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Myopia, Regrets and Risky Behaviors

Pierre Pestieau* and Gregory Ponthiere†

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Abstract

This paper examines how a government should intervene when agents make, for different reasons, choices that have long term detrimental effects on their survival prospects. We consider an economy where some agents make risky choices (here sin good consumption) out of myopia, and regret their choices later on, whereas other agents make, because of their impatience, the same risky choices, which they never regret. We argue that, in the first-best, a government should only interfere with behaviors that agents regret, but not with other behaviors. In the second-best, asymmetric information and redistributive concerns imply interference not only with myopic behaviors, but also with impatience-based behaviors. Finally, we introduce heterogeneity in individual productivity, and show that the optimal tax on the sin good depends on the size of the myopic group, on the reactivity of sin good consumption to tax changes, and on the extent to which sin good consumption is correlated with labor earnings.

Keywords: self control, risk taking, optimal taxation, sin goods, myopia, impatience, regrets.

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1 Introduction

Undoubtedly, the consumption of "sin goods" - i.e. goods that generate instantaneous satisfaction at the cost of worse future living conditions - is an old practice, probably as old as religions, morals or State laws aimed at regulating such activities. Drinking, smoking, having unprotected sex or committing crimes are probably as ancient as mankind. While sin good consumption is an old practice, it still prevails today, and to a significant extent, as illustrated by Figure 1, which shows the levels of yearly alcohol consumption per head and the prevalence of tobacco use around the world.[1]

Note that the inter-country heterogeneity on both dimensions is large: although some countries, like Ethiopia, exhibit very low levels of consumption of

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[1]Sources: World Health Organization, WHO Statistical Information System, retrived on 01/12/2008 at http://www.who.int/whosis/data/.

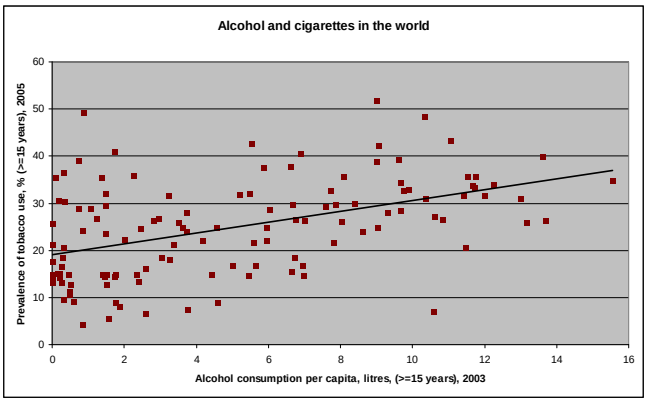

Figure 1: Alcohol and tobacco consumption in the world.

sin goods (less than 1 liter of alcohol per person, and only 4.3 per cent of smokers), consumption is far larger in other countries: Hungary, for instance, exhibits an alcoholic consumption of 13.6 liters per person per year, and a smoking prevalence of 39.6 per cent. But besides those large cross-country differentials, the drawing of a basic tendency line suggests that there seems to be, at least at first glance, some positive correlation between tobacco and alcohol consumptions, pointing to some form of "sin" lifestyle.

The existence of "unhealthy" lifestyles raises difficult policy issues for governments, as various empirical studies showed the negative influence of several sin goods on health and longevity, inviting some public intervention. For instance, the negative impact of cigarettes on health and longevity was shown by Doll and Hill (1950) and various subsequent studies (see Kaplan *et al*, 1987), while the negative influence of alcoholism was stressed by Poikolainen (1982).[2] Those findings can be confirmed by a quick look at aggregate data. In the case of smoking, Figure 2 shows a positive relationship between the consumption of cigarettes per person and the proportion of smoking-related deaths.[3]

Empirical evidence showing the negative impact of sin goods on health has made governments intervene, and, in particular, has motivated a heavy taxation of sin goods. Note, however, that the actual impact of sin goods taxation on sin goods consumption has been far from unambiguous. For instance, if one looks at the relationship between the taxation of tobacco products and the consumption of tobacco across countries, it is far from obvious that taxation contributes to reduce smoking behavior. As illustrated on Figure 3, the comparison of the total tax rates on tobacco products and the consumption of cigarettes in Europe for

[2] Note that demographic studies on the impact of sin goods do not concentrate exclusively on alcohol and tobacco, but focused recently on the impact of excessive or inadequate eating (Bender *et al*, 1998; Stamler, 1973).

[3] Sources: World Health Organization, Regional Office for Europe. Retrived on 01/12/2008 at http://data.euro.who.int/tobacco/.

