

Consumer behaviour: utility maximization and the seek of novelty.

M. Abraham Garcia-Torres
MERIT, Maastricht University.
P.O. Box 616, 6200 MD Maastricht
The Netherlands
Tel: +31 (0) 43 388 38 84
Fax: +31 (0) 43 388 49 05
E-Mail: abraham.garcia@merit.unimaas.nl

Abstract

Evolution of consumers' preferences has been recognized by many scholars as being key to understanding technological change. However, mainstream economics cannot account for the seemingly irrational behavior of consumers based on changes in taste – consumer theory lacks flexibility and accuracy to explain changes in consumer behavior. Adopting a behavioral psychology perspective, this paper argues that there is a rational pattern in the change of consumers' tastes. I argue that behavioral psychology offers us a unique perspective to solve some of the paradoxes of consumer behavior. This paper incorporates flexibility into Pollak's (1970) utility function to more adequately account for, and differentiate between, habit formation routines. A model is developed in which habit formation and consumption of new goods are interrelated.

1 Introduction

”The production of goods satisfies the wants that the consumption of these goods creates or that the producers of goods synthesize. Production induces more wants and the need for more production”
J. K. Galbraith, *The Affluent Society*.

The dependence effect alluded to by Galbraith clearly underlines the interrelation between the demand and the supply. Demand and supply maybe viewed as the two sides of the same coin. It is impossible to increase the diameter of one side of the coin while keeping the flip side unchanged. An examination of the two sides reveals that they are nevertheless very different. The supply side is related with production, a technical process in which the inputs are transformed in goods throughout the process of fabrication. It is a scientific process, where technology is used to produce more with less resources. The supply side of the coin is rather straightforward and tidy and favored as the subject of study by many economists. Perhaps it is the closeness of this side in its relation to the natural sciences that made it easier to be studied with the scientific tools of the economist. Maybe, it also the reason why it had been much more studied by the literature. The other side of the coin seems much darker, much dirtier. At the root of demand theory, we are quickly faced with the preference of a single consumer. The root of consumer preferences is at best slippery. The preferences seems to be in a world were the logic does not exist. A second deeper view at the coin might make us realize that both sides are actually made of the same metal. Technological change, when it takes the shape of product innovation, is nothing more than a new idea being “produced”. This change is reflected on the demand side by the consumer’s willingness to pay to get that produced idea. The root of that new idea is in a similar place to the preferences, where there is no logic.

The argument about the flow of causality between the supply and the demand sides is an old question that has shifted economists from one side to the other along the history. First it was Say, according to whom every supply generates its own demand. Keynes formulated the opposite argument, suggesting that it was actually the demand that drove the supply. A review of the earlier literature on technological change reveals a “supply push” argument. This argument was later countered by “demand pull” arguments.

The first integrated view of technological change seems to come from the National Systems of Innovation (NSI) approach. The approach is focused on the interrelation between the supply and the demand sides as the two dimensions that drive economic growth and the accumulation of wealth. There are in addition numerous models to explain consumer behavior in non-classical terms (Metcalf 2001, Bianchi 2002, Dosi et al. 1997, Loasby 2001). These models build on the efforts of other scholars such as Lancaster, Becker, Scitovsky ... and a long list others. There is a general agreement among scholars, specially those focused on technical change, that we lack understanding of the demand (Witt 2001). Only once we are able to understand the change in demand could we

attempt to explain the whole process of technical change. As Passinetti said,

”Any investigation into technical progress must necessarily imply some hypothesis on the evolution of consumers’ preferences[...]. Not to make such hypothesis and to pretend to discuss technical progress [...] would render the investigation meaningless.” (Pasinetti 1981)

This paper draws on the literature in psychology and physiological psychology to explain the evolution of consumer preferences over time.

The paper is organized as follows. Section two reviews the different directions taken in the literature on consumer behavior. Section three is concerned with the research on behavior psychology, underlining some theories that could help us explain consumer behavior. Section four develops a model of consumption with variation of the preferences and a continuous quest for novelty. Section five presents a mathematical formalization of the model. The last section concludes.

2 The dynamics of utility in the economic literature.

The section addresses two fundamental questions: 1) why do we consume new goods?, and 2) how do we change our taste over time?

It is easy to see that the utility that a commodity gives me as a consumer is not the same over time. Utility changes over time but does not follow the same pattern for all the goods. Let us compare three different things: A CD , a pizza and a T-shirt:

A CD: Two years ago, I bought a new CD, during the first two months I could constantly listen to it. I liked the music from the very beginning, but I have to say that I liked it even more, when I knew the lyrics by heart and I was even able to sing while listening to the songs. After some time, I started getting bored with the CD. Now the CD put away on a shelf and I will never listen it as much as I did before. But every now and then I might want to listen to it. The evolution of the utility of CD in this case is pretty clear: a positive value at the beginning increases over time and reaches a peak after which it begins a decline toward zero. Not everyone likes the kind of music I listen to but numerous individual consumers would agree with the pattern I just described about how their preferences change over time about other types music in the CD format. So it seems to me that behind this similar pattern there might be a theory that explains the similarities among the consumer on the evolution of tastes.

A pizza: I am used to eating one pizza a week. I have been doing this for ages, and it seems that I never get bored with eating pizza. Here the evolution of the utility over time seems to be much more stable, and it is best described as habit formation: the same good seems to give me the same utility over time. Keep in mind the difference with the CD – I am using the same CD all the time whereas I eat a different pizza every few days.

A new T-shirt: I bought a new fashionable T-shirt last month. It was very expensive but I liked it so much that after some thinking I decided that I had to buy it. And now, when I wear it I think that the color is perhaps a little too brilliant for my style. Actually, I don't like it any more. But I feel so guilty after having spent all that money that I have decided to keep it. Maybe I will wear it another day. Probably I will never wear it. The utility of the T-shirt seems to have dropped extremely quickly from a high level to almost zero.

Can we find a theory that explains these three different patterns of behavior at the same time? The first step in studying these variations in consumer preferences is to devise a method measuring utility. The next section deals with this issue.

2.1 Measurability of the utility.

The idea that utility can be cardinally measured goes back to Bentham and to some efforts made by J.S.Mill. Robbins (1932) became very convinced that utility could not be measured in a cardinal way, but that it should be used to explain preferences. The idea that utility could be measured by a cardinal number was eventually given up in favor of ordinal utility. The important fact was not that we could give a cardinal number to a utility, but the idea that we always preferred some things over others. Thus the stress was put on ordinal utility, or the order of preferences, and this approach formed the foundation of the consumer theory.

Hicks and Allen (1934) attribute the use of utility as an index of individual preferences to Pareto. They argued that even if the utility function could be used as an index, the selection of the function will determined the substitution effect among goods (and therefore it was not so trivial.). Samuelson (1938) formulated a theory in which utility had never the connotation of hedonistic value, but it was indeed the revelation of a preference. The main problem was the assumption of stability of preferences over the time. The theory relies on the fact that the set of goods x_1 is preferred to x_2 at a certain point in time. This should not mean that in time the preferences of the consumer will remain the same. Some recent experiments with consumer behavior, such as those by Simppel (1995), prove that the assumption of stability is too strong. In his experiment the same goods are offered to the same consumers at different times over a period of time. All the consumers choose a different basket of goods every time. This proves that preferences are not stable for even the same consumer(s). By extension, it may be argued that if our preferences were stable, then we will not have a market for new products.

