A behavioral note on the demand for health

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ABSTRACT:

On this note we introduce some behavioral hypothesis on the static version of Grossman model on the demand for health. Three behavioral hypotheses are considered in the static version of Grossman model: the status, the social pressure and trust. We show that a preference for status and for social approval result in a higher optimal choice for health. The same cannot be concluded when considering the influence of trust. The variable trust has an ambiguous result on the optimal health decision of individuals.

KEY WORDS: health demand, Grossman model, behavioral factors.
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1) Introduction

The significant contributions to the field of economics of health come, among others, from behavioral economics and social norms, wrote Fuchs (1999). Behavioral economics provide a psychological perspective that seems to be ignored by the common neoclassic assumptions of Economics, such as, status, peer pressure and trust. After Fuchs article, Richman (2005) proposed the incorporation of psychological variables in the most well-known model of health demand by Grossman (1972). However, Richman's work is descriptive and doesn't attempt to formalise any of his suggestions.

The Grossmans´s model of the demand for health is one of the most influential papers in health economics. The basic idea of the model is that individuals not only derive utility from health, but they are also producers of their own health. As producers of health, individuals have to buy inputs, such as medical care, food and gym classes, so that eventually, they are investors of their own health.

Demand for health comprises two components: the consumption effect, that arises form the direct utility of health, and the investment effect, that arises from the increased time of being healthy.

The utility function of individuals reflects the fact that satisfaction comes from self-produced health and from the consumption of all the other goods and services in the market. However, taking into account the comments of Fuchs and the suggestions of Richman, it should be considered behavior variables which influence the optimal choice of individuals.

Our aim in this note is to introduce, firstly, two behavioral variables in the utility function that have been recognized as relevant variables in the decisions of agents. These are *status* and *social pressure*.

Secondly, we consider the variable *trust,* a well known feature of healthcare as noticed by Arrow (1963). In Grossman models' education, even if assumed to be exogenous, plays a crucial role in determining the efficiency of the health production. There are two mechanism of transmitting this efficiency: allocative efficiency and productivity efficiency. The first mechanism translates the fact that better informed and educated people have healthier behaviors and decisions. The second mechanism emphasizes how different marginal productivities of given health inputs implies different levels of produced health. Higher levels of education lead individuals to make better use from a given health input. It is exactly over this mechanism that trust is considered, in particular, we describe how changing trust can affect, or not, the choice about health of individuals.

We show that a preference for status and for social recognition motivates the consumer to choose a higher level of health stock. On the other hand, by considering trust, the production function of health becomes more efficient which allows the consumer to achieve higher levels of utility but it cannot be said anything about the optimal choice of health.

This analysis is relevant for policy makers. In order to improve healthy choices, institutional and educational advertising may be a good strategy to boost status and social pressure on the individuals' preferences.

This note is organized as follows: on section 2 we briefly review the static version of Grossman model of health demand. Next, on section 3, we discuss the impact of the behavioral variables on the Grossman health demand. Finally, conclusions are presented on section 4.

2) The Grossman model – static version

The classical model explaining demand for health is proposed by Grossman. It formalizes the demand for health based on basic idea: health is a personalized capital good that deteriorates over time, but which can be created by investing in health. So individuals are consumers and producers of their own health. For this purpose each individual decides how to allocate is limited time and income. The payoff of the health investment is the healthy time that the individual can use to work and earn money, or to enjoy leisure.

The original model is dynamic, but a simplified static version was presented by Wagstaff (1986). We take a utility function quasiconcave on health stock (H) and on consumption of goods (C); and the health production function, (H(M)) is increasing and concave in health inputs (M).

The individual objective is to maximize his utility subject to the budget constraint and the health production function, that is:

$$\underset{M,C}{Max}\ U(H,C) \qquad\qquad (1)$$
$$\text{s.t. } H = H(M) \text{ and } P_c C + P_m M = Y,$$

where P_c and P_m are the prices of consumption and health inputs and Y is the individual income.

Substituting the health production function in the objective function, we simplify the optimization problem and we get

$$\underset{M,C}{Max}\ U(H(M),C)$$
$$\text{s.t. } P_c C + P_m M = Y.$$

Computing the first order conditions and finding the optimum, we get the following expression, which is our benchmark:

$$\frac{\left(\frac{\partial U}{\partial H}\right)}{\left(\frac{\partial U}{\partial C}\right)} = \frac{\frac{P_m}{dH/dM}}{P_c}, \qquad (2)$$

and where the l.h.s. is the marginal rate of substitution: $MRS^B = \frac{\left(\frac{\partial U}{\partial H}\right)}{\left(\frac{\partial U}{\partial C}\right)}$.

