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# The Development of a Menu

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## ABSTRACT

The consumer rationally looks for the highest utility being guided by the instinct of getting pleasure. This has been the starting point and the conclusion of all the theories dealing with the theory of consumption. Discarding the analysis of utility measurement, all theories analyzed how the individual looked for utility maximization to the limit. This paper shows that the only and best way to achieve such maximization is to look for the combination (not the group) of goods allowing for behavior optimization. This point of view, that must be the first one, comes from the combinatorial mathematics theory.

## INTRODUCTION

The phases of economic activities that end in obtaining utility are, at a first stage, the choice of goods in two ways: diversity and quantity. The combinatorial order of consumption or creation of the menu will be established. The combinatorial theory that establishes menus takes place at the second stage. A disorganized, non entropic world can be established where individuals do not know their preferences and cannot create their own combinatorial menus. Economic individuals are enemies of pure, non compensating risk and, therefore, will prefer the advantages in the choice to obtain the best menu to the adventure of risk without reward.

A unit of energy called *quantum* is allocated to each effort derived from each combination. Converging entropy in the system can be measured in the creation of the final menu.

The combinatorial theory applied to microeconomics had its origin in two works: one of them was entitled *Combinatorial Theory Applied to the Theory of Utility* and it was published in 1993. The other paper was entitled *Combinatorial Theory Applied to the Study of Production* and it was published in 1994. This work provided the necessary tool for more synthetical and condensed works. One of them, on energy consumption or entropic universe is *Chaos and Combinatorial Ordering in Economics: Chaos and a System's Energy Are Similar Concepts* (2004). Another one is *Business, Combinatorial Theory and Decision-Making* (2005). Both have been published in this journal.

## THE COMBINATION

Once the consumer has been supplied with the goods in diversity and quantity, he proceeds to create a strategy to consume them. This strategy is the combination of the goods. The combination is the time and serial placement of the goods to be consumed. If there is only one good, there is no point in speaking about combination. It makes sense from two goods onwards. Two goods – a and b – can be combined in two different ways: (a, b) and (b, a). The capacity to combine increases in increasing order as the number of goods increases.

The combination of goods permits the design of a choice plan of what is going to be consumed and the way this consumption will take place. In fact, the combination of the goods in different ways, in all possible ways, implies the design of alternative menus, because each combination is a menu. Once the alternative menus have been created, then the most convenient one can be chosen. This is the reason why the combination is the consumer's plan to choose the optimal menu to maximize utility.

Combinatorial mathematics calls ordinary permutations to all orders in the A group of n elements – goods in this case – where all elements are included and none of them is repeated. In other words, ordinary permutations are all groups or possible orders where all the elements are implied and none of them is repeated. This is the case shown in this paper. It allows working with the pure design of menus without making it more complex with other combinations that the combinatorial theory uses (ordinary variations, variations with repetition, permutations with repetition, etc.).

If there are n good, the formula that allows establishing the number of possible ordering is n!, that is $P_n = n!$. In this way, if an individual chooses five goods: a, b, c, d, e, the following combinations (permutations) can be observed: $P_5 = 5.4.3.2.1 = 120$. If there were seven goods: a, b, c, d, e, f, g, 5,040 combinations could be registered.

As it can be noted, the acceptance of the combinatorial theory not only enlarges the richness of the analysis but also provides a numerical dimension. If this area of the mathematical theory is not developed, both the creation of menus and its choice and the capacity to count menus would be lost.

In the example above, an individual can create 5,040 menus because 5,040 different combinations could be counted. Whenever the term combination is used in this paper, it is referred to ordinary permutations. As it has been mentioned, this type of permutations allows the simplification of menus without making them lose their global nature.

## THE CHOICE

Choices go through two stages in consumption: the first one refers to the diversity of goods. It has been observed that one unit of each good take part in ordinary permutations considered here. The second refers to the choice of the best menu. This activity is complex and shows an important scientific interest because it includes a series of previous activities.

Among the second choices, the first one is long and hard because it implies the creation of the menus that has been studied above: there would be 120 menus in the case of 5 goods and 5,040 menus in the case of seven units. The second – among second choices – is equally complex because the consumer must rank (not measure) the menus from the best to the worst. The first one will be the optimal, providing the best utility, and the last one will be the one with the lowest utility. This paper is not intended to measure utility or to make interpersonal comparisons of utility. It is aimed at establishing some steps to rank utilities with the criteria of preferences. Therefore, it is considered that each step or each menu defines a different utility level and is found in a level of preference within the ranking of menus. Menus are labeled with ordinal and not numeral criteria. Therefore, in the sequence of choice, two different criteria are taken into account: numerals, referred to the counting of groups or menus called specific, and others known as ordinal that help identify the best menu.