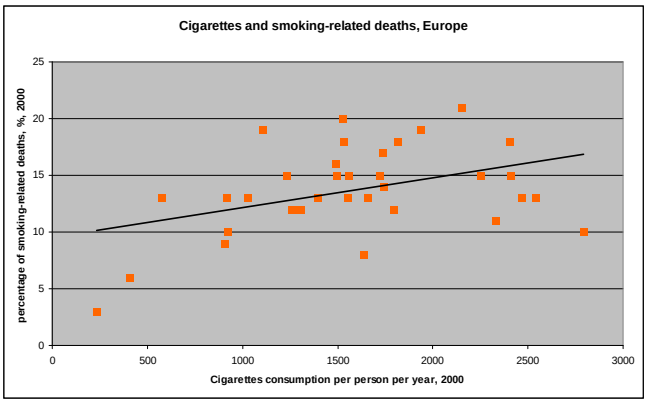

Figure 2: Cigarettes consumption and smoking-related deaths in Europe.

2005 does not yield the - expected - negative relationship between taxation and consumption of sin goods.[4] On the contrary, drawing a regression line yields a rather flat, but *positive* relationship between tobacco taxation and tobacco consumption, unlike what is expected.[5]

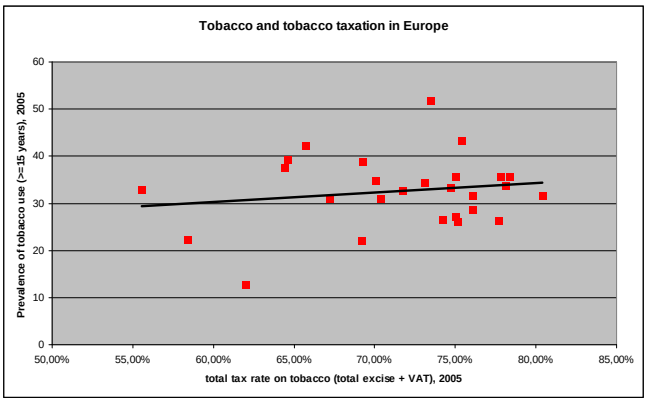

Figure 3: Tobacco products taxation and smoking prevalence in Europe.

Despite its simplicity, Figure 3 suffices, nonetheless, to highlight two crucial points. First, it suggests that, although all European governments apply high tax rates on tobacco products (between 55 and 80 per cent), there remains a

[4] Sources: World Health Organization, Regional Office for Europe. Retrived on 01/12/2008 at http://data.euro.who.int/tobacco/.

[5] However, such a positive relationship should not be interpreted as reflecting an incapacity of tobacco taxation to reduce smoking, as such a diagnosis could only be made in the light of cautious econometric analysis based on time series or panel data.

large smoking prevalence. Second, countries with the same tax rates on tobacco can achieve quite different smoking prevalence rates. The observed differentials are likely to reflect a large heterogeneity of lifestyles across countries, heterogeneity that is also likely to exists *within* countries, some people being more willing to consume sin goods than others, despite heavy taxation.[6]

Those two observations - a large average prevalence and a large heterogeneity despite heavy taxation - cannot be neglected when considering the issue of the optimal taxation of sin goods. Clearly, when examining the design of the optimal taxation of sin goods, one cannot avoid to ask to oneself what motivations lie behind the observed consumption of sin goods. Large prevalence rates may be due, for instance, to myopia, in the sense that agents tend to ignore the negative effects of sin goods consumption on future health.[7] But sin goods consumption may, on the contrary, be due to - fully rational - risk-taking behavior, some people considering that it is their own choice to take risks if they want so, while knowing all possible future consequences of their current actions.

Myopia and rational risk-taking are two distinct ways to explain the consumption of sin goods. Those two kinds motivations underlying one's behavior lead often to the same decisions, which amount to give little importance to the lagged detrimental effects of behaviors that bring instant gratification. Thus, sin goods consumption can be actually interpreted as resulting either from a myopia that prevented agents from anticipating the impact of their behavior on future welfare, or, alternatively, from a - fully rational - risk-taking behavior.

However, there is a big difference between those two motivations underlying risky behaviors. Myopic agents are characterized by a constant tension between their two selves, that of instant gratification and that of long term welfare. *Ex post*, when facing the negative effect of their past consumption, they regret their past decisions. Hence, they would welcome a government forcing them to behave with a balanced concern for both short-run and long-term interests. On the contrary, rational risk-takers do not experience such a duality, and, given the absence of regret, there is no reason for interfering with their choice.[8]

The coexistence of regretting and non-regretting sin good consumers has been emphasized by empirical studies on the prevalence of regrets among smokers. By means of a telephone survey of a representative sample of U.S. respondents, Slovic (2001) found that 85 % of adult smokers stated that they would not start smoking if they had to do it over again. In the U.K., Jarvis *et al* (2002) showed that about 83 % of smokers "would not start smoking if they had their time again". Finally, Fong *et al* (2004) showed, on the basis of a telephone survey in Canada, the U.S., the U.K. and Australia, that about 90 % of smokers agree with the statement "if you had to do it over again, you would not

[6] On the heterogeneity of smokers, see the recent study by Grignon (2007), who shows that inconsistent time preferences lead to a higher smoking prevalence *ceteris paribus*.