The right hand side of condition 2 is the ratio of health inputs cost relative to the marginal product of health input and the cost of consumption.

We can represent this static analysis and equilibrium on a four quadrant diagram as in figure 1 (as in Wagstaff) .

Figure 1 about here

The first quadrant shows that the optimum (point A) is reached when the utility possibility frontier has the same slope as the indifference curves.

3) Behavioral variables: status and social pressure

In this section we introduce two variables that may help to explain the demand of health. We begin to introduce the variable *status* and then the variable *social pressure*. Afterwards, we consider how *trust* influences the efficiency of health inputs. All deductions are in the appendix.

3.1) Allowing for a status preference

People may have a preference for being better than the average of other individuals in society. This behavior is captured by the variable status. Being fitter, looking younger and more beautiful than those of the same age gives *status* and so a higher level of utility.

To capture this feature we introduce a relative component of health in the utility function: $\frac{H}{\hat{H}}$, where the numerator is the consumer health stock and the denominator is the average health stock of the same age group.

This formal specification was proposed by Howarth (1996) and it reflects the fact that the larger is the average of the group health, the lower is *status*, and so the lower is individual satisfaction. On the other hand, the higher is own health relative to the others, the higher is *status* and so the happier is the person.

The optimization problem of the consumer is therefore the following:

$$\begin{aligned} &\underset{M,C}{Max}\, U(H, C, \frac{H}{\hat{H}}) \\ &s.t.\ H = H(M) \text{ and } P_c C + P_m M = Y, \end{aligned} \qquad (3)$$

which can be rewritten as

$$\underset{M,C}{Max}\, U(H(M), C, \frac{H(M)}{\hat{H}})$$
$$s.t.\ P_c C + P_m M = Y$$

By computing the first order condition, we find the optimum:

$$\frac{\frac{\partial U}{\partial H} + \frac{\partial U}{\partial \frac{H}{\hat{H}}} \frac{1}{\hat{H}}}{\left(\frac{\partial U}{\partial C}\right)} = \frac{\frac{P_m}{dH/dM}}{P_c}, \qquad (4)$$

where the l.h.s. is the marginal rate of substitution (MRS).

Comparing this MRS with the MRS^B of the benchmark model, we see that now the numerator is larger. So it is expected to find a higher level of health stock and lower level of consumption than before.

The reason for this comes from the fact that an increase in the numerator implies an increase of the marginal utility of consumption. Given that the relative costs are the same as in the benchmark, this increase of the marginal utility of consumption implies a lower level of consumption because of marginal utility is decreasing.

Therefore, an individual worried with his social image would be willing to spend more in health goods and services than in consumption. An example of the status preference of people is the expenditure on health clubs or the general check up examinations.

3.2) Allowing for social pressure

We now introduce the variable *social pressure* in the utility function. People are sensitive to what the others consider about them. A person gets happy if there is social approval, while gets unhappy with social disapproval. This approval or disapproval has the implicit existence of social norms that work as a behavioral reference for people. To capture the idea of social pressure, we introduce a function similar to that proposed by Kandel and Lazear (1992), who have first proposed a function for peer pressure.

The *social pressure* function is given by $S(H - \tilde{H})$, where $\tilde{H}$ is the social norm that defines the level of stock health that is socially acceptable. So when the individual health capital is larger than the reference level, there is a social approval that increases the individual utility. The inverse happens when the individual health is below the social norm, so that social disapproval results in a lower level of utility. A good example of this social (dis)approvement is the way society reacts to over/under weight or to non/smoking people.

The consumer optimization problem can now be written as follows:

$$\begin{aligned} &\underset{M,C}{Max}\, U\left(H(M), C, S(H(M)-\tilde{H})\right) \\ &s.t.\, P_c C + P_m M = Y. \end{aligned} \tag{5}$$

From the first order conditions, we derive the optimum the solution which is given by

$$\frac{\left(\frac{\partial U}{\partial H}+\frac{\partial U}{\partial S}\frac{\partial S}{\partial H}\right)}{\left(\frac{\partial U}{\partial C}\right)}=\frac{\frac{P_m}{dH/dM}}{P_c}. \tag{6}$$

If there is social approval then $\frac{\partial U}{\partial S}>0$ and so the numerator of the MRS is larger than that of MRS^B of the benchmark model. But if there is a social disapproval, $\frac{\partial U}{\partial S}<0$, the numerator here becomes smaller. Hence, under social approval there is a higher level of health and lower of consumption, while under social disapproval the opposite happens.