In this final ordering stage it is interesting to find the best menu, but it is also interesting to know the second best and successive menus. The reason can be found in the fact that collective negotiations, especially with Leviathan, will make it possible to give up menus that are not optimal.

## CHANCE AND CHOICE

Choices are a way of getting the optimal menu that provides the best utility. This is a path of rational effort and it is, above all, rewarding, as it has been observed before. It is doubtlessly the reason why the individual will accept any task: creating specific menus, putting these menus in order, and choosing the best one in exchange for obtaining the desired reward: the highest possible utility.

Are chances interesting? For instance, if each specific menu was written in a piece of paper and all of them put into a poll box, would the individual be interested in this game or would he rather choose the best one directly? The individual will prefer a rational choice rather than the choice at random for two major reasons. The first one in importance is that there is a high chance that his choice would not allow him to get the best menu. Secondly, because of the subjective uselessness of the action of playing without a reward. These conclusions easily become an answer to a question: why would anyone play and take a risk if the best utility can be obtained directly?

The probability of getting the optimal menu in only one try is: $1/P_n$

If this is applied to the previous examples with five goods, it would be 1/120, and if there were seven goods, it would become 1/5,040. The enormous analytical capacity derived from the acceptance of the combinatorial theory can be seen in this case.

Obviously, these statements are not relevant for the case of the single menu with only one good. In that case, one paper would offer 100% certainty to get the optimal menu because there is only one specific menu and, in that case, the game would not exist. But it becomes relevant when there are two goods and the risk is 50%. The higher the number of goods, the higher the risk and the uselessness of choosing at random.

## MARGINAL UTILITY IN THE COMBINATION

There is no doubt that the successive consumption of goods in each menu, whatever it is, is an example of the decreasing marginal utility. A mental experiment can be carried out and say that this marginal utility, or rather this decrease, does not exist. What is the experiment for? It can be applied to work with utilities derived from the menu as specific combination.

This experiment means that utilities generated by each combination or specific menu are compared in a successive, continuous and converging way. As each specific menu determines one utility and these are ranked from the highest to the lowest (utilities are not measured), the difference between each pair allows measuring one marginal utility (only measured as a combination). In order to isolate this combinatorial effect, it has been necessary to discard the law of marginal utilities that appears as a consequence of consumption of goods in each specific menu. Coming back to the ranking in the series or favorite utilities of each specific menu, the height of each step is, to these effects, the marginal utility.

To these effects the marginal utility is decreasing as well. It will be explained below. With an arrangement of the goods that defines the worst possible menu, it can be proceeded to change the placement of a good in a way that defines the second worst possible menu. Between both utilities there will be an average marginal benefit measured in terms of marginal utility. The consumer will experience a notable improvement in its utility. He will then add another good to define the third worst menu. Compared with the utility of the second one, there will be an improvement or increase in utility but not as intense as the first one. In this way the optimal menu or best menu will be reached: that whose utility cannot improve because there is not a better menu (in fact, there is not even a further menu). The last increase in utility will tend to zero.

## NET MARGINAL UTILITY AND THE THEORY OF THE JIGSAW

Another issue is the net marginal utility. This is measured by the difference between the combinatorial marginal utility and the marginal effort in the creation and choice of the respective menu. We know from the theory on the decrease of marginal utility above mentioned that it is necessary to measure the trend or evolution of the effort to be made in the creation and choice the menu.

When provided with a series of goods, the consumer starts to make these menus. That is: to put the goods in order and combine them. As this ranking activity develops, there are fewer items to order or combine and the effort decreases. The same happens with the choice. If the individual has already chosen, there are fewer items to chose and therefore the marginal effort decreases. These points are true even if it is admitted that the individual specializes or *learns to learn* to create and select a menu.

These theories are better understood with the example of a jigsaw, made of small pieces that, at the end, will define a single image. At first, the effort is bigger but, as the work progresses and pieces fit, the effort is less. The same happens with the creation and the choice of menus: the necessary effort to complete all the menus and choose the best one is less necessary. It can be stated that the productivity derived from the effort and the choice increase.