[7] Note that the widespread feeling of invulnerability among young adults and adolescents (see Quadrel et al, 1993) can be regarded as a form of myopia, that is, an ignorance of the consequences of one's actions.

[8] *Ex post*, the risk-taker would say "I gambled and I lost and I have no regrets." The myopic would say: "I was overwhelmed by my immediate self but I would have liked to be refrained from it in the name of my long term interest."

have started smoking". All this suggests that regrets, although widespread, are not expressed by all sin good consumers, confirming the diversity of attitudes towards sin goods consumption *ex post*: some risk-takers are myopic risk-takers with regrets, whereas others are merely regretless risk-takers.

That diversity of *ex post* attitudes towards past sin goods consumption behavior raises some important issues for the policy maker.[9] Clearly, even under the assumption that those behaviors do not create externalities on other members of society (which is not the case of smoking or unprotected sex), it is not obvious to see whether a government should interfere or not. And if yes, should it interfere in the same way towards myopic and rational individuals?

The goal of this paper is precisely to examine whether and how the government should interfere when individuals make choices that have long-term detrimental effects, but for different reasons. For that purpose, we develop a two-period model where the probability of survival from the first period of life (young adulthood) to the second period (old age) depends on sin good consumption when being young.[10] For simplicity, the population is assumed to be composed of three types of agents: (1) farsighted agents, (2) myopic risk-takers (with regrets *ex post*) and (3) rational risk-takers, who are guided here by their impatience (but without any regrets *ex post*).[11] Thus this paper characterizes the optimal taxation of sin goods in a context where heterogeneous agents can behave in a similar manner, but for different reasons.[12]

Whereas it could be argued, from an "old" paternalistic perspective, that both myopic and rational risk-taking agents do not behave in their best interests, we shall consider here that the different attitudes of agents *ex post* invite a distinct treatment of the two types of agents by the government, even though their behavior is exactly the same. By doing so, we are in conformity with what can be called a "new" paternalism, as opposed to the "old" paternalism. Indeed, old-style paternalism would recommend a similar treatment of rational risk-takers and myopics, on the grounds that risk-taking is "bad", whatever the underlying motivations are.[13] Against that view, new paternalism recommends a distinct treatment of rationals and myopics, taking the different motivations

[9] A good way to sort out the two types of risk-takers would be to observe their behavior in case of vote on a tax (or even a prohibition) on the sin good. The regretless risktakers would definitely vote for a tax equal to zero. In contrast, the regretful myopics, assuming that they are sophisticated, would vote for the tax (or even the prohibition), which they perceive as a commitment device (see Cremer *et al*, 2007).

[10] Note that, in the context of a two-period model with endogenous death after young adulthood, there is little room for regrets in period 2 (as one is then dead), so that regrets are assumed to take place at the end of period 1.

[11] We are well aware that having a high impatience and having a low risk-aversion are two distinct aspects of human personality. While these two traits can be both regarded as implying risk-taking behaviors, we shall here use the former rather than the latter, as this is more convenient for analytical purposes. But note that assuming agents with distinct risk-aversions would not affect our conclusions, as these only presuppose that a given risky behavior causes regrets among some people (type-2 agents), and no regret among others (type-3 agents).

[12] As such, this paper is a complement, on the normative side, of recent behavioral studies on risk-taking and myopia among young adults (see O'Donoghue and Rabbin, 2000).

[13] But such a paternalism seems hardly justifiable, as this relies on a questionable set of "good" and "bad" things established *independently* from what people think.

into account. From that point of view, governements should not interfere with rational risk-takers (as long as no externalities are involved), but there is some ground for intervening in the case of the myopics (i.e. their regrets).

This paper adopts the new paternalistic view, and characterizes the optimal public policy under a diversity of motivations. In the first best, a new paternalistic government should interfere only with myopic risky behaviors (to avoid regrets), but not with rational risky behaviors. Hence, the government should only induce myopic agents into behaving with concern for the long-term. However, in the second best, particularly when agents differ not only in terms of myopia but also of income, asymmetric information and redistributive concerns may imply interference with rational risky behaviors as well.

At this stage of our inquiry, it may be worth underlining some restrictions of the present study. First, we shall leave aside externalities associated with the consumption of sin goods, and concentrate on sin goods that only affect agent's own welfare. Secondly, this study shall not consider the problem of addiction.[14] Note, however, that the addiction motive - past choices being irreversible - can be interpreted as a kind of myopia, because the anticipation of future addiction would probably, for a farsighted agent, prevent him from consuming addictive sin goods. Third, we shall limit the instruments of the government to a tax and transfer policy, and leave aside other forms of intervention.[15]

The rest of this paper is organized as follows. Section 2 develops the basic model, where agents of three types - farsighted, myopic and impatient - choose their consumption of a sin good (impatience being taken as a proxy for risk taking behavior). Section 3 characterizes the first-best optimum, and studies its decentralization. The second-best problem is examined in Section 4. Finally, Section 5 adds a second source of heterogeneity - productivity - and studies the optimal linear taxation problem. Conclusions are drawn in Section 6.

