Sunk costs of consumer search: economic rationality of satisficing decision

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Abstract

The paper argues that sunk costs' sensitivity can lead to the optimal consumption-leisure choice under price dispersion. The increase in quantity to be purchased with the extension of the time horizon of the consumption-leisure choice equalizes marginal costs of search with its marginal benefits. The implicit optimal choice results in the explicit satisficing decision. The transformation of cognitive mechanism of discouragement into satisficing happens only in the "common model" of consumer behavior. The paper argues that the cognitive mechanism of aspiration takes place when consumers try to get marginal savings on purchase greater than the wage rate and, therefore, they follow the "leisure model" of behavior where both the marginal utility of labor income and the marginal utility of consumption become negative.

Key words: sunk costs, consumption-leisure choice, search, satisficing, maximizing

JEL Classification: D11, D83.

1. Introduction

The analysis of sunk costs usually have been followed by experimental studies, previewed by strong assumptions that "sunk cost effects on decision-making (were), of course, irrational from the perspective of both classical economic and normative decision theories."(Garland and Newport 1991, p.55). However, there were some efforts to explain the phenomenon of sunk costs on the basis of economic rationality (McAfee et al. 2010).

In 1980 R.Thaler attempted to point the way towards a positive theory of consumer choice on the basis of the prospect theory of D.Kahneman and A.Tversky (Thaler 1980). R.Thaler reviewed some issues that were considered inconsistent with economic theory. The analysis of that inconsistency included the endowment effect, the search for big-ticket items, and the sunk costs effect. This paper continues to argue that there are no inconsistencies and the standard tools of economic theory can explain all these effects that do require neither alternative descriptive theories nor specific utility functions.

It was previously shown that the development of the G.Stigler's marginal approach could reveal the general relationship between labor, search or home production, and leisure (Aguiar and Hurst 2007, Malakhov 2003). Furthermore, that general relationship could retain a metaphorical methodological legacy of M.Friedman and L.J.Savage. Like billiards player, a consumer does not engage complicated calculations. He just relies on his feelings and he takes a satisficing decision. And this satisficing decision automatically equalizes marginal costs of search with its marginal benefit (Malakhov 2012, 2013a,2013b), or:

$$w\frac{\partial L}{\partial S} = Q\frac{\partial P}{\partial S} \quad (1)$$

w – wage rate; L – labor time; S – time of search; $\partial L/\partial S<0$ - propensity to search; Q – quantity to be purchased; $\partial P/\partial S<0$ - price reduction in a given store.

If we take this equation as the constraint, we can solve the implicit consumption-leisure utility maximization problem (*max U(,Q)* subject to Eq.1 gives the *MRS (H for Q)=w/P*$_0$) for the following explicit satisficing decision (Fig.1):

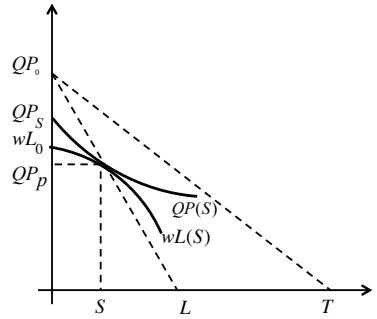


Fig.1. Explicit satisficing decision

wL(S) – labor income; *QP(S)* – expenditures on the chosen quantity; wL_0 – reservation labor income; *QPs* – expenditures at the starting price; *QPp* – actual expenditures; QP_0 – potential labor income $\{QP_0=w(L+S)=-T\partial P/\partial S\}$.

The general relationship between labor, search, and leisure shows that standard tools of the economic marginal analysis can easily explain the paradox of little pre-purchase search for big-ticket items (Malakhov 2012). Moreover, the explanation of this paradox represents only a part of the synthesis of the search-satisficing concept with the neoclassical paradigm. This synthesis also discovers microeconomic roots of the endowment effect. Indeed, this effect occurs because there is a difference between the actual labor income *wL*, spent on purchase, and the potential labor income *w(L+S),* where search costs *wS* increase the willingness to accept (Fig.1)[1].