It is concluded, considering this trend that marginal utilities will be decreasing and the net marginal utilities will be constant. If marginal utilities decrease and the marginal effort that is also decreasing has to be deducted, the result is that net marginal utilities tend to be constant.

## COMPACT SUB-COMBINATIONS

It has been observed that any menu is a combination or ordering of goods in time. These orders are ranked in a comparative order of utility. This is a vertical approach that goes from the best menu to the one generating less utility. This research now proceeds to the analysis of the menu, any menu, horizontally, looking for special connections among them. Connections will be considered special if they are preferred.

In any specific menu, for instance (d, c, f, a, b, e, h, g), the consumer can be especially interested by the subgroup (e, h, g) and this does not imply that the individual will not consume the remaining goods. It is the case of someone who particularly likes the combination coffee, a drink and a cigarette, because this combination provides him with a special utility. This type of combination is called *welding*.

As in the case of ordinary permutations – all possible groups including all possible goods – weldings are not necessarily present in all specific menus. But the creation of specific menus is an intellectual exercise to rank utilities. This means that there will be more than one welding (n>2) in several – but not all – specific menus. In the case of a collective negotiation, weldings will be reluctant to be given up.

If the optimal menu is considered and if there is a connection or special preference combination above any other, there will then be a *hard core*. The definition of hard core is the best preferred combination in the optimal menu, which at the same time is the best menu. Hard cores must be taken into consideration since they are combinations not subject to bribes, or combinations that cannot be given up.

Both weldings and hard cores are interrelations or internal links in the preferences of consumers.

Following the same logical process, there are also combinations of goods with weak preference. They are considered as weak within the combination. It means that in any specific menu, including the optimal menu, the existence of indifferent combinations in their ranking means that they are weakly preferred. This type of combination is called *soft welding*. The existence of soft weldings in the negotiations among individuals or among groups offers the chance of agreements and the creation of combinatorial chains as explained below.

Ranked in intensity of preference in the chart of combinations, those with more importance or solidity are hard cores, followed by weldings and the last ones would be soft weldings. The combinations that are not important or seem indifferent are *neutral combinations*. Because of their own nature, neutral combinations cannot exist in an optimal menu, because in this menu the order of goods is the preferred one.

## THE NEGOTIATION

In a group of public goods (a, b, c) provided by Leviathan, each citizen-consumer or each subgroup will prefer a combination. As the supply is only one, Leviathan will be indifferent or non-belligerent in that combination. Consumers must look for a combination that can be preferred by everybody. The problem is that none of the combinations or almost none of them is going to be preferred by everybody simultaneously. The one that some individuals like will be rejected by others.

As there cannot be a combination that can be special for everybody, a combination that is not that bad, or the second best, or the third best, etc. will be looked for. The search of this combination brings about the need of a negotiation or agreement among the consumers of public goods. The negotiation should be preceded by the definition of each consumer or group of consumer's combinatory map of preferences and such a map will be the expression of their compact combinations and sub-combinations. Nothing can be said on the negotiations until the actors of the negotiation confirm the existence of their hard cores, weldings, soft weldings and neutral weldings. Knowing these compact sub-combinations is important because the degree of negotiation will be in inverse proportion to the intensity of these combinatory unions.

To start, individuals will show their preference for hard cores and, for the same reason, they will not be willing to give up their preference. They will be more open to give up ordinary weldings and they will be ready to give up, make agreements or sell in soft weldings and neutral weldings because they are not the ones they prefer most.

Negotiating and giving up mean leaving a soft or neutral combination in the market so that a better one can be created, that more people like. In this sense, it can be stated that it is better to have a menu, or rather the part of a menu that all people like to not having a common menu at all. The best social menu will be created by successive voting and simple majority. However, this utility derived from the optimal social menu will be better that the menu imposed by Leviathan or a random menu, because a social menu is the result of some agreements based on negotiations that are in turn based in negotiations on behavior of utility maximizations.

## MEASURING ENERGY

This part of the paper is the development of a lecture given in Istanbul on 6th August, 2005. In Physics, the energetic measure of chaos is equivalent to the measure of energy caused by such chaos. In Economics, the opposite is understood. The reason will be explained below.