Kahneman (1999) suggests that the technology we have today allows for an accurate measurement of the hedonistic value created by consumption. He offers psycho-physiological measurements such as EGG (Electroencephalogram waves) to account for this. The research carried out by many psychologists use either verbal rating measurements, psycho-physiological measurements, and behavioral variables as inputs in their models.

2.2 Assumption of consumption independence.

As soon as we want to understand the dynamics of consumption we face another problem, which is to know the effect of previous consumption on present or future consumption. The easiest way to solve this problem is to assume consumption independence over time. That means that previous consumption has no bearing on consumption at the present time or in future. The utility of an experienced output is unaffected by outcomes experienced in prior or future periods. The assumption of consumption independence implies that a person's choice to have dinner at a French versus a Chinese restaurant does not depend on whether the person had dinner at a French or Chinese restaurant yesterday. Samuelson (1952) noted that this assumption was not very accurate:

” The amount of wine that I drank yesterday and will drink tomorrow can be expected to have effect upon my today's indifference slope between wine and milk”

Koopmans some years later said (1960):

” One cannot claim a high degree of realism for [the independence assumption], because there is no clear reason why complementarity of goods could not extend over more than one time period”

The consumer will try to differentiate consumption over time as much as possible, but is there any logic behind it?. Why do we behave in this way?

2.3 Utility is affected by past consumption.

The first trial to break the assumption of consumption independence came from Duesenberry (1952). He was the first to propose that the idea of “habit formation”. This means that the level of past consumption can affect the utility form current consumption. The idea was formally developed by Pollack (1970), creating a model of habit formation. In this model the present utility is explained by the past consumption of that good. The idea behind the model is that there is a minimal quantity that the consumer needs, which is explained through the habit she has. The consumer will therefore try to approach that level. Pollack (1970) works with a discreet time model while Ryder and Heal (1973) present a model for habit formation in a continuous space. Both of models develop an long run equilibria for the consumer. The main problems with these models may be summarized as follows:

- They do not allow for new consumption of goods.
- There is no possibility of getting jaded with any goods: once you have consumed in the past you will consume forever.
- The consumer knows everything about her future preferences. There is no option for change in tastes.

The idea behind these models should be right, but it cannot be the complete explanation of the problem. Because, past consumption can explain habit

formation in the consumer, but cannot explain the willingness to buy something new. Because the new good is new, it means that the consumer has never consumed it before and therefore there is no habit to ever consume it.

2.4 Utility is affected by future consumption.

If somebody invites you to go a restaurant tomorrow, your utility increases already today. This is the idea behind the models according to which consumers already increase their utility from expected futures outcomes. If people act like this, future consumption must affect positively the present utility values. Jevons (1888) was a pioneer in building models upon the idea of the utility coming from anticipated future consumptions.

“To secure a maximum of benefit in life, all future events, all future pleasures or pains, should act upon us with the same force as if they were present, allowance being made for their uncertainty. The factor expressing the effect of remoteness should, in short, always be utility, so that time should have no influence. But no human mind is constituted in this perfect way: a future feeling is always less influential than a present one.” W.S.Jevons

Ainslie (1975,1991,1992) suggested that the way that futures outcomes affect the present utility was not a normal discount exponential factor. Based on some experiments with animals and humans, he argues that in order to account for the average behavior, we should discount future values with an hyperbolic function. His research is against the assumption of constant revealed preferences. Thaler (1981) makes the following point: a person might prefer one apple today to two tomorrow, and at the same time prefer two apples in 51 days than one apple in 50. Note that the election is between the same goods, with the same time interval among elections. In both cases the interval is one day. Under constant revealed preferences the election should be the same.

Despite the agreement on the shape of the function that should be selected to account for discount factors, the value of the discount factor seems to be very different depending on the experiment. For a review of discounting model and estimate of different values see Frederik et al. (2002)

A general related finding among economists and psychologists working with future preferences is the so called loss-gains asymmetry. It was first suggested by Markovitz (1952) that the consumer theory should be based in gain and loss prospects. Kahneman and Tversky (1979) incorporate this idea and present a model of decision of the consumer under uncertainty. The basic argument is that it is not real probability that makes the consumer decide but the perceived uncertainty. The model can explain the “Allais Paradox”, another break of the constant revealed preferences but based on the presence of uncertainty in the decision. When the consumer is discounting future outcomes the conclusion is that future losses are discounted at a lower rate than futures gains. This basically means that the value that a consumer gives in future to a loss of a quantity

is higher than the value she gives to a future gain of the same quantity. Tversky and Kahneman (1991) point out that many experiments relate a constant ratio between losses and gains of approximately double.

Tversky and Kahneman (1991) also pointed out that it is not the total gain-loss that counts for the consumer but the relative gain. They explained that the initial situation of the consumer determines the consumer's behavior, and that value of the things is related to that initial position. Scitovsky (1976) seems to make the same point, although with a different argument. He argues that pleasure is derived from a quick change in the relative wealth that the consumer has. A stable level of wealth gives the consumer comfort but not pleasure. Loewenstein and Prelec (1992) present a very elegant model in which they take into account all these irregularities in consumer behavior.

Another branch of the literature deals with the incapacity of the consumer to predict change in future utility. Loewenstein et al. (2000) systematically find that even if the consumer is able to predict the direction in which her utility will change she normally miscalculates the impact of the change. They explain that the real utility she will experience lies between the prediction she makes and her current situation. The results of this branch of literature are very interesting. There is one main problem, however, which is that if somebody offers you something tomorrow, today you are already better off. But for a consumer in the daily decision-making process there is no one to offer this possibility. The consumer has to decide in the present.

2.5 More alternative approach of consumer behavior.

In this section I review briefly some elements of models that account for consumer behavior more realistically.

- Mental account. The initial idea was introduced in Kahneman and Tversky (1986). These models try to explain consumer behavior and suggest that people do not spend money without making distinctions: consumers behave as if they have an account for savings, one for big expenditures, and another for daily consumption... For a revision see Thaler (1999).
- Choice Bracketing. The consumer does not take a single decision on consumption but continuously repeats the act of consuming over the time. This branch holds that consuming behavior is the product of a bracketing of the choices. Bracketing affects the inter-temporal choices and broad bracketing is better in terms of the consumer's utility than short-term bracketing. For a review of choice bracketing see Read et al. (1999).
- Multiple Self and temptation. Those are models of inter-temporal choice, in which the agent is modeled as if she behaves like two different people. One of them is willing to get instantaneous utility from consumption and therefore is myopic while the other is the far-seeing consumer that is worried about the future. Laibson (1997) combines these ideas with the hyperbolic discount functions to explain why the consumer uses some

non-liquidable actives to control myopic behavior. Gul and Pesendorffer (2001) suggest that people get disutility from not choosing the immediately enjoyable option. They conclude that people are worse off after the temptation has been presented.