2 The basic model

2.1 Environment

We consider a population of agents who live, at best, two periods. The first period is lived with certainty, whereas the second period is lived with a probability π. That probability of survival depends negatively on the consumption of a sin good, denoted y, through the survival function

$$\pi = \pi(y)$$

with $\pi'(y) < 0$ and $\pi''(y) > 0$.

In the first period, agents allocate their (fixed) earnings between current consumption, c, saving, s, and the sin good y, which brings immediate utility but has a negative effect on the probability of survival to the second period π.

[14] On this, see Orphanides and Zervos (1995), Gruber and Koszegi (2000, 2002) and Suranovic *et al* (1999).

[15] Alternative interventions include: education, information campaigns, age restrictions, etc.

The society is composed of three types of agents:[16]

- Type-1 agents are *farsighted*;
- Type-2 agents are *myopic*, but with a dual self: they would like, *ex post*, to have been forced to behave as farsighted (i.e. regrets *ex post*);
- Type-3 agents are *impatient*; they do not care about the future (without any regret *ex post*).

Note that the impatience of the third type of agents is only an analitycally convenient way to express rational risk-taking.

In terms of the time preference factor α_i weighting the second-period utility of agents, the factors of type-2 and type-3 agents α_2 and α_3 cannot be distinguished on the basis of the first-period choice. The only thing we know is that $\alpha_2 = \alpha_3 < \alpha_1$. Throughout this paper, we shall, for simplicity, assume that type-2 and type-3 agents act in such a way that they do not assign any weight to the second period: $\alpha_2 = \alpha_3 = 0$.

2.2 The laissez-faire

An agent of type $i = 1, 2, 3$ chooses the first-period and second-period consumptions of the normal good c_i and d_i, as well as the consumption of the sin good y_i, in such a way as to maximize his expected lifetime utility subject to his budget constraint, the utility of death being normalized to zero. It is assumed, for simplicity, that a perfect annuity market exists, and that there is a zero interest rate, so that the return on savings is $1/\pi_i$. Moreover, individual utility is assumed to be quasi linear in first-period consumption for conveniency.

Hence, the problem of each agent of type i can be written as the maximization of

$$\max_{c_i, d_i, y_i} c_i + v(y_i) + \alpha_i \pi(y_i)\, u(d_i)$$

subject to the constraint

$$c_i + y_i + d_i \pi(y_i) \leq w$$

where $v(y_i)$ is the utility derived from the consumption of the sin good, while w is the income endowment of the agent.

The FOCs yield

$$\begin{aligned} 1 &= \mu \\ \alpha_i u'(d_i) &= \mu \\ v'(y_i) + \alpha_i \pi'(y_i)\, u(d_i) &= \mu(1 + \pi'(y_i)\, d_i) \end{aligned}$$

[16] We shall denote by n_i the number of agents of type $i = 1, 2, 3$.

Given that $\alpha_2 = \alpha_3 = 0$, we have

$$\begin{aligned} u'(d_1) &= \frac{1}{\alpha_1} \\ d_2 &= d_3 = 0 \\ v'(y_1) &= 1 - \pi'(y_1)\,\alpha_1\,[u(d_1) - u'(d_1)d_1] > 1 \\ v'(y_2) &= v'(y_3) = 1 \end{aligned}$$

From this, it is not difficult to see that agents of types 2 and 3 save nothing, as the second period does not matter for them, contrary to type-1 agents, who save some resources. Moreover, agents of types 2 and 3 consume also the same amount of sin good $y_2 = y_3$, which is higher than the one consumed by type-1 agents. The reason why $y_1 < y_2 = y_3$ is that type-1 agents care about the negative impact of the sin good on the probability of survival, unlike type-2 and type-3 agents, who do not care, *ex ante*, about period 2. As a consequence, agents of type 1, by choosing a lower consumption of sin good, have also a higher survival probability than type-2 and type-3 agents, who have a low and identical survival probability: $\pi_1 > \pi_2 = \pi_3$.

Note, however, that although agents of types 2 and 3 make, under $\alpha_2 = \alpha_3$, exactly the same choices, the motivations underlying those choices differ. Agents of type 3 are fully rational and consistent: at the end of period 1, when they face the level of the survival probability $\pi_3 < \pi_1$, they express no regret: this is the mere result of their choice and their impatience, to which they still adhere (in other words, they would be willing to act again in the same way if some time-traveling machine existed). On the contrary, agents of type 2, when facing $\pi_2 = \pi_3 < \pi_1$, express regrets: their myopia did not allow them to see the impact of sin good consumption on the survival probability, and, *if they could go back to their youth*, they would act differently from what they did, and would opt for a lower sin good consumption.