Let's imagine a situation where consumers do not know their preferences and, therefore, goods are not ranked. This is a world of chaos in the sense that pre-Socratic philosophers used it: matter without laws governing it and without energy. Max Plank developed the theory with the introduction of the concept of energetic *quantum* discovered by the German physician. Quantum is a discrete measure of energy. It is considered that consumers have their tastes and therefore some preferences and they follow coordinative logical criteria. Let's assume that they start to design all combinations or specific menus and each design implies the consumption of a quantum. The creation of all menus and the choice of the best menu lead to the completion of the consumer's tasks to make him feel sure that his optimizing activity has reached its end.

From a situation of chaos – in the sense that chaos is considered here – a situation of order and balance is reached where chaos does not exist. In physics, chaos implies an explosion outwards, a *big bang* with energy consumption. In economics it is just the opposite: an initial situation of uncertainty (the Greek chaos) leads to the internal order. It is an implosion or *big crush* where another movement would not make any sense.

What is the value of the total energy consumed by each consumer? If it is measured in quantum, the value of all the energy is the value of all possible combinations that have been measured as the numeric value of ordinary permutations. Therefore, the energy will be:

$$\text{Energy} = P_n = m! \text{ Quantum}$$

For the coherence of the measure of chaos (the big bang) this economic approach (big crush) can be considered in the opposite way: how much would it cost to disarrange the market leaving it in total chaos?

## MORAL RISK AND ASYMMETRIC INFORMATION

There is moral risk when, in general, the exchange of information on the menus between the agent and the principal has not been enough. The principal is the economic subject who wants an activity to be accomplished and commands it to the agent. An example of this is when people act as the principal and the State acts as the agent. Moral risk takes place when one has more information at his disposal than the other – Leviathan in this case. This imbalance in information is asymmetric information in the market.

The existence of a perfect competence of goods markets requires a perfect competence of information markets, which implies symmetric information.

In other words, asymmetric information is not compatible with optimal social welfare functions and causes *adverse choice*. Therefore, all types of negotiation among social groups, including those between social groups and Leviathan, are a process of publication of information that encourages symmetry in information and the achievement of better social welfare functions. The economic market and the market of votes in the political activity are tasks that reveal the preferences of economic subjects. This means that all the menus (all combinations) goods in all economic groups including Leviathan will manifest themselves.

Two comments must be made: firstly, that Leviathan is indifferent, and secondly, that it is belligerent. In the first case, the State creates all menus of public activities and publishes them without showing preference for any of them. In this case, social groups or individuals belonging to the social groups will vote for the menu they choose as the best one. A perfect information market of public activities is guaranteed in this way. This implies symmetric and balanced information in the market and the disappearance of adverse choice and moral risk.

In the second case, internal lobbies in Leviathan will be interested in a particular menu or in a series of menus similar to that one. The weight of information is imbalanced in their favor and they will supply the information suitable to their interests. There is moral risk and adverse choice. This preference shows that there are weldings (or a single welding) in the menu of Leviathan's members. It is also possible that there are no coincidences in the menus of the groups within Leviathan. If this situation occurs, it can be said that the capacity to impose a menu on the people is weakened. But it is also true that the capacity to negotiate within Leviathan is much easier than within the group of citizens. In the case of a negotiation among all economic subjects – given perfect information market conditions –where there is belligerent Leviathan on the one hand and social groups on the other, it would be possible to reach a second best situation.

This means that both the principal (the people) and the agent (Leviathan) will give up their menus in exchange for an agreed similar menu. It is certain that they will not enjoy the optimal menu but they will enjoy the best possible one. The possibility of achieving the best possible menu is always preferable to an impossible menu or a remote menu far from corresponding to each person's preferences. On the other hand, this negotiation and the choice are preceded by the expression of the principal's and the agent's preferences. It is the disclosure of universal information. Such disclosure is the nearest condition to a better social welfare function (even though it is not the first best).

Negotiations by Leviathan will be as follows: it will either sell them to the citizen if they are positive and will buy them if they are negative. It will be possible to bribe the citizens by offering them a menu that was not initially wished.

## JOINT PRODUCTION AND EXTERNAL ECONOMIES

Together with the consumption and production of the major products, there is consumption and production of derived goods. These are external economies in consumption and in production that have to be included in the menu if the information must be complete and moral risk is to be avoided. Adverse choice and efficient allocation of resources also have to exist. Information on the menu, on consumption and on production of major goods must be accompanied by positive and negative external economies to achieve perfect competence in the market of information and to avoid asymmetric information. In this way, we can approach a guaranteed welfare function.