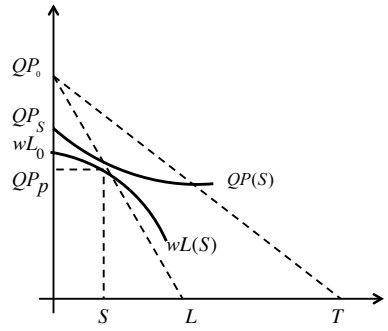
The billiard metaphor represents also a basis for the understanding how the search-satisficing procedure can incorporate the consumer sunk costs' sensitivity.

2. "Common" sunk costs' sensitivity

The C.Kogut's study of consumer search behavior and sunk costs showed that individuals were making decisions based on the total return from searching, rather than simply the marginal return from another draw (Kogut 1990). The analysis of the search behavior can eliminate the difference between total and marginal estimates. Usually sunk costs are followed by a feeling of disappointment. If the problem is strictly constrained, this disappointment will expose the cognitive mechanism of discouragement. The discouragement is one of the mechanisms that result in goal termination (Simon 1967). However, the nature of the problem of sunk costs by definition needs a relaxation of constraints because "this effect is manifested in a greater tendency to continue an endeavor once an investment in money, effort, or time has been made." (Arkes and Blumer 1985, p.124). From the point of view of the search theory the discouragement means that the search has not been efficient and total losses are greater than total gains. This consideration can be written as $|dwL(S)|>|dQP(S)|$. However, any relaxation needs a marginal evaluation. And hence we can turn from the total discouragement to the marginal

[1] The analysis of the endowment effect needs a voluminous presentation of discussions on the *WTP-WTA* relationship. Readers, who are interesting in the development of the search model, can make this analysis themselves. Here it is only worth to pay attention to the point of departure, where the following Equation 4, taken for the value *S=0*, provides the equality *WTP=WTA*.

disappointment (Fig.2; Eq.2) [2]:



$$\left|dwL(S)\right| > \left|dQP(S)\right|;$$
$$w\left|dS\frac{\partial L}{\partial S}\right| > Q\left|dS\frac{\partial P}{\partial S}\right| \quad (2)$$
$$w\left|\frac{\partial L}{\partial S}\right| > Q\left|\frac{\partial P}{\partial S}\right|$$

Fig.2. Explicit suboptimal disappointing decision

The inequality (2) states the fact that for the given price reduction $\partial P/\partial S$, i.e., in the given store, the absolute value of marginal loss is greater than the absolute value of marginal benefit. We cannot rationalize our purchase of the chosen quantity in the chosen store. Simply, the price in this store for the chosen quantity seems "insufficiently interesting". But it might be satisficing for the greater quantity. The greater quantity may be either explicit, and we buy more potatoes, or implicit, if we come back to the J.Stiglitz's notation that "a good *x* which lasts twice as long as a good *y* (if the interest rate is zero) is just equal to two units of *y"* (Stiglitz 1979, p.342), and the "insufficiently interesting" price corresponds to a higher quality and to a longer product's lifecycle.

The J.Stiglitz's notation shows the way where the phenomenon of sunk costs' sensitivity appears. Consumers increase quantity to be purchased in order to recover fixed sunk costs of visiting the store. "The buyer's sunk travel costs may be exploited…In this case, because the cost of the extra trip may not be worth it, the consumer may still buy other items from the retailer…" (Ratchword 2009, p.56). However, if we consider the consistent buyer who does not change his intensity of consumption, we have to follow the J.Stiglitz's notation and we should agree that the increase in quantity changes the time horizon of the consumption-leisure choice. Consumers leave the maximum of the current consumption-leisure utility and they look for another maximum with the new time horizon. Again, this shift does not represent calculations of marginal values of search. The choice of another maximum represents the implicit process of the explicit way out from disappointment.