3 The first-best problem

3.1 The first-best optimum

Let us now consider the problem faced by a utilitarian social planner, who wants to maximize social welfare. The problem of the planner can be written as the choice of c_i, d_i and y_i for $i = 1, 2, 3$. The social planner does not want to interfere with the choices of the agents of types 1 and 3, as those agents are acting in a consistent way, that is, without any regret. On the contrary, the social planner would like to correct the myopia of agents of type 2.

As a consequence of those two concerns, the social planner will, in his optimization problem, fix the time preference parameters of the different agents, denoted, for simplicity, by β_i, as follows. The planner fixes β_1 at a level equal to the level of α_1, and the parameter β_3 at the level of α_3 (i.e. $\beta_3 = \alpha_3 = 0$). However, the social planner fixes β_2 at a level different from α_2. The reason why the social planner acts in that way is that he would like to prevent type-2

agents from regretting their choices *ex post*. Hence, in order to avoid a situation where type-2 agents regret their past choices and envy type-1 agents at the end of the first period, the planner fixes, in his problem, $\beta_2 = \beta_1 > \alpha_2$.

The Lagrangian of that problem can thus be written as

$$\pounds = \sum_{i=1,2,3} n_i \left\{ V\left[c_i + v(y_i) + \beta_i \pi\left(y_i\right) u(d_i)\right] - \mu\left[c_i + y_i + \pi(y_i) d_i - w\right] \right\}$$

where $V(.)$ is a strictly concave transform, while μ is the Lagrange multiplier associated with the budget constraint.

The FOCs yield

$$\begin{aligned} V'(x_i) &= \mu \\ V'(x_i)\beta_i \pi\left(y_i\right) u'(d_i) &= \mu\pi(y_i) \\ V'(x_i)\left[v'(y_i) + \beta_i \pi'(y_i) u(d_i)\right] &= \mu(1 + \pi'(y_i) d_i) \end{aligned}$$

where x_i denotes the argument of the transform $V(.)$. Note that all types of agents have here the same expected lifetime utility, as $x_1 = x_2 = x_3$.

Hence, given that $\beta_3 = \alpha_3 = 0$, we have

$$\begin{aligned} u'(d_i) &= \frac{1}{\beta_i},\ i = 1, 2 \\ d_3 &= 0 \\ v'(y_i) &= 1 - \beta_i \pi'(y_i)\left[u(d_i) - u'(d_i) d_i\right],\ i = 1, 2 \\ v'(y_3) &= 1 \end{aligned}$$

so that

$$\begin{aligned} d_1 &= d_2 > d_3 = 0 \\ y_1 &= y_2 < y_3 \end{aligned}$$

Thus, in the first best optimum, type-3 agents do not consume anything in the second period, contrary to types 1 and 2. Both types 1 and 2 consume a small amount of sin goods, while type 3 consumes a higher amount. But resources are distributed in such a way that the expected lifetime utility is, from the point of view of the social planner, equalized across all types, as we have $x_1 = x_2 = x_3$.

3.2 Decentralization

To see how the social optimum can be decentralized, let us now compare the FOCs under laissez-faire with the ones under the first-best.

Clearly, the social planner does not need to interfere with the choices of agents of type 1, as there is a perfect identity between the FOCs under laissez-faire and at the first-best for that type of agents. The same is also true for agents of type 3. However, the planner must interfere with the choice of type-2 agents, and at two levels: the savings decision and the sin goods consumption.

Actually, the laissez-faire level of second-period consumption, equal to zero, is inferior to the first-best level, which is strictly positive, because $\beta_2 > \alpha_2 = 0$. Thus, in order to decentralize the first-best optimum, the government must force type-2 agents to pay a tax T_2 in the first period, and uses this to finance a pension P_2 in the second period, which is given only in case of survival. Provided T_2 and P_2 are equal to[17]

$$\begin{aligned} T_2 &= \pi(y_2)\, d_2 \\ P_2 &= d_2 \end{aligned}$$

this forced pension system for type-2 agents induces the first-best consumption path. Indeed, type-2 agents still choose to have no savings under that system, but their second-period consumption is now equal to the pension P_2. Note, however, that this pension system does not affect the consumption of the sin good, as we have quasi-linear utility in y. Thus the pension system $\{T_2, P_2\}$ is necessary but not sufficient for the decentralization of the optimum.