- The consumer as a firm. Following the ideas of Lancaster (1966) in which consumer does not consume because of the object itself but because of the intrinsic characteristic of the goods, Stigler and Becker (1977) argued that the consumer should be considered as a firm that is using goods to produce commodities. A new good is considered as a new technology for the production of the commodities. For a good review of this model see Bianchi (2002).

3 Behavioral psychology and the consumer theory.

In behavioral psychology two contributions are fundamental for explaining the consumer's behavior. This section offers a brief review of these contributions.

3.1 Arousal theory and the seeking for novelty.¹

"The classical theory of decision-making, whatever its status as a specification of rationality, does not begin to explain the mental processes underlying decisions" (Legrenzi et al.1993).

The brain activity known as arousal is manifested in electrical impulses which can be monitored by means of an electroencephalograph. Brain activity appears as waves in the electroencephalogram and called EEG waves. Different brain waves correspond to different levels of agitation. Neuro-physiologists have called these waves - alpha, beta, gamma and so on. Hebb explains that nerve cells have two kinds of activities:

-The spike potential: is the maximal potential at which the cell sends information, which is at the speed one millisecond.

-The dendritic potential: is a slow burning activity which is not all-or-none, and tends to last 15 to 30 milliseconds.

The activity of the nerve cells depends on the stimulation that the central system receives from outside through the senses, the muscles and internal organs, and within the brain itself. The dendrite activity facilitates the spike potential of the cell. And if the system does not receive any stimuli the nerve system shows inhibition and true fatigue that might last for minutes instead of seconds (6 to 9 min.).

The level of arousal in the nerve system is a combination of all the impulses generated by the dendrite activity of all the nerve cells. The level of arousal has a relation with our well-being feelings. This level varies from moment to

¹This section is based in the article presented by Hebb in 1955

moment but it never reaches the zero level as far as the organism is alive. Indeed death is defined in terms of brain inactivity. The level of well being changes with our activity in a given day. It is very slow while we sleep, increases when we wake up, and it normally increases during the day with our activities. The level of arousal also determines our performance. Very low arousal will not allow us to perform well, the performance increases as the arousal increases, but after a level of arousal it affects our performance in a negative way. Thus the theory explains that in order to feel well we need to get a certain number of stimuli from our environment. An inverted “U” explains the relation, in which the optimal level is somewhere in the middle. This is the point where there is not too much and not too little stimuli and is therefore the point where we feel most comfortable.

Berlyne (1977) deals with novelty, and how novelty affects the hedonistic capacity of the stimuli. Hebb (1955) argues that we need to get enough stimuli from outside to be well. Berlyne goes one step further and explains that the repeated exposition to the same stimuli reduces its arousal capacity. This basically means that we need to get not only stimuli, but constantly different stimuli to feel comfortable.

These theories view of the consumer is very different from rational classical consumer. In these theories we do not have a consumer that knows what she wants. Instead we have a consumer who tries to maintain optimal arousal level and is continuously looking for new things, for new stimuli. The general conclusion seems to be that everybody is looking for something, despite the fact that most of the time we do not know what we want. So we have to expose ourselves to trial and error experiences. It has to be pointed out that new stimuli can also come from non-market sources. A book borrowed from a friend or the library may provide sufficient novelty to maintain optimal arousal level.

Berlyne points out that novelty is related to the decision to buy something new. He argues that the maximal hedonistic value, which may affect the decision of buying something new is related to the amount of novelty embedded in the object. The consumer will prefer a middle amount of novelty, not too little not too much. Again an U inverted curve seems to explain that relation.

Scitovsky referring to the work of Berlyne says:

”Some redundancy is essential to render anything new pleasantly stimulating, and the degree of amount of redundancy has much to do with how pleasant it is. Just as perfect originality or no redundancy is unpleasant because it is bewildering, so perfect banality or full redundancy is unpleasant because it is boring”

This review in this section illustrates why the consumer buys new things, and why such an enormous amount of new products are constantly being created. However, the literature reviewed thus far does not explain why and how the consumer develops or changes habits. The next section will introduce another theory that deals with the evolution of habits.

3.2 Opponent process and the formation and break of habits.²

”How strange would appear to be this thing that men call pleasure! and how curiously it is related to what is thought to be its opposite, pain! The two will never be found together in a man, and yet if you seek the one and obtain it, you are almost bound always to get the other as well, just as though they were both attached to one and the same head. ...Wherever the one is found, the other follows up behind. So, in my case, since I had pain in my leg as a result of the fetters, pleasure seem to have come to follow it up. ” (Plato, Phaedo).

Solomon (1980) refers to the “opponent-process” theory. The idea is that every positive stimulus generates in the brain a negative reaction with the final result of leaving us in the same initial hedonistic position. I will argue that this theory can explain the change in consumer preferences over time. Solomon studies the reaction that an external stimulus has on the individual. In his paper I only focus on the positive stimuli. Based on experiments with animals and humans Solomon concludes that behavior is similar in both cases. Individuals are exposed to short time interval stimulus and he follows their reactions, measuring them by physiological indicators: excitement, blood pressure, heart activity...

The stimulus generates in the individual a positive reaction in a hedonistic sense. A few moments after the stimuli has been introduced the individual arrives at a maximal level of hedonistic stimulation, after which point the effect of the stimuli in the individual starts to decrease. The moment the stimuli stops, the individual starts feeling the negative reaction. Solomon explains that this negative reaction is a defense mechanism of the organism to be let after some time in the initial baseline. These dynamics are consistent with the homeostatic theories introduced in the previous sections.

One example of the “opponent-process” is opium consumption. The “right” dose of opium makes the individual feel better and better as far as the dose is affecting him. Solomon (1980) calls this positive state “State A”. This state will reach the peak (the rush), followed by a decline in the intensity (euphoria). After the dose loses its effects, the user goes into a state of discomfort with both psychological, and physiological aspects. The negative state is called “State B”. The pattern changes as the individual becomes used to the stimuli. And the main changes are that the peak of the State A is becoming lower, and lower with the repetition of the experiment. State B is changing in dimension, the duration in time is increasing with the repetition of exposition to the stimuli. And the peak is being higher in the negative scale.

In order to explain that, he develops the opponent process theory. He says that every positive reaction of the human brain activates also a negative effect that lets the body in the same baseline. The idea is that the brain activates the

²This section is based in article written by Solomon in 1980.

mechanism to be let at the same initial level. The state in which the individual is depends on the difference between this two process:

- $|a-b|$ if $a > b$ then the individual will be in state A.
- $|a-b|$ if $a < b$ then the individual will be in state B.