Externalities must be arranged, numbered and acquired by means of property rights so that menus can be subject to transaction in the market. The existence of property rights eliminates uncertainty in the market and makes transactions transparent. Optimal briberies should be included among these transactions. The possibility of creating specific menus exclusively on externalities or allocating – positive or negative – externalities to them and form a complete menu should be considered.

The participation of Leviathan in the market should take place no matter if it creates positive or negative external economies. Citizens, on the other hand, must vote freely and approve the *complete* menu. Leviathan's intervention with citizens must imply selling external economies if they are positive and buying them if they are negative. A negotiation where both win should be possible. This negotiation should be as follows: Leviathan proposes a menu in which it is interested but not the citizens.

However, the inclusion of *new* goods – in this case external economies add goods to the main menu – will convince citizens of approving such menu. In this case, the groups belonging to Leviathan, as well as the citizens, will enjoy the production and supply of that menu, and an agreement will be reached. This will be the case of the optimal bribery because there will always be an agreement. At the same time, the distribution of such information on external economies will increase market symmetry and eliminate adverse choice.

In the case of negative external economies in production and supply of Leviathan's goods, the pressure of citizens may force to alter not only such supply but also the menu. But it is also true, on the other hand, that Leviathan will give in to any menu that citizens demand. This possibility is interesting for Leviathan as the least possible evil. The production and supply of goods is better than the inexistence of goods, derived from a non-existent negotiation.

## MARKET IMPERFECTION

The market may experience two types of imperfections. One of them is the formation of soundly based cartels that create a common menu and are strong enough to impose it to Leviathan. Another imperfection is the existence of weldings in each menu that make it little suitable for negotiation. Both types discriminate plural, democratic and universal negotiation and keep the market away from perfect competence. The optimal levels defined by the social welfare function cannot be achieved. There will be two ways to make these imperfections disappear: one is to extend the cartel to the remaining social groups. Weldings should be eliminated on the condition that the other groups will give their menus in to adapt to the main menu. To eliminate a welding would imply to change the arrangement of the goods in the menu so that other groups can do something similar and vote a common menu. In this way, the group will be strong enough against the menu of a supposedly belligerent Leviathan. Another way would consist in making other groups negotiate the formation of common menus or similar alternative menus that can be used as a base for the choice of a menu similar to each one's optimal menu.

In any of the two possibilities, the same negotiation would be used to disclose the negotiations and, therefore, it would approach symmetric information among citizens, and between the citizens and Leviathan.

A serious case of asymmetric information takes place when cartels or powerful lobbies exist within Leviathan. In this case, each group will be interested in imposing its particular menu. In both cases, there will be hidden and protected information for reasons related with power, and they will make the market become imperfect and it will be difficult to solve this situation.

## CONCLUSION

The utility that every individual enjoys depends on the number of goods, their diversity and the way they are combined. This approach has been forgotten by microeconomics and combinatorial mathematics must be used in order to develop it. Since it is possible to combine goods in different ways – considering that all goods are included and none is repeated – there will be several possible menus: n! to be exact. Among them, the one providing the best utility will be chosen and will be preferred to the rest. This menu can be found with the ordinal sequence of the utilities generated by each menu. Ordinal criteria of utility preference and not quantitative or interpersonal comparative criteria are followed at any moment.

Consumers will prefer to choose the best menu than relying on an activity led by chance. This example is valid if we consider two units or more. The creation of menus and the choice imply a marginal cost, on the one hand, facing exclusively combinatorial marginal utilities. The marginal cost is reduced since the productivity of the creation and choice of menus is growing, just as a jigsaw is finished faster as more pieces are put in their places. Therefore, marginal utilities only due to combinations tend to be constant. There will be groups or combinations within a menu that will be preferred. In a ranking, hard cores will be at the top, then weldings, followed by soft weldings and neutral ones. Negotiations are important to achieve a consensus that allows the design of an optimal social menu in the case of the provision of public goods. These negotiations will depend on the elasticity or inelasticity of preferences, which is the existence of soft weldings, weldings or hard cores.

. The entropy or energy consumption can be measured by allocating an energy measure called quantum to the effort of designing each menu. And because there will be n! menus, there will be the same amount of quanta. This paper considers ordinary permutations. That is, all the combinations where all the elements in n are included and none of them are repeated.

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