Regarding the decentralization of the first-best optimum of sin goods consumption, let us notice that the FOC for the first-best level of y_2 is

$$v'(y_2) = 1 - \pi'(y_2)\, \beta_2 \left[u(d_2) - u'(d_2) d_2\right]$$

whereas, under a tax θ_2 on y_2, the laissez-faire level of sin goods is characterized by

$$v'(y_2) = 1 + \theta_2$$

Hence, the first-best level of sin good consumption can be decentralized by means of a tax θ_2 equal to

$$\theta_2 = -\pi'(y_2)\, \beta_2 \left[u(d_2) - u'(d_2) d_2\right] > 0$$

where d_2 and y_2 take their first-best levels. This tax depends positively on β_2, and is thus increasing in the degree of myopia of the agent. The tax depends also on the sensitivity of the survival probability to the consumption of y.

Thus, under the forced pension system $\{T_2, P_2\}$ and the tax θ_2, type-1 and type-2 agents have, under laissez-faire, exactly the same allocations. This will prevent type-2 agents from envying type-1 agents *ex post*.

Finally, note that, in order to achieve the equality of marginal social utilities, the implementation of the first-best may also require some lump sum transfers across groups 1, 2 and 3. However, given that those three types of agents have the same endowment, one could argue that the role of the government should be restricted to the (forced) pension system $\{T_2, P_2\}$ and the Pigouvian tax θ_2 on the sin good, in the name of responsibility.

[17] Note that d_2 and y_2 take here their first-best levels.

4 The second-best problem

4.1 The second-best optimum

Let us now consider the second-best problem, in which the social planner cannot observe the types of agents. Under such a limited observability of types, it is likely that type-2 agents will pretend to be type-3 agents, in order to escape from the forced savings system proposed by the planner. Indeed, even though this forced pension system is built for the good of type-2 agents, those agents cannot realize, *ex ante*, that such a system would be good for them, and might prefer pretending to be of type-3.

The Lagrangian of the second-best problem can be written as

$$\begin{aligned}\mathcal{L} &= \sum_{i=1,2,3} n_i \left\{V\left[c_i + v(y_i) + \beta_i \pi\left(y_i\right) u(d_i)\right] - \mu\left[c_i + y_i + \pi(y_i) d_i - w\right]\right\} \\ &\quad + \lambda\left[c_2 + \alpha_2 \pi\left(y_2\right) u(d_2) + v(y_2) - c_3 - \alpha_2 \pi\left(y_3\right) u(d_3) - v(y_3)\right]\end{aligned}$$

where λ is the Lagrange multiplier associated with the incentive compatibility constraint.

As above, the social planner fixes, in the social objective function, $\beta_1 = \alpha_1$, $\beta_3 = \alpha_3$, and $\beta_2 > \alpha_2$, in such a way as to correct for type-2 agents' myopia.[18] Note, however, that, within the incentive compatibility constraint, the time preference factor used consists of the parameter α_2, i.e. the degree of farsightedness of agents of type 2 at the time of their decision. The intuition behind this is that, when deciding whether they pretend to be of type 3 or not, type-2 agents are still subject to their myopia (as for their other decisions).

The FOCs yield

$$\begin{aligned}\left(V'(x_1) - \mu\right) n_1 &= 0 \\ \left(V'(x_2) - \mu\right) n_2 + \lambda &= 0 \\ \left(V'(x_3) - \mu\right) n_3 - \lambda &= 0 \\ \left(V'(x_1)\beta u'(d_1) - \mu\right) n_1 &= 0 \\ \left(V'(x_2)\beta u'(d_2) - \mu\right) n_2 &= 0 \\ d_3 &= 0 \\ V'(x_1)\left[v'(y_1) + \beta\pi'(y_1)u(d_1)\right] - \mu(1 + \pi'(y_1)d_1) &= 0 \\ n_2\left[V'(x_2)\left[v'(y_2) + \beta\pi'(y_2)u(d_2)\right] - \mu(1 + \pi'(y_2)d_2)\right] + \lambda v'(y_2) &= 0 \\ n_3\left[V'(x_3)v'(y_3) - \mu\right] - \lambda v'(y_3) &= 0\end{aligned}$$

From the first three FOCs, we have

$$\begin{aligned}V'(x_1) &= \mu \\ V'(x_2) &= \mu - \frac{\lambda}{n_2} \\ V'(x_3) &= \mu + \frac{\lambda}{n_3}\end{aligned}$$

[18] We assume also, for simplicity, that $\alpha_2 = \alpha_3 = 0$ as above, and that $\beta_1 = \beta_2 = \beta$.

Those equalities imply: $x_3 < x_1 < x_2$. Type-2 agents have, at the second-best, a higher utility than type-1 and type-3 agents. Given that this was not the case at the first-best, where $x_3 = x_1 = x_2$, it follows that type-2 agents tend to benefit from asymmetric information at the expense of type-3 agents. Substituting those expressions in the FOCs for savings yields

$$\begin{aligned} u'(d_1) &= \frac{1}{\beta} \\ u'(d_2) &= \frac{1}{\left(1 - \frac{\lambda}{\mu n_2}\right)\beta} \\ d_3 &= 0 \end{aligned}$$

From which we have: $d_3 < d_2 < d_1$. Note that type-2 agents have here a lower second-period consumption than under the first-best, to an extent that depends on the curvature of the utility function. This change with respect to the first-best comes from the incentive compatibility constraint. Given that type-2 agents do not see, *ex ante*, the relevancy of second-period consumption, the social planner proposes a lower d_2 than at the first-best, to prevent them from pretending to be of type 3.