However, the increase in quantity to be purchased changes the marginal values of search. The change in the absolute value of the marginal benefit is obvious:

$$\frac{\partial Q\,|\,\partial P/\partial S\,|}{\partial Q} = \left|\frac{\partial P}{\partial S}\right| > 0 \quad (3)$$

The increase in quantity to be purchased raises the absolute value of the marginal benefit of search. However, the change in the value of marginal costs of search is not so evident. Here we should come back to the properties of the "common model" of search behavior (Malakhov 2012, 2013a):

$$w\frac{\partial L}{\partial S} = -w\frac{L+S}{T} \Rightarrow w\left|\frac{\partial L}{\partial S}\right| = w\frac{L+S}{T} \quad (4)$$

[2] Absolute values do not change the logic of the problem and they are taken here only for the simplicity of presentation.

The increase in consumption gives us the following:

$$\frac{\partial w\,|\partial L/\partial S|}{\partial Q} = \frac{\partial w(L+S)/T}{\partial Q} = w\left(\frac{T(\partial(L+S)/\partial Q) - (L+S)\partial T/\partial Q}{T^2}\right) =$$
$$= \frac{w}{Q}\left(\frac{\partial(L+S)}{\partial Q}\frac{Q}{T} - \frac{(L+S)}{T}\frac{\partial T}{\partial Q}\frac{Q}{T}\right) = \frac{w}{Q}\frac{(L+S)}{T}\left(\frac{\partial(L+S)}{\partial Q}\frac{Q}{(L+S)} - \frac{\partial T}{\partial Q}\frac{Q}{T}\right) = \quad (5)$$
$$= \frac{w\,|\partial L/\partial S|}{Q}\left(e_{(L+S),Q} - e_{T,Q}\right)$$

Then we can simplify the expression in parentheses, keeping in mind that being disappointed by the given price reduction, the consumer decides to buy goods not only for this week but also for the next week in order not to travel to the store next Saturday ($\partial S/\partial Q=0$):

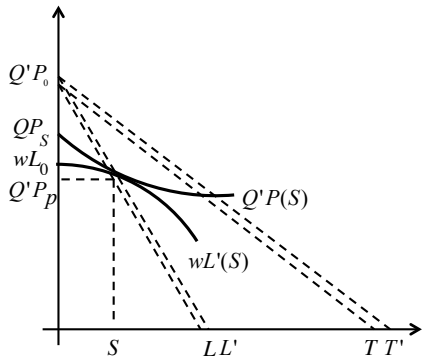
$$e_{(L+S),Q} = \frac{\partial(L+S)}{\partial Q}\frac{Q}{(L+S)} = \frac{\partial L}{\partial Q}\frac{Q}{(L+S)}\frac{L}{L} = e_{L,Q}\frac{L}{(L+S)} \quad (6)$$

$$e_{T,Q} = \frac{\partial(L+S+H)}{\partial Q}\frac{Q}{L+S+H} = \frac{\partial(L+H)}{\partial Q}\frac{Q}{L+H}\frac{L+H}{L+S+H} =$$
$$= e_{(L+H),Q}\frac{L+H}{L+S+H} \quad (7)$$

The decision to buy more changes neither the price and price reduction nor the intensity of consumption Q/H. Therefore, the increase in labor time as well as the increase in leisure time should be proportional to the increase in quantity to be purchased, or $e_{L,Q}=1$ and $e_{H,Q}=1$. However, it is easy to show that the proportional increase in labor time ($e_{L,Q}=1$) as well as in leisure time ($e_{H,Q}=1$) give us $e_{(L+H),Q}=1$. And from the Eq.5,6, and Eq.7 we have:

$$\frac{\partial w\,|\partial L/\partial S|}{\partial Q} = \frac{w\,|\partial L/\partial S|}{Q}\left(\frac{L}{L+S} - \frac{L+H}{L+S+H}\right) < 0 \quad (8)$$

or the increase in consumption decreases the absolute value of marginal costs of search. This means that ***the increase in quantity to be purchased moves the marginal values of search in opposite directions*** (Eq.3 and Eq.8) until the moment when disappointment vanishes and the inequality (2) takes the form of the key equation (1). And this equation means that the consumer maximizes the consumption-leisure utility on its new level for a new time horizon (Fig.4, Eq.9):



$$w\left|\frac{\partial L}{\partial S}\right| > Q\left|\frac{\partial P}{\partial S}\right|; w\left|\frac{\partial L'}{\partial S}\right| = Q'\left|\frac{\partial P}{\partial S}\right| \quad (9)$$