This means that when there is social approval, individuals are worried about their integration in the society and their consequent utility, as so they tend to spend more on health goods and services to build a healthy image than on consumption goods.

The typical example of the social pressure that induces people to demand for health are the beauty clinics where people may under take, for instances, personal diet to loose weight, or the enrolment in quitting smokers programs, and also the preventive examination of some diseases, as aids.

3.3) Introducing trust

Finally, we introduce *trust* in the static version of Grossman model. The reason for considering this variable is in the essence of Grossman's model itself, where education was taken as an exogenous variable. Education reflects several cultural and behavioral features where trust may be one of them. Trust is considered an important currency of organizational life, in particular, in the health care system as acknowledge by Arrow (1963).

The introduction of *trust* in the static model of demand for health cannot be done by changing the preferences since *trust* is not a matter of preferences but of health production. So we introduce the variable *trust* (T) in the health production function.

Once trust has been built, it allows for a better efficiency for a given level of inputs, this means that there is a new and more efficient production function of health stock. This is shown in figure 2 with the move from $H=H(M;T_0)$ to $H=H(M;T_1)$, that is, an expansion of the health production function.

This results in a wider utility possibility frontier, and thus it allows the individual to achieve a higher indifference curve. Whether the consumer chooses more goods consumption or more health or keeps consuming the same proportion, depends on the utility function itself.

Figure 2 about here

Trust is mainly relevant for the efficiency of production function of health, either preventive, as exercise and diet, or curative, as the schedule, duration and other rules of a treatment. However, because of the increase in this productive efficiency, it is not possible to conclude about the decision of agents on the quantity of health and consumption. If agents are careless, then an increase in the efficiency may just mean an open door to increase consumption; if agents are careful then they may just opt for equal or larger amount of health.

4) Conclusion

The basic aim of this paper was to introduce and discuss the relevance of some behavioral features that are important in studying the demand for health.

Our contribution was the introduction of behavioral variables in the simplified static model of Grossman. We started by considering preferences that allow for the role of *status* and *social pressure* on the decision of health demand of individuals. We found that when taking these aspects into consideration results in a different level of health stock and goods consumption. Individuals choose a higher health stock and a lower level of consumption, due to the extra gain accruing from *status* and *social approval* preferences.

We have also considered the role of *trust*, which has a significant importance when explaining, either the health satisfaction, or the health system achievement. This particular behavioral aspect was not introduced in the individual preferences since it is a feature that increases the efficiency of health inputs. As so under a situation where there is *trust*, individuals are able to draw a higher level of health than when there is no trust, due to the more efficient production of health. However, we cannot say whether this result in an increase of health or of consumption because it depends on the utility function.

The results obtained here may have some implications for policy makers. If people are sensitive to *status* and *social pressure*, when deciding the amount of health to afford, then policies aiming at these features may induce people to have healthier behaviors. On the other hand, if there is some concern with the efficiency of the health production system, then a policy enhancing *trust* may be an indirect strategy to achieve the desired target.

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Appendix

We assume second order conditions are satisfied.

1) Benchmark model

$$\underset{M,C}{Max}\ U(H(M),C)$$
s.t. $P_c C + P_m M = Y$

$$\ell = U(H(M),C) + \lambda(Y - P_c C - P_m M)$$
$$\frac{\partial \ell}{\partial M} = 0 \Leftrightarrow \frac{\partial U}{\partial H}\frac{\partial H}{\partial M} - \lambda P_m = 0$$
$$\frac{\partial \ell}{\partial C} = 0 \Leftrightarrow \frac{\partial U}{\partial C} - \lambda P_c = 0$$

Dividing the first equation by the second, we get immediately the MRS:

$$\frac{\frac{\partial U}{\partial H}\frac{\partial H}{\partial M}}{\frac{\partial U}{\partial C}} = \frac{P_m \Big/ \frac{\partial H}{\partial M}}{P_c}.$$