Regarding the consumption of sin goods, we have

$$\begin{aligned} v'(y_1) &= 1 - \beta\pi'(y_1)\left[u(d_1) - u'(d_1)d_1\right] \\ v'(y_2) &= 1 - \beta\pi'(y_2)\left(1 - \frac{\lambda}{\mu n_2}\right)\left[u(d_2) - u'(d_2)d_2\right] \\ v'(y_3) &= 1 \end{aligned}$$

Thus we have $y_1 < y_2 < y_3$. Hence, whereas, at the first-best, type-1 and type-2 agents were treated similarly, this is no longer the case here, as type-2 agents enjoy a higher level of sin good consumption than type-1 agents. Here again, this change is due to the incentive compatibility constraint.

Comparing these FOCs with the first-best FOCs, we can see that

$$\begin{aligned} y_1^{FB} &= y_1^{SB} \\ y_2^{FB} &< y_2^{SB} \\ y_3^{FB} &= y_3^{SB} \end{aligned}$$

Type-1 agents consume, at the second-best optimum, the same sin good quantity as in the first-best. However, the second-best optimum involves a higher consumption of sin goods for type-2 agents, in such a way as to prevent them from pretending to be of type 3. Note that the sin good consumption of type-3 agents is the same as in the first-best.

But this does not imply that type-3 agents are not affected by the introduction of the incentive compatibility constraint. Actually, in comparison with the first-best, type-3 are made worse off, while type-1 agents keep the same level of

utility, whereas type-2 agents are made better off:

$$\begin{aligned} x_1^{FB} &= x_1^{SB} \\ x_2^{FB} &< x_2^{SB} \\ x_3^{FB} &> x_3^{SB} \end{aligned}$$

Thus the social planner, by preventing type-2 agents from pretending to be of type 3, offers them a basket that will, at the end of the day, make these better off than type-1 and type-3 agents. The latter are the victims of this, as type-3 agents see their welfare falling in comparison with the first-best optimum. Actually, given that type-3 agents have a lower utility, but keep the same sin good consumption and the same saving as in the first-best, it must be the case that these enjoy a lower first-period consumption than at the first-best. Hence reducing the first-period consumption of type-3 agents appears to be the strategy adopted by the social planner to solve the incentive problem.

4.2 Decentralization

As in the first-best, the decentralization of the second-best involves a forced savings system for type-2 agents, that is, a first period tax T_2 and a second-period pension P_2 such that

$$\begin{aligned} T_2 &= \pi\left(y_2\right) d_2 \\ P_2 &= d_2 \end{aligned}$$

where d_2 and y_2 take their second-best levels. Given that $y_2^{SB} > y_2^{FB}$ and $d_2^{SB} < d_2^{FB}$, it is not difficult to see that the tax and the pension will be here of smaller size in comparison with the first-best levels:

$$\begin{aligned} T_2^{SB} &< T_2^{FB} \\ P_2^{SB} &< P_2^{FB} \end{aligned}$$

The decentralization of the second-best requires also a tax on the sin good for type-2 agents, but this tax will now take a lower level than under the first-best. Indeed, the FOC for optimal second-best y_2 is

$$v'(y_2) = 1 - \beta\pi'(y_2)\left(1 - \frac{\lambda}{\mu n_2}\right)\left[u(d_2) - u'(d_2)d_2\right]$$

Comparing this with the FOC under laissez-faire yields an optimal tax θ_2^{SB}:

$$\theta_2^{SB} = -\pi'\left(y_2\right)\beta\left(1 - \frac{\lambda}{\mu n_2}\right)\left(u(d_2) - u'(d_2)d_2\right) > 0$$

Given that $1 - \frac{\lambda}{\mu n_2} < 1$, we have

$$\theta_2^{SB} < \theta_2^{FB}$$

Thus the second-best tax on the sin good is smaller than the first-best tax, as the incentive-compatibility constraint tends to counteract the correction of the myopia: in order to prevent type-2 agents from pretending to be of type-3, we have to weaken the tax on the sin good.

Finally, as in the first-best, those policies $\{T_2, P_2, \theta_2\}$ do not suffice to decentralize the social optimum. Some lump sum transfers across agents are also needed, to satisfy the above FOCs. We shall not explore here those transfers in details, but it is clear that, in the light of what was stressed above, type-3 agents tend, in comparison with the first-best, to transfer more resources to type-2 agents, as their first-period consumption is reduced with respect to the first-best, whereas the opposite holds for type-2 agents.