Fig.4. Explicit satisficing decision for the extended time horizon *T(Q)*

3. "Leisure" sunk costs' sensitivity

The "common model" of behavior presumes that the absolute value of marginal savings on purchase is less than the wage rate ($w>Q|\partial P/\partial S;|$). This inequality results in the common redistribution of time where search displaces both labor time and leisure time from the given time horizon, like ice displaces both whiskey and soda in the glass ($L+S+H=T$; $\partial L/\partial S+1+\partial H/\partial S=0$; $-1<\partial L/\partial S<0$; $\partial H/\partial S<0$). However, when the absolute value of marginal savings becomes greater than the wage rate, the marginal utility of labor income becomes negative ($MU_w=\lambda<0$) (Malakhov 2013a). Moreover, the inequality ($w<Q|\partial P/\partial S|$) changes the redistribution of time. According to the key equation of the search model (1), the absolute value of the propensity to search becomes greater than one, $|\partial L/\partial S|>1$, or $\partial L/\partial S<-1$. The "price of leisure" becomes greater than the wage rate. And whatever the time horizon we choose, we will always get the positive leisure-search relationship ($\partial H/\partial S>0$). However, the positive leisure-search relationship results in the positive consumption-leisure relationship ($\partial H/\partial S>0$; $\partial Q/\partial H>0$) (Malakhov 2011,2013a). And with regard to the negative marginal utility of labor income ($MU_w=\lambda<0$) consumption becomes "bad". The negative marginal utility of labor income makes the marginal utility of the absolute value of price reduction $\partial U/\partial|\partial P/\partial S|$ positive. If the prices' search itself has the diminishing marginal efficiency ($\partial P/\partial S<0$; $\partial^2 P/\partial S^2>0$), the greater absolute value of price reduction $|\partial P/\partial S|$ corresponds to the higher price. And as far as the marginal utility of price reduction is positive, or $\partial U/\partial|\partial P/\partial S|>0$, the Veblen effect takes place (Fig.5):

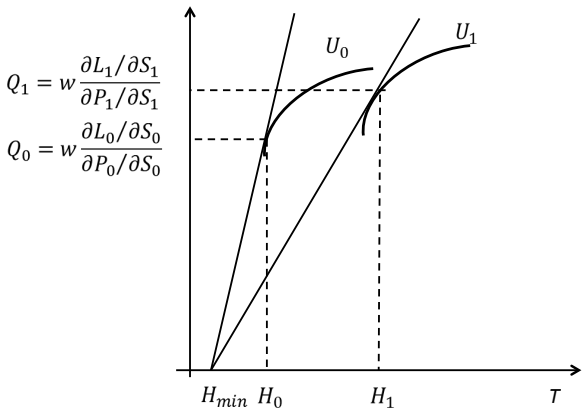


Fig.5. Veblen effect and "leisure" sunk costs

Here, the only way to compensate the high price is to increase leisure time in order to depreciate the purchase of the big-ticket item. If we substitute the search by the home production, we will get the same result.[3]

The purchase of big-ticket items clarifies the behavioral difference between the "common model" and the "leisure model". In the "common model" consumers can choose the big-ticket item of higher quality and with guarantees. That makes it more expensive but the recalculation of the time horizon, i.e., of the big-ticket item's lifecycle, as well as the recalculation and the subsequent increase in labor time keeps the consumption-leisure choice within the "common model". The procedure described by the inequalities (3) and (8) makes the high price acceptable. And the explicit form of this rational implicit decision really looks satisficing, like it was well presented by Kapteyn et al. in 1979.