2) The model with a *status* preference

$$\underset{M,C}{Max}\ U(H(M),C,\frac{H(M)}{\hat{H}})$$
s.t. $P_c C + P_m M = Y$

$$\ell = U(H(M),C,\frac{H(M)}{\hat{H}}) + \lambda(Y - P_c C - P_m M)$$
$$\frac{\partial \ell}{\partial M} = 0 \Leftrightarrow \frac{\partial U}{\partial H}\frac{\partial H}{\partial M} + \frac{1}{\hat{H}}\frac{\partial U}{\partial H}\frac{\partial H}{\partial M} - \lambda P_m = 0$$
$$\frac{\partial \ell}{\partial C} = 0 \Leftrightarrow \frac{\partial U}{\partial C} - \lambda P_c = 0$$

Dividing the first equation by the second, we immediately get:

$$\frac{\frac{\partial U}{\partial H}\frac{\partial H}{\partial M}+\frac{1}{\hat{H}}\frac{\partial U}{\partial H}}{\frac{\partial U}{\partial C}}=\frac{P_m \Big/ \frac{\partial H}{\partial M}}{P_c}.$$

3) The model with *social pressure*

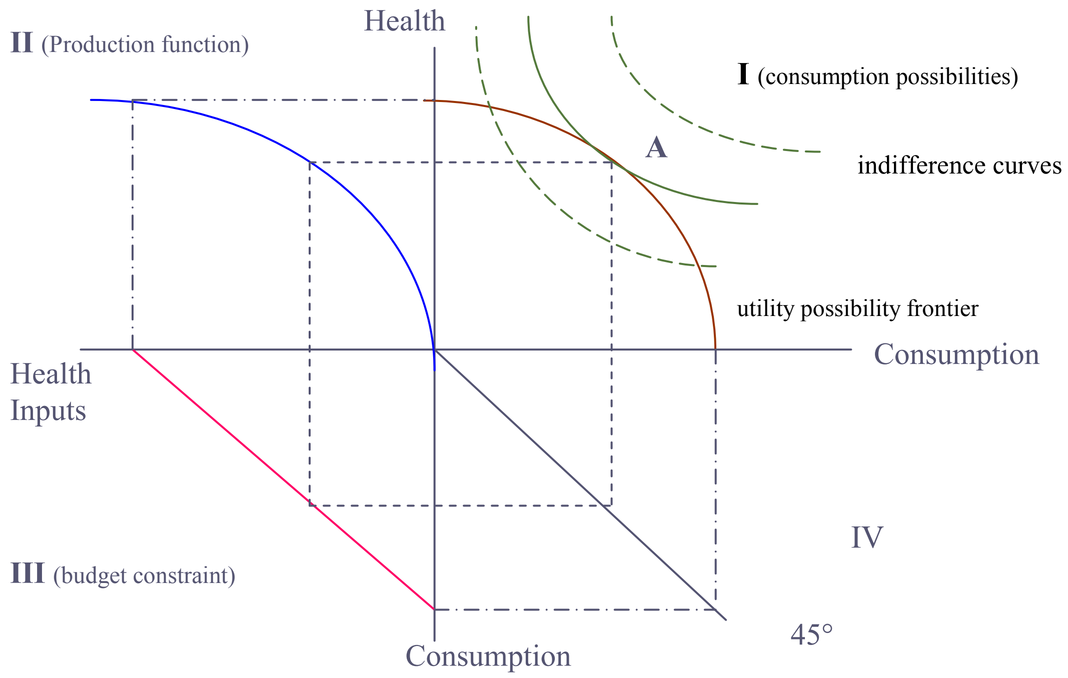
$$\underset{M,C}{Max}\ U(H(M),C,S(H(M)-\widetilde{H}))$$
s.t. $P_c C + P_m M = Y$

$$\ell = U(H(M),C,S(H(M)-\widetilde{H}))+\lambda(Y-P_c C-P_m M)$$
$$\frac{\partial \ell}{\partial M}=0 \Leftrightarrow \frac{\partial U}{\partial H}\frac{\partial H}{\partial M}+\frac{\partial U}{\partial S}\frac{\partial S}{\partial H}\frac{\partial H}{\partial M}-\lambda P_m=0$$
$$\frac{\partial \ell}{\partial C}=0 \Leftrightarrow \frac{\partial U}{\partial C}-\lambda P_c=0$$

Dividing the first equation by the second, we get:

$$\frac{\frac{\partial U}{\partial H}+\frac{\partial U}{\partial S}\frac{\partial S}{\partial H}}{\frac{\partial U}{\partial C}}=\frac{P_m \Big/ \frac{\partial H}{\partial M}}{P_c}.$$

Figure 1 - Four quadrants and the determination of the optimum



The second and third quadrants are the constraints of the optimization problem faced by an individual.

Figure 2 – Four quadrants and the optimum after a change in *trust*