5 Double heterogeneity and linear taxation

In the previous sections, we assumed uniform incomes, which allowed us to obtain a simple and intuitive tax formula on the sin good. The analysis was restricted to a simple self-selection constraint, which prevents the myopic from mimicking the rational risk-taker. However, it is clear that if there was not only a heterogeneity regarding individual attitudes towards sinful consumption, but, also, heterogeneous earning capacities, then the design of the optimal tax on sin goods would be more complicated. This section considers that problem.

For that purpose, we introduce here differential wages w_i. Thus, each individual variable will now be indexed by the letter i for the wage rate w_i, and by letters $j = 1, 2, 3$ for farsightedness, myopia (with regrets) and impatience (without regrets).

In order to make the analysis more tractable, we shall here focus on a linear taxation scheme, with non-individualized taxation instruments. Note that, as type-2 agents save nothing under the laissez-faire, a standard subsidy on savings cannot help decentralizing the optimum, as it is ineffective in the context of a corner solution under the laissez-faire. Hence, we shall, throughout this section, use the following taxation instruments: a flat tax τ on earnings, a demogrant a, a tax θ on the sin good, and a pension benefit P.

5.1 The agents' decisions

Under a quadratic disutility of labor, the problem of an agent of type ij is to maximize:

$$w_i \ell_{ij} (1-\tau) + a - s_{ij} - y_{ij} (1+\theta) - \frac{\ell_{ij}^2}{2} + v(y_{ij}) + \alpha_{ij} \pi(y_{ij}) u\left(\frac{s_{ij}}{\pi(y_{ij})} + P\right)$$

where ℓ_{ij} denotes the labor of agents of type ij, while α_{ij} denotes his actual level of farsightedness. As above, we shall assume that $\alpha_{i1} > 0$ and $\alpha_{i2} = \alpha_{i3} = 0$.

From individual optimization, we have

$$\begin{aligned}
\ell_{ij} &= w_i(1-\tau),\ j=1,2,3 \\
s_{i1} &= s_{i1}(\tau, a, \theta, P) \\
s_{ij} &= 0,\ j=2,3 \\
y_{ij} &= y_{ij}(\tau, a, \theta, P),\ j=1,2,3
\end{aligned}$$

Note that the labour supply decision does not depend on whether the agent is farsighted, myopic or impatient, but depends only on the wage level and on the tax rate. Here again, type-2 and type-3 agents do not save, whereas the savings of type-1 agents is a function of the policy instruments.

5.2 The planner's problem

As above, we use α_{ij} for the actual level of farsightedness and β_{ij} for the time preference factor used by the social planner. We assume that $\alpha_{i2} = \alpha_{i3} = \beta_{i3} = 0$ and that $\alpha_{i1} = \beta_{i1} = \beta_{i2}$.

We write the problem of the social planner by means of the following Lagrangian:

$$\begin{aligned}
\pounds &= \sum n_{ij} V \left[\frac{w_i^2 (1-\tau)^2}{2} + a - s_{ij} - y_{ij}(1+\theta) + v(y_{ij}) \right. \\
&\quad \left. + \beta_{ij} \pi(y_{ij})\, u\left(\frac{s_{ij}}{\pi_{ij}} + P \right) \right] + \mu \sum n_{ij} \left(\tau(1-\tau) w_i^2 + \theta y_{ij} - a - \pi(y_{ij}) P \right)
\end{aligned}$$

where n_{ij} is the proportion of individuals of type j with productivity w_i, the optimal labor supply $\ell_{ij} = w_i(1-\tau)$ is substituted in, and μ is the Lagrange multiplier associated with the revenue constraint.

From the FOCs for an interior maximum and using the envelope theorem, we obtain the following FOCs, for respectively a, τ, P and θ:

$$\sum n_{ij} V'(x_{ij}) + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial y_{i2}}{\partial a} + \mu \sum n_{ij} \left(\theta \frac{\partial y_{ij}}{\partial a} - 1 - \pi'(y_{ij}) \frac{\partial y_{ij}}{\partial a} P \right) = 0$$

$$-\sum n_{ij} V'(x_{ij})\, w_i^2 (1-\tau) + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial y_{i2}}{\partial \tau} + \mu \sum n_{ij} \left[(1-2\tau) w_i^2 + \theta \frac{\partial y_{ij}}{\partial \tau} - \pi'(y_{ij}) \frac{\partial y_{ij}}{\partial \tau} P \right] = 0$$

$$\sum n_{ij} V'(x_{ij})\, \beta_{ij} \pi(y_{ij})\, u'(d_{ij}) + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial y_{i2}}{\partial P} + \mu \sum n_{ij} \left[\theta \frac{\partial y_{ij}}{\partial P} - \pi'(y_{ij}) \frac{\partial y_{ij}}{\partial P} P - \pi(y_{ij}) \right] = 0$$