The foundation of the "common model" is very strong because it is based on the natural rule of the redistribution of time. When the share of leisure in the time horizon H/T determines leisure-search relationship ($dH(S)=dS\times\partial H/\partial S=dS\times(-H/T)$, and $\partial H/\partial S=-H/T$), the propensity to search $\partial L/\partial S$ can be determined by the very simple equation (4) and it gets the negative derivative, or $\partial^2 L/\partial S^2<0$. This derivative of propensity to search provides the resolution of many microeconomic phenomena along the Cobb-Douglas consumption-leisure utility curve $U(Q,H) = Q^{-\partial L/\partial S}H^{-\partial H/\partial S}$ in the same manner like physical laws provide correct intuition of billiards players.

But it is not true for the "leisure model" of behavior. The Cobb-Douglas curve disappears. There is no natural equivalent to the redistribution of time under the positive leisure-search $\partial H/\partial S>0$ relationship. And we cannot determine exactly the depreciation rule for either high price or excess consumption under such extension of leisure time. Indeed, "once individuals have made a large sunk investment, they have a tendency to invest more in an attempt to prevent their previous investment from being wasted. The greater the size of their sunk investment, the more they tend to invest further, even when the return on additional investment does not seem worthwhile." (McAfee et al., pp.324). Once the Chateau Lafite Rothschild 1995 from Pauillac is bought for the party, it will need something like the Opus XA from Arturo Fuente in order to make cigars "well-matched" with the good wine. And the leisurely manner of consumption of good wine with good cigars definitely makes the party longer.

4. Conclusion

The implicit increase in quantity to be purchased, i.e., the choice of the big-ticket item of high quality with longer lifecycle, makes the satisficing as well as the optimal decision of the depreciation of sunk costs more transparent if we take into account the interest rate. If we presuppose that the interest rate r increases prices of durables and therefore the absolute value of the marginal savings on purchase $|\partial P/\partial S|$ and if the interest rate r does not change the intensity of consumption, the behavior of marginal values of search under the implicit increase in consumption and with regard to the interest rate makes the present dissatisfying decision to be satisficing as well as optimal from the prospective point of view due to the increase in the absolute value of marginal savings and to the decrease in the absolute value of marginal losses (Eq.3, Eq.8). In this manner the interest rate contributes to the recovery of the sunk costs of search.

The "common" sunk costs could be depreciated in the other manner, for example, by the decrease in the intensity of consumption Q/H. However, the decrease in the intensity of consumption under the "common model" is voluntary and controlled when it expresses the planned careful use of the big-ticket item and it considerably diminishes the absolute value of marginal losses ($e_{L,Q}<e_{(L+H),Q}$; $\partial w|\partial L/\partial S|/\partial Q<<0$). Conversely, if a consumer looks for the marginal savings greater than his wage rate ($w<Q|\partial P/S|$), he recovers "leisure" sunk costs when the increase in consumption-leisure utility is possible only with the obligatory decrease in the intensity of consumption (Fig.5). There, the decision to increase the intensity of consumption immediately discovers the "bad" economic nature of the chosen item.

It looks like a paradox that only for examples like Chateau Lafite Rothschild 1995 - Opus XA Arturo Fuente as well as for many other cases of the "leisure model" of behavior we can definitely talk about *aspiration* as the cognitive mechanism of the goal termination. The properties of the model of behavior of Economic Man seem not to be compatible with the "common model" of behavior. Either Economic Man can perfectly calculate his consumption-leisure ratio and he can choose anytime the store where the price reduction corresponds to his intensity of consumption ($\partial P/\partial S=\partial P/\partial S(Q)$; $\partial P/\partial S = \partial P/\partial S(H)$) and consumption and leisure become perfect complements, or he is a vulgar maximizer.

[3] The analysis of "leisure model" with regard to the home production illustrates well the irrational shortened labor supply in agrarian economics, which expose the Chayanov's backward bending effect (see, for example, Shanin 1986).

Indeed, he does not need a calculator to compare the wage rate with savings on purchase. He simply tries to find an opportunity to get from the search more than from the labor ($w<Q|\partial P/S|$), when he can be really insatiable. However, the purchase could be unplanned and the table tennis, bought occasionally at sales, really becomes "bad" as the "easy come" item and it can take its right place in a month in the garage. There, being got out to the open air once in a season, it will serve for years, or it will be presented at garage sales as the real "easy go" item.

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