,2} q_{x_i} \tau(x_i) = x_1^{\tau(x_1)} + x_2^{\tau(x_2)}$. Savour is offered by both cheap wine and *grand cru*, $\tau(x_1), \tau(x_2)$, however assume that the taste for *grand cru* is appreciated by HOS if and only if she has been taught to (by her friends). Therefore, if agent S is not a *connoisseur*, the want for savour does not lead to any preference ordering since the agent is indifferent: $\tau(x_1) = \tau(x_2) = 1$, such that only quantity matters, while for a connoisseur $\tau(x_1) < \tau(x_2)$, with $\tau(x_1) < 1$ so that both quantity and taste matter. This corresponds to what Bourdieu (1984) calls the ‘differential experiences” of the product.

The aim is [...] to move beyond the abstract relationship between consumers with interchangeable tastes and products with uniformly perceived and appreciated properties to the relationship between tastes which vary in a necessary way according to their social and economic conditions of production, and the products on which they confer their different social identities. One only has to ask the question, which economists strangely ignore, of the economic conditions of the production of the dispositions demanded by the economy, i.e., in this case, the question of the economic and social determinants of tastes, to see the necessity of including in the complete definition of the product the differential experiences which the consumers have of it as a function of the dispositions they derive from their position in economic space.

(Bourdieu, 1984, pp. 100-101)

If the want for drinking wine with diner is more important than that for entertaining friends, up to a certain limit $q_t \leq Q_t$ HOS will feel that quantity is more urgent than entertaining friends and will make her choice on the basis of the size of $q_\tau$. Only if two combinations have the same value of $q_\tau$ would she take into consideration her next want which we assume is shaped according to how many friends HOS has who are connoisseurs, i.e., $e = ax_1^{\tau(x_1=1)} + b(x_1^{\tau(x_1<1)} + x_2^{\tau(x_2)})$. In her choice, therefore, HOS will prefer $C'(x_1', x_2')$ to $C''(x_1'', x_2'')$ according to the following scheme:

\begin{itemize}
  \item $q''_\tau < q'_\tau < Q_\tau$
  \item $q''_\tau = q'_\tau \leq Q_\tau$ and $e'' < e'$
\end{itemize}

(A)
\[ q''_r < Q_r < q'_r \]
\[ Q_r < q'_r, q''_r \text{ and } e'' < e'. \]

Now assume that: \( x'_1 > x''_1 \) and \( x'_2 = x''_2 \) and are such that \( q'_r > q''_r \) for non-connoisseurs and \( q''_r > q'_r \) for connoisseurs. Further assume that at time \( t_0 \) agent \( S \) is not a connoisseur. At time \( t_1 \) she meets people that are connoisseur, such that \( e' < e'' \). Therefore, according to the above scheme, at \( t_1 \) \( HOS \) will now choose:

(a) \[ C' \text{ for } q''_r < q'_r < Q_r \]
\[ C'' \text{ for } q''_r = q'_r \leq Q_r \text{ and } e' < e'' \]
\[ C' \text{ for } q''_r < Q_r < q'_r \]
\[ C'' \text{ for } Q_r < q'_r, q''_r \text{ and } e' < e''. \]

Agent \( S \) is likely to change is \textit{wants} at time \( t_2 \). Since she learnt enjoying \textit{grand cru}, every things equal, our \( HOS \) will now choose:

(b) \[ C'' \text{ for } q'_r < q''_r < Q_r \]
\[ C'' \text{ for } q''_r = q'_r \leq Q_r \text{ and } e' < e'' \]
\[ C'' \text{ for } q'_r < Q_r < q''_r \]
\[ C'' \text{ for } Q_r < q'_r, q''_r \text{ and } e' < e''. \]

However, if at time \( t_3 \) agent \( S \) goes back to her old friends so that \( e'' < e' \), every thing equal (meaning that she will not forget the taste of \textit{grand cru}), \( HOS \) will now choose:

(c) \[ C'' \text{ for } q'_r < q''_r < Q_r \]
\[ C' \text{ for } q''_r = q'_r \leq Q_r \text{ and } e'' < e' \]
\[ C'' \text{ for } q'_r < Q_r < q''_r \]
\[ C' \text{ for } Q_r < q'_r, q''_r \text{ and } e'' < e'. \]

Although rational (\textit{HOB} fulfills postulate 3.4 and 3.5), \( HOS \) has evolving preferences, her choice mechanism allows for both changing \textit{tastes} and context-adaptative behaviours. Indeed, her \textit{tastes} may change over time as she learns new enjoyment technologies. Moreover, such a change, if it ever happens, would leave a track in the individual choice mechanism, it would involve a dependence of the future decisions of the individual to this change. In our example, the change in the agent environment at time \( t + 1 \), even cancelled out by a symmetric change at time \( t + 3 \), does not leave the agent in the same position he was at time \( t \) (before the first modification of the environment). About context-adaptative behaviors, the point is that, although the proper \textit{tastes} of \( HOS \) remains constant, when her decision process is driven by her social environment, here a want related to the tastes of others, her choice may be in contradiction with her \textit{tastes} but nevertheless remaining rational. This result can only be reached when considering the hierarchy of wants,
Figure 1: HOS’s behavior curves evolution
their plurality and their irreducibility. This is illustrated in our example by criteria (c). Following Georgescu-Roegen (1954), one may represent the criteria (A) under the form of indifference curves by generalizing the functions $q$ and $e$. Figure 1 represents the choice sequence of $HOS$ for criteria (a), (b), (c). There, lines $aa'$ and $bb'$ represent curves of ($q$) family, $bb'$ corresponding to the satiation level $q = Q$. Lines $cc'$, $dd'$ and $ee'$ represent curves of ($e$) family. Georgescu-Roegen (1954) calls these curves "behavior curves", which are somehow a generalization of the indifference curves. In our case, any points above $aa'$ is preferred to any on it, which is preferred to any points below $aa'$. Once reached the satiation level represented by $bb'$, the relations of preference are given by the ($e$) family. What however differentiate the behavior curves from the indifference curves is that the curve $b'Bc$, on figure 1(a), is a behavior curve. The fact that for a connoisseur $X^2$ is taster than $X^1$ makes the slope of the tangent to the ($e$) curve less steep than that tangent to the ($q$) curve passing through the same point.