Out of the experiments Solomon (1980) finds out that the b process (figure 1) is affected by:

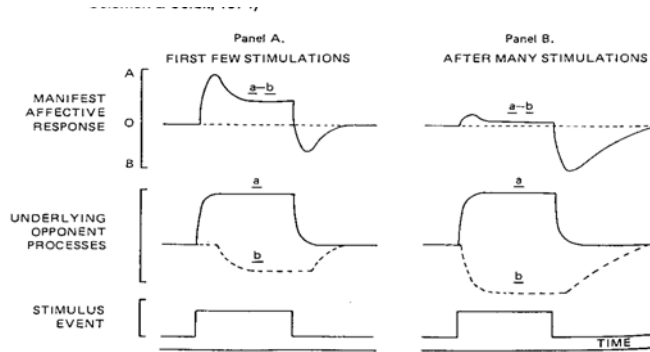


Figure1: Opponent process.

- 1.-The time interval : The process b decreases or even disappears with the time in which the experiment is repeated
- 2.-There is a saving effect: It takes less time to activate the b process if the individual has already experience it
- 3.-The quality of the stimuli: An enhancement of the quality of the stimulation could produce an increase in the critical decay duration of the process.

From these findings he enunciates the law of the b process:

“Opponent processes are strengthened by use and approach asymptotes having values that are a direct function of the quality, intensity and duration of each exposure and an inverse function of the interstimulus interval.”

Solomon finds the physiological explanation for the process on the endorphins. Later research has found different kinds of the endomorphines. Ito and Cappioto (1999) say that the dopamine is related to the reward effect (the a process) while the acetylcholine is responsible for the adversative behavior (the b process). These findings may be related with Berlyne’s (1974). Solomon (1980) suggests that exposure to the same stimuli reduces its capacity to generate in the individual a positive hedonistic value. Berlyne’s position on experimental novelty is saying exactly the same. Exposure to the same thing reduces the novelty value over time.

4 The Theory.

To fully understand consumer behavior we have to separate two actions by the consumer. These two actions are interrelated. The consumer buys some goods, so she realizes the “action of purchasing”. In this act of buying she buys several goods, at the same time. The second action is the “action of consuming” goods. The later is related with “experienced utility”, i.e. with the hedonistic capacity of the goods. The former is related with the “decision utility”. The figure captures the relationships between these two actions.

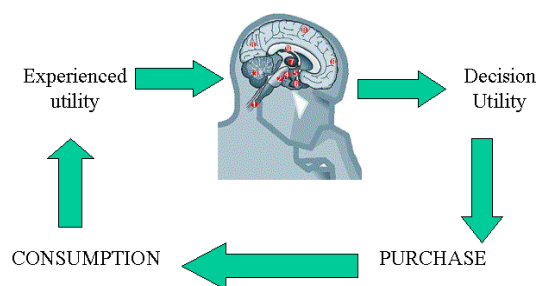


Figure 1: Figure 2.

The relationship between decision utility and experienced utility is formed in the consumer’s brain. Depending on the experienced utility, especially whether or not she likes what she consumes, she will decide to purchase or not. Probably she will consume most of the articles before she feels the need to purchase more goods. In most cases the action of purchasing and consuming may be separated. Some of the articles would be stored, and used later. For most services the two purchasing and consuming activities are inter-related. I pay for the cinema and watch the movie right after paying. But some of the services are enjoyed for a long time after paying for them, like a hair-cut.

4.1 Experienced Utility, formation and break of habits.

The experienced utility of the same good is regulated by three variables, which are:

- The time interval among consumptions of the same good.
- The memory of the consumer.

- The quality of the good.

Now we assume that the consumer is only being affected by the consumption of a single good. Let us study how does experienced utility change. Lets start with a large time interval among consumptions. If the time interval is long enough so that the consumer's memory can hardly evoke the last experience then the consumer will be able to enjoy the next consumption. As the time interval decreases, the consumer develops an adversity against that same good. If the consumer for any reason is forced to consume in decreasing intervals of time she might develop such an adversity that she might not even be able to use the good for the rest of her life. If the adversity is not too strong, some time without consuming the good might be enough to allow her to enjoy the good again. The formation of a habit is a learning process in which the consumer learns and learning occurs when the time interval is "right" in that the consumer consumes without getting jaded.

The higher the memory the longer the time needed among consumptions to experience the same utility. Proving this fact, as Scitosky points it out, is the stronger habit formation between old people and children. These two groups can be consuming the same thing, or doing the same thing but reach boredom after different time periods with adults becoming bored sooner than children.

An increase in the quality of the good *ceteris paribus* will induce an increase of the experienced utility.

How is a habit created? The consumer learns how much time she needs among consumptions. If she could consume that good forever.

How does she break the habit? If in the process of developing the habit, she makes mistakes and reduces the time consumption of the goods, then her brain will start the so called "b process" and develop an adversity for that good. The adversity might be such that she does not want to consume that good anymore for a long time or never again. At this point she will have broken the habit. Based on this line of reasoning we may classify consuming habits as follows:

- Addictions: An addition is the consumption of a good which in the long term will require all the consumer's rent. In this sense addictions are drugs, compulsive need of gambling... Some socially accepted addictions like drinking tea or coffee, smoking, and so forth are considered as habits.
- Eternal Habits: is the consumption of a good which the consumer learns how to consume. This means that the consumer has achieved a "right" time interval for the consumption of that good and is thus unlikely to become jaded. We are interested in studying the dynamics of consumption and hence the evolution of consumer taste over time. That also means that it is possible that the good switches from one classification to other.
- Temporal Habits: the consumption of the good will give the consumer utility for some time, after a will she will be tired of that good. The moment that she will not get any utility at all she has two options, not using it any more, or try to look for a similar object with some more quality that can give her still higher utility.

- Consumption of novelty. The consumer buys that because of her curiosity, and will enjoy it until the novelty disappears. Once the novelty is gone, the good has no use for the consumer.

An eternal habit can be changed into a temporal one if the consumer makes the mistake of consuming the good too much in too little time. In the same way a temporal habit might become eternal if she learns to use it “properly”. In other words, the classification may change over time. But in order to keep it simple, we will assume that the time interval among consumptions of the same good is constant. So we are able to understand the dynamics of the preferences.

Now is time to answer the questions I raised in introduction. Consuming pizza is an eternal habit while the use of a CD is a temporal habit. The explanation for the distinction is again the time interval between consumptions of the same good. If the consumer uses the CD with a large time interval she might never get bored with it. If anybody keeps on eating pizza every day, there is not a single person in the world that will not hate it. The case of the T-shirt will fall under the classification of novelty.

Let try to answer also some of the questions raised in the literature. Let us start by a very famous quote from Marshall,

”There is however an implicit condition in this law [decreasing marginal utility] which should be clear. It is that we do not suppose time to be allowed for any alteration at he character or tastes of the man himself. It is therefore no exception to the law that the more goo music a man hears, the stronger is his taste for it likely to become...

This seems logical, but how would it be explained under the opponent process theory. It is a matter of definition of the good that we are using. If we take music in general, then it is clearly a habit. So the more she listens the more she wants to listen. But there is a limit in the consumption which is given by the time constraint that the consumer has. Which means that she cannot increase the consumption of music forever. So there is an upper limit of this consumption determined by time. The consumer might never reach a saturation point of consumption in music because she learns to use the “right” time intervals among consumptions. The interesting thing here is that Marshall seems to be thinking about different pieces of music... the more he hears the more ”different” pieces he would like to hear.

But if we define the object of consumption within a single piece of music, for example the ”Die Zauberflote” by Mozart, then it is very likely that the person who keeps on playing it all the time is going to become jaded and grow tired of this piece. In the beginning she might even like it more the more as she uses it, but she will arrive at a peak in the hedonistic scale after which she will start disliking it. The argument here is that if she puts the right time interval among the consumptions of the piece of music from Mozart, she might never get tired of it. There are not very many normal people that could stand listening always to the same piece of music without becoming jaded.

It is important to stress that we as consumers might differ in the kind of music we like, but the way the preferences evolve is very similar. For example, I like pop music and a friend of mine likes classical music. Let us imagine, that she buys a new CD of classical music, one that she has never heard before. At the same time I buy a new CD of pop music. We agreed on listening to the new CD once a day. I am pretty sure that the evolution of our preferences along the time is going to be very similar.

Bianchi (2002) is asking why it is that Mozart never is old fashioned. One possible answer will be, that we as a society have learnt to listen to this kind of music. We learn to hear that kind of music at school, which means that there are certain institutions in the society that are protecting this music from being completely forgotten. They are in charge of exposing people to that kind of art, so that they will learn to enjoy it. That can also explain why it never is old fashioned. Another way of answering is that it depends on what is old-fashion and what is not. To many people in this society Mozart's music is quite old-fashioned. And even though there is a proportion of the society that keeps on listening to Mozart, it is clear that listening to Mozart is not a trend in the society. Some people might even consider Mozart as quite tedious. A similar idea is that there are still people in the society that write with a typewriter, and they prefer that to the computer. The fact that there is a small proportion of the society using typewriters does not mean that they are not use by the majority. To conclude, it is important for economists to closely examine consumption in explaining growth. Very little of the annual growth can be explained through the purchase of Mozart's music as compared to the last Shaquira's album.

Bianchi is also asking about the formation of fashions, their evolution and repetition. What is a fashion? To some fashion is nothing but a new stimuli that captures the attention of many costumers in the same period. Why? Because we live in the same society, and along our history we have been exposed to similar pattern, our memory evolution to the same pattern is socially evolving. So, something that is new for me is also new for my neighbor, and for most of the people living in my city, in my country.... As to why fashions come back, it may be that the society forgets an old stimulus, something that has not been seen for a long time.

4.2 The consumer and the seeking of novelty.

How does a new commodity (a new fashion pair of jeans) increase the utility of the consumption? From the point of view of the consumer, it is a new stimulus that is allowing her to experience higher arousal level and therefore feel more comfortable. Taking into account the ideas from Berlyne (1974), this means that the repeat exposition to the same stimuli, means that it decreases novelty, and she will probably get bored.

Bianchi (2002) aslo asks how does a Guercino improve a Picasso? Well it depends, if the consumer has been exposed for a long time to the Guercino, a Picasso will improve her situation. Because a Guercino will mean a new stimulus. Based on the capacity that the new stimulus has to generate on the individ-

ual an increase in the arousal capacity, which basically means, under normal circumstances (she is not too stress or anxious) she will feel more comfortable.

We have to think about the idea, that most of the stimuli we get over one normal day, they do not come from the shopping. We get stimuli from our work, from our own thoughts, from the our friends, family etc... But every now and then, we also get stimuli from a newspaper, a new book, a new T-shirt something that we buy. But if her arousal potential is being hold only by shopping it will mean that she needs to keep on buying new things to feel comfortable.

Novelty is a factor that is mixed in the decision utility. Novelty makes goods important. But novelty disappears over time. There is also the intrinsic value that a good offers to the consumer, i.e. on the capacity to generate a positive hedonistic value. In this case the good has the potential to become a habit. The first time somebody smokes, she does it because it is something new for her, she wants to try. Initially there may be no addiction. But once the novelty is gone the addictive good is still able to generate positive stimulus in the consumer. The usual smoker does not buy cigarettes for the novelty but for the capacity that the good in itself has to offer.

Do we need an answer as to why we look for new things? What is the reason, what is behind our human nature that make as curious? This question is out of the scope of this paper and besides, a question that is perhaps best dealt with by non-economists. As economists we have to learn to work with a consumer that is looking for the unknown. The reasons are not so important as the fact that she is actually doing it.

4.3 The infrared line between consumption and purchase.

Nothing last forever. There is not a single good in the world whose life is eternal. It might be possible to find some durable goods whose life is even longer than the life of the consumer but they will disappear with the time. So, how does the capacity to generate positive experienced utility of a commodity finish? I think there three possible answer to this question:

- It physically disappears through consumption.
- It breaks.
- Or we get bored of it.

Some goods can be enjoy for a short time. It is in the interaction of the consumer with the good that the consumer develops a habit for that good. Which means, that if she likes it she will buy it again. For the semi-durable and durables goods the experience utility expands over time. The consumer buys a car, buys a table, a pot and enjoys it for lot of years. Which basically means those object do not have to be included on the usual shopping list.

A positive utility derived from the same durable or semi-durable good means that the consumer has an eternal habit for that good. For example, the table gives me a positive utility because it can be used for sitting at when eating, reading, or working. If the capacity of the table to generate that habit ends because it breaks, it means that in order to satisfy my habit I will have to buy a new table. It is through the necessity of buying a new table that the

consumer affects the economy. The cause for the purchase of the table is the consumer's habit of deriving utility from table. The consequence is the purchase of the table. The experienced utility affects the decision utility. How quickly the consumer becomes tired of a good has a direct impact on the economy. Continuous decreases in the intervals among consumptions result in increased expenditure on consumables and an increase in the growth of the economy.

Out of the three ways in which a good can end its positive hedonistic capacity two are physical, and the one depends on the brain of the consumer. So here there is an important point, the velocity in change of goods which are not broken. This rate is very important and it might be argued that it is socially determined. We may thus conclude that this rate affects the rate of growth in the economy. In a developing country a table probably lasts until it breaks, in developed countries tables are more likely to be replaced when they go out of fashion.

The physical life of the good, the average time in which it does break, might be in hands of the producer. It is also affecting the growth. So a way of holding constant a demand, is not to make very durables goods. Take for example a mobile phone. Many people might argue now that the demand is saturated. But what is the average life of a mobile phone? Four or five years at the most. Instead of getting more durable mobile phones we get ones that are able to transmit pictures. It remains a mystery why there is not even a single company that makes mobile phones resistant to falls instead of a lot of companies making mobile with many added features. Arguably this is because mobile phone makers are attempting to avoid a saturated market for mobile phones. If we reduce the life of the good, we assure that the consumer to hold her habit will have to pass more a more time through the infrared line at the retailer's checkout point.

Let us move from a single consumer to the consumption of a whole country. Let us assume that the consumers are stable on the rate of substitution of their goods (for example, they change their table every ten years, or every two but constant time for every consumer). Let us also assume that the life of the goods on average is constant. The prices of the goods are constant and the rents of the consumer are also constant. Consumers only can decide on how much they want to buy or how much they want to save. If we have all the consumers in this situation, it will mean that there is no possible option for an increase in the growth that does not come from the generation of a new habit. So the producer will try to invent something not with the original goal of producing more with less resources, but with the goal of convincing the consumer that they do need the new product. Only if the consumers decide to buy more, then the GDP will be increased. It could be argued that a change in the quality of the product will also affect the increase in GDP, but if the increase in quality is made without an increase in price, that means that the GDP will be the same.

So, Galbraith is right. To increase the GDP we need a consumer that constantly is forced to cross the infrared line more and more often.

5 Formalization of the model

The consumer is maximizing the utility, which is based on two things: on her experienced past utility and on the novelty. At the time of deciding about what to buy some of them will be bought because she knows she liked them, and other just because they are new. So the decision utility of consumed goods and the new ones is different in their origin but the result at the time of deciding is the same. So, it will help her to choose what does she have to buy. The utility function is presented in Pollak(1971):

$$U_t = \sum_{i=1}^{i=N_t} a_i \text{Log}(x_{it} - z_{it}) \quad (1)$$

$$\text{with } a_i > 0, (x_{it} - z_{it}) > 0, \sum a_i = 1, x_{it} \geq 1 \quad (2)$$

$$s.t \mu = \sum p_i x_i \quad (3)$$

One of the principal problems, when we try to study the introduction of a new good into the consumer's choice is that the marginal utility of any good goes to infinity as the quantity of the good goes to zero. Therefore, I will introduce one more restriction which is that the consumer has to buy at the least one single unit. After this point the normal classical assumption of divisibility holds as usual. Basically it means, that the consumer cannot buy one half of the good, but she can buy one and a half of it. The three first restrictions of the parameters in 1 appeared also in Pollak (1971), and the last one is introduced due to this problem. The quantity consumed in $T=t$ is, x_t and p_i is the price of the good. The monetary restriction is given by μ . The habit evolution is given by z_{it} .

5.1 The habit formation and the consumption of novelty.

The habit formation is the result of the remembered experienced utility. The instantaneous utility is the result of the sum of two processes:

1. The positive hedonistic value "a". This coefficient is the capacity of the good to activate the reward activity in the brain, and to segregate endorphins in our brain.

$$ax_{it} \quad (4)$$

2. The opponent process."h" is the capacity that the every exposition to the good has to segregate in our brain the withdrawal of acetylcholine, responsible for the adversity towards the good. This adversity process is negative related to time interval Δt which means that if the time interval among consumptions is big enough the opponent process will be close to zero. If the time interval is small the adversity to the good will increase.

$$OP_t = -h \cdot \frac{1}{\Delta t} x_{it} \quad (5)$$

For simplification, we will assume that the time interval among consumptions of the same good is constant. So, $b=h \cdot \frac{1}{\Delta t}$ and inserting this coefficient in 5 and making the experienced utility a function of all the past consumptions we have:

$$EU_t = a \sum_{i=0}^{i=t} \delta^t X_t - b \sum_{i=0}^{i=t} \delta^t X_t \quad (6)$$

For a new good she does not have any experienced utility. The only utility is the future utility she is expecting to get out of the used of that good, and the novelty it have.

The novelty disappears with the time of exposition to the good, and it follows a constant depreciation rate equal for all the goods. Nt is not so much the novelty that the good has, but the capacity that this new good has to increase the curiosity of the consumer.

$$N_t = N \cdot \delta^t \quad (7)$$

with $\delta < 1$.

So the Utility of a good is a function of two things, on the one hand of the experienced utility on the other on the novelty.

$$U_{xit}(EU_t, N_t) \quad (8)$$

The habit formation can be reduce to the following formula

$$z_{it} = EU_{it-1} + N_{it} \quad (9)$$

$$z_{it} = a \sum_{i=0}^{i=t} \delta^t X_{t-1} - b \sum_{i=0}^{i=t} \delta^t X_{t-1} + N_i \cdot \sigma^t \quad (10)$$

or

$$z_{it} = (a - b + d)x_{t-1} + N_i \cdot \sigma^t \quad (11)$$

The problem of the consumer is:

$$Max U \quad (12)$$

$$s.t \mu = \sum p_i x_i \quad (13)$$

This has a solution in the short time, that depending on the consumer's evolution of preferences in time, will be different. In the long run nobody knows what will happen so to try to find the solution in the long run does not have any sense.³

³Pollak made a mistake and forgot in this formula the term $\sum a_k$.

$$h_{it} = z_{it} \sum_k a_k - \frac{a_{it}}{p_{it}} \sum_k p_k z_k + \frac{a_{it}}{p_{it}} \mu$$

5.2 Solution of the dynamic system. Case of two goods.

One of the most interesting cases is the introduction of a good into the consumer's basket. The first good is x, which is an old habit. It can be also consider as all the old goods. She has been consuming this good for a long time, which basically means that there is no novelty in this good.

$$x_t = z_{xt} a_y - \frac{a_x}{p_x} p_y z_y + \frac{a_x}{p_x} \mu \quad (14)$$

The second good is a new good. The demand of this good is given by

$$y_t = z_{yt} a_x - \frac{a_y}{p_y} p_x z_x + \frac{a_y}{p_y} \mu \quad (15)$$

If we substitute the formula for z_x and z_y we have:

$$\begin{aligned} x_t &= c_x a_y x_{t-1} - \frac{a_x}{p_x} p_y (c_y y_{t-1} + N_y \cdot \sigma^t) + \frac{a_x}{p_x} \mu \\ y_t &= (c_y y_{t-1} + N_y \cdot \sigma^t) a_x - \frac{a_y}{p_y} p_x c_x x_{t-1} + \frac{a_y}{p_y} \mu \end{aligned}$$

rearranging we have the following dynamic system:

$$\begin{aligned} x_t &= c_x a_y x_{t-1} - \frac{a_x}{p_x} p_y c_y y_{t-1} - \frac{a_x}{p_x} p_y N_y \cdot \sigma^t + \frac{a_x}{p_x} \mu \\ y_t &= -\frac{a_y}{p_y} p_x c_x x_{t-1} + a_x c_y y_{t-1} + a_x N_y \cdot \sigma^t + \frac{a_y}{p_y} \mu \end{aligned}$$

and the solution of this system is given by:

$$x_t = -\frac{p_y}{p_x} A (a_x c_y + a_y c_x)^t - B \frac{p_y N}{p_x (1 - a_x c_y - a_y c_x)} (\sigma)^t + \mu \frac{a_x (c_y - 1)}{p_x (a_x c_y + a_y c_x - 1)}$$

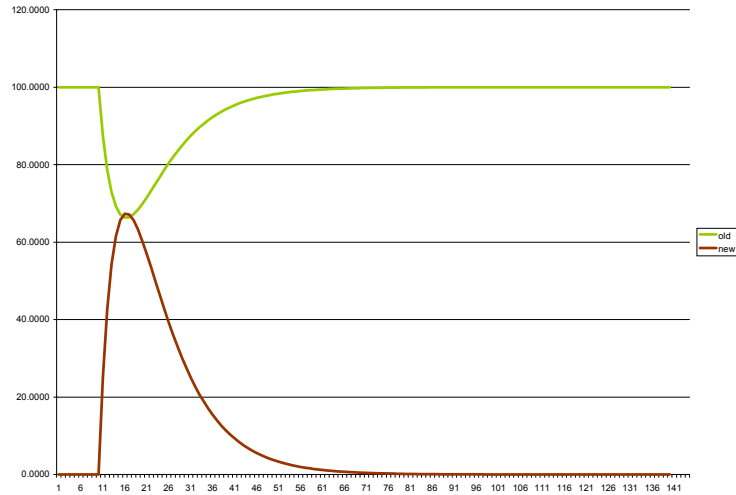
$$y_t = A (a_x c_y + a_y c_x)^t + B \frac{N a_x}{p_x (1 - a_x c_y - a_y c_x)} (\sigma)^t + \mu \frac{a_y (c_x - 1)}{p_y (a_x c_y + a_y c_x - 1)}$$

With

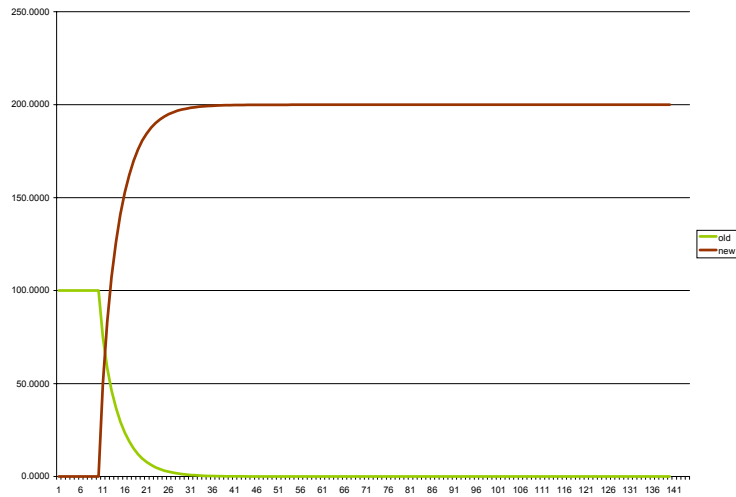
$$\begin{aligned} A &= \frac{\mu a_y}{p_y} \left(\frac{c_y a_x - c_x}{(a_x c_y + a_y c_x - 1)} - c_x \right) \\ B &= \frac{(a_x c_y + a_y c_x - 1) \sigma}{a_x c_y + a_y c_x - \sigma} \end{aligned}$$

The parameters c_i are equal to the remembered satisfaction from that specific good. Let us study different interesting cases:

1.-If c_x is equal to one and $c_y < 1$, it will mean that the consumer is very pleased with what she have, that she might try another goods with some novelty, but once the novelty disappear she will consume again the old goods.⁴



2.- If $c_y = 1$, and $c_x < 1$ it will mean that the new good is going to fully please the consumer, up to a point that the only thing she will consume will be the new good. This could be the case of a drug addiction, or a perfect substitution of the old good by the new one.⁵



⁴The parameters for this simulation are: $p1 = 10$, $p2 = 5$, $a1=0.5$, $a2=0.5$, $c_x=1$, $c_y=0.7$, Novelty=50, $\sigma=0.9$, and the rent=1000.-

⁵The parameters for this simulation are: $p1 = 10$, $p2 = 5$, $a1=0.5$, $a2=0.5$, $c_x=0.6$, $c_y=1$, Novelty=20, $\sigma=0.3$, and the rent=1000.

3.- If $c_x, c_y < 1$, and $c_y \geq \frac{1-c_x a_y + (c_x-1)a_y \mu / p_y}{a_x}$. Then we have an eternal habit. The consumer will receive enough pleasure from the consumption of the good to continue it forever.

4.- If $c_x, c_y < 1$, and $c_y < \frac{1-c_x a_y + (c_x-1)a_y \mu / p_y}{a_x}$. Then we have a temporal habit. The consumer will buy it for some time, but after a while she will stop buying it.

5.- It is also interesting to study how much novelty is necessary to include a new good into the consumer basket. Making $y_0=1$ and solving the equation for N , we have that:

$$N = \frac{1}{a_x} + \frac{(c_x-1)\mu a_y}{p_y a_x}$$

If N is larger than this quantity she will consume more than a single quantity for the first time.

6.- If the novelty is larger than

$$N > \frac{\mu a_x + c_y \mu a_y}{p_y a_x}$$

The quantity of the old good will be negative. This does not have economic sense, unless the old good we are consuming is considered like a saving, and when it is negative the consumer is using savings proceeding from past periods.

6 Conclusion.

The paper has presented a model with different evolution of preferences over the time. It has included flexibility in the normal habit formation, in such a way that the consumer can continue with her past consumptions, or choose new ones.

To include a new consumption into the consumer's choice, first there has to be a certain amount of novelty, that will make the consumer get the first unit of the new good. Once an unit has been bought, the novelty will affect her for a time, but will disappear quickly. Then it will be her experienced with the good what will make her keep on buying it or stop the consumption of this good.

The case of two goods is presented in the paper. Not all the values for all the parameter have a significant economic result. Some of the value could make the quantity to be negative. One option will be to consider the old good, as the savings. The consumer is used to save a quantity of the rent, and has a habit for this savings. The introduction of a lot of novelty will make the consumer to use past savings.

The case of n good will be left for future research.

7 References

- Ainslie, G. (1975). "Specious Reward: A Behavioral Theory of Impulsiveness and Impulse Control." *Psychological Bulletin* 82(4): 463-496.
- Ainslie, G. (1991). "Derivation of "Rational" Economic Behavior from Hyperbolic Discount Curves." *American Economic Review* 81(2): 334-40.
- Ainslie, G. (1992). *Picoeconomics : the strategic interaction of successive motivational states within the person*. Cambridge England ; New York, NY, Cambridge University Press.
- Aversi, R., G. Dosi, et al. (1997). "Demand Dynamics With Socially Evolving Preferences." Interim Report (IIASA) IR 97-081: December 1997.
- Becker, G. S. (1995). *Irrational Behavior and Economic Theory. The essence of Becker*. Stanford, Hoover Institution Press: 18-35.
- Bentham, J. (1907). *An introduction to the principles of morals and legislation*. Oxford,, Clarendon press; etc. etc.
- Berlyne, D. E. (1974). *Studies in the new experimental aesthetics: steps toward an objective psychology of aesthetic appreciation*. Washington,, Hemisphere Pub. Corp.
- Bianchi, M. (2002). "Novelty, Preferences, and Fashion: When Goods Are Unsettling." *Journal of Economic Behavior and Organization* 47(1): 1-18.
- Boyer, M. (1978). "A Habit Forming Optimal Growth Model." *International Economic Review* 19(3): 585-609.
- Chang, L. and M. A. Robert (2002). "Materialism as an Attempt to Cope with Uncertainty." *Psychology and Marketing* 19(5): 286-406.
- Diewert, W. E. (1974). "Intertemporal Consumer Theory and the Demand for Durables." *Econometrica* 42(3): 497-516.
- Duesenberry, J. S. (1949). *Income, saving, and the theory of consumer behavior*. Cambridge,, Harvard University Press.
- Frederick, S. L., George O'Donoghue, Ted (2002). "Time Discounting and Time Preference: A Critical Review." *Journal of Economic Literature* 40(2): 351-401.
- Galbraith, J. K. (1958). *The affluent society*. Boston,, Houghton Mifflin.
- Gul, F. P., Wolfgang (2001). "Temptation and Self-Control." *Econometrica* 69(6): 1403-35.

- Hausman, J. A. (1981). "Exact Consumer's Surplus and Deadweight Loss." *American Economic Review* 71(4): 662-76.
- Hausman, J. A. N., Whitney K. (1995). "Nonparametric Estimation of Exact Consumers Surplus and Deadweight Loss." *Econometrica* 63(6): 1445-76.
- Hebb, D. O. (1955). "Drives and the C.N.S. (Conceptual Nervous System)." *The Psychological Review* 62(4): 243-254.
- Herbert, A. S. (1955). "A Behavioral Model of Rational Choice." *The Quaterly Journal of Economics* 69(1): 99-118.
- Hicks, J. R. (1940). "The Valuation of the Social Income." *Economica* 7(26): 105-124.
- Hicks, J. R. and R. G. D. Allen (1934). "A Reconsideration of the Theory of Value. Part I." *Economica* 1(1): 52-76.
- Hicks, J. R. and R. G. D. Allen (1934). "A Reconsideration of the Theory of Value. Part II. A Mathematical Theory of Individual Demand Functions." *Economica* 1(2): 196-219.
- Houthakker, H. S. (1950). "Revealed Preferences and the Utility Function." *Economica* 17(66): 150-174.
- Ito, T. A. and J. T. Cacioppo (1999). "The Psychophysiology of Utility Appraisals." In Kahneman (Ed) 1999. *Well-being : the foundations of hedonic psychology*.
- Jevons, W. S. (1871). *The theory of political economy*. London, New York,, Macmillan.
- Kahneman, D., E. Diener, et al. (1999). *Well-being : the foundations of hedonic psychology*. New York, Russell Sage Foundation.
- Kahneman, D. T., Amos (1979). "Prospect Theory: An Analysis of Decision under Risk." *Econometrica* 47(2): 263-91.
- Kahneman, D. W., Peter P. Sarin, Rakesh (1997). "Back to Bentham? Explorations of Experienced Utility." *Quarterly Journal of Economics* 112(2): 375-405.
- Koopmans, T. C. (1960). "Stationary ordinal utility and Impatience." *Econometrica* 28: 287-309.
- Laibson, D. (1997). "Golden Eggs and Hyperbolic Discounting." *Quarterly Journal of Economics* 112(2): 443-77.
- Lancaster, K. (1966). "Change and Innovation in the Technology of Consumption." *The American Economic Review* 56(1/2): 14-23.

- Legrenzi, P. V. G. and J. Laird (1993). "Focussing in Reasoning and Choice." *Cognition* 49(521-82).
- Loasby, B. J. (2001). "Cognition, Imagination and Institutions in Demand Creation." *Journal of Evolutionary Economics* 11(1): 7-21.
- Loewenstein, G. O. D., Ted Rabin, Matthew (2000). Projection Bias in Predicting Future Utility, University of California, Berkeley, Department of Economics Working Paper: E00/284.
- Loewenstein, G. P., Drazen (1991). "Negative Time Preference." *American Economic Review* 81(2): 347-52.
- Loewenstein, G. P., Drazen (1992). "Anomalies in Intertemporal Choice: Evidence and an Interpretation." *Quarterly Journal of Economics* 107(2): 573-97
- Markowitz, H. (1952). "The Utility of Wealth." *Journal of Political Economy* 60: 151-58.
- Metcalfe, J. S. (2001). "Consumption, Preferences, and the Evolutionary Agenda." *Journal of Evolutionary Economics* 11(1): 37-58.
- Mill, J. S. and G. Sher (1979). *Utilitarianism*. Indianapolis, Hackett Pub. Co.
- Nevo, A. (2003). "New Products, Quality Changes, and Welfare Measures Computed from Estimated Demand Systems." *Review of Economics and Statistics* 85(2): 266-75
- Pasinetti, L. L. (1981). *Structural change and economic growth : a theoretical essay on the dynamics of the wealth of nations*. Cambridge Eng. ; New York, Cambridge University Press.
- Pollak (1970). "Habit Formation and Dynamics Demand Functions." *The Journal of Political Economy* 78(4. Part 1.): 745-763.
- Read, D. L., George Rabin, Matthew (1999). "Choice Bracketing." *Journal of Risk and Uncertainty* 19(1-3): 171-97.
- Robbins, L. R. (1935). *An essay on the nature & significance of economic science*. London,, Macmillan.
- Ryder, H. E., Jr. Heal, Geoffrey M. (1973). "Optimum Growth with Intertemporally Dependent Preferences." *Review of Economic Studies* 40(1): 1-33.
- Samuelson, P. A. (1937). "A Note on Measurement of Utility." *The Review of Economic Studies* 4(2): 155-161.

- Samuelson, P. A. (1938). "A Note on the Pure Theory of Consumer Behaviour." *Economica* 5(17): 61-71.
- Samuelson, P. A. (1952). "Probability, Utility, and the independence axiom." *Econometrica* 20(4): 670-78.
- Scitovsky, T. (1976). *The joyless economy : an inquiry into human satisfaction and consumer dissatisfaction*. New York, Oxford University Press.
- Sippel, R. (1994). *An Experiment On the Pure Theory of Consumer's Behavior*, Universitat Bonn Sonderforschungsbereich 303 - Discussion Paper: B-274
- Solomon, R. L. (1980). "The Opponent-Process Theory of Acquired Motivation." *American Psychologist* 35(8): 691-712.
- Stigler, G. J. B., Gary S. (1977). "De Gustibus Non Est Disputandum." *American Economic Review* 67(2): 76-90.
- Thaler, R. H. (1981). ""Some Empirical Evidence on Dynamics Inconsistency"" *Economics Letters* 8: 201-07.
- Thaler, R. H. (1999). "Mental Accounting Matters." *Journal of Behavioral Decision Making* 12: 183-206.
- Tversky, A. and D. Kahneman (1986). "Rational Choice and the Framing of Decisions." *Journal of Business* 59(4): 78.
- Tversky, A. K., Daniel (1991). "Loss Aversion in Riskless Choice: A Reference-Dependent Model." *Quarterly Journal of Economics* 106(4): 1039-61.
- Witt, U. (2001). "Economic Growth- What Happens on the Demand Side?" *Journal of Evolutionary Economics* 11: 1-5.
- Witt, U. (2001). "Learning to Consume—A Theory of Wants and the Growth of Demand." *Journal of Evolutionary Economics* 11(1): 23-36.