4.2 Irreversibility of economic changes

A straightforward reason for change in the agent social environment is a modification of her budget constraint. Here we will show that, as soon as we include learning, any change in income leading to a change in tastes will leave a mark in the economy. Within the present model, the irreversibility of economic change (such as a shift in price or personal income) appears to be "the normal case, while reversibility is the exceptional one" (Georgescu-Roegen, 1950, p.134) and this irreversibility is explained by learning.

Taking the example of section 4.1, imagine that at time $t_0$ $HOS$ experiments an increase in income, so that she meets the connoisseurs, and that, at time $t_3$, $HOS$ experiments a symmetric decrease in income, so that he is back to her previous situation. Since the connoisseurs introduce $HOS$ to a new relevant experience, her tastes changed by social learning, and the equilibrium between time $t_0$ and time $t_3$ will not be the same.

Indeed, the set of economic experience $S$ is modified by the modification of the budget constraint, by social learning (see figure 2). Assume that at time $t_0$ the past economic experience of $HOS$ is represented by the combinaisons $\alpha$, $\beta$. Following Georgescu-Roegen (1950), the set $S_{t_0}$ corresponds to the smallest convex contour which contains $\alpha$, $\beta$, as well as two other fixed points $I$ and $J$. Call $S_0$ the area of this contour (the share area on figure 2). Further assume that, from $t_0$ to $t_1$, $HOS$ experiments an increase in income, moving from the budget line $BC_0$ to $BC_1$, thereby entering the "connoisseur group", $HOS$ increase in set of experience, as he is now able to enjoy taste. The convex contour $S_{t_1}$ now also includes $\lambda$, and its area $S_1$ (the union of the shared and dotted areas) is greater than $S_0$. $\lambda$ is thus a new relevant experience for $HOS$.

Following Georgescu-Roegen (1950) and our previous example, we can state that, for the want for quantity, the $HOS$'s indifference curves are represented by:

$$
\phi_t[C, \psi(S)] = q_t(x_1, x_2, S_t) \\
\phi_t[C, \psi(S)] = x_1^{\tau_1(x_1, S_t)} + x_2^{\tau_2(x_2, S_t)}
$$

(2)
Figure 2: Evolution of the set of individual experience $\overline{S}$
Figure 3: Irreversibility of changes in individual tastes
At time $t_0$, equation (2) is:

$$\phi_{t_0}(C, \psi(S)) = x_1^{\tau(x_1, S_{t_0})} + x_2^{\tau(x_2, S_{t_0})}$$

which, according to our example is equal to:

$$\phi_{t_0}(C, \psi(S)) = x_1 + x_2$$

From time $t_1$ and $t_2$ the agent is learning to enjoy taste, so that, from time $t_2$ on, her indifference map can be represented by:

$$\phi_{t_2}(C, \psi(S)) = x_1^{\tau(x_1, S_{t_2})} + x_2^{\tau(x_2, S_{t_2})}$$

with $\tau(x_1, S_{t_2}) \leq 1$ and $\tau(x_2, S_{t_2}) \geq 1$. This last structure of $HOS$'s preferences will stay constant until she meets another new relevant experience, modifying once more her set $S$.

A change in the agent’s economic situation which modifies her preference ordering will obviously have a persistent impact on her equilibrium choice, even though the agent goes back to her initial situation. This mechanism is illustrated by figure 3. Assume that one unit of grand cru worths ten units of cheap wine, and that the budget of $HOS$ is $BC_0$ units of cheap wine. While at time $t_0$ she will choose to buy the combination containing the more of $X_1$ (let us call it $C_0$) subject to her budget constraint $BC_0$, at time $t_3$ she will choose a combination $C^3$ such that $X_2^{C^3} \geq X_2^{C_0}$ subject to $BC_3 = BC_0$. In this case, $C^3 = C_0$ is a possibility among others, rather than a rule.

5 Conclusion

We have shown that both path dependency and context dependency can be included in a formal theory of choice. We set that individuals learn from their personal experience and are influenced by their reference groups, which can be real as well as virtual. The influence of the reference groups may be soft, their observation being taken as information, or invasive, taken as behavioral prescriptions. We then derived results on the constancy of preference ordering. Using the concept of hierarchic wants, we explained how an agent may have changing preference ordering, while her tastes remain unchanging. Moreover, combining learning to the hierarchy of wants, the individual may perfectly change tastes, inducing thereby a modification of her preference ordering. In both case the agent remains nonetheless rational. The learning mechanism described here also establishes irreversibility of the economic changes as a rule, the complete reversibility being the exception.

This mechanism of choice can be applied to household’s financial decisions as well. We pointed out in section 3.2 that consumption norms, what an individual thinks she should consume, may not be in accordance to the agent’s budget constraint. To the extend that
it exists some financial norms guiding households' behavior with regard to credit, that is what their should or should not spend, how much their should borrow, this framework may be use to rationalized the overspending and over-indebteness attitude of American households from the 90’s to the explosion of their debt in 2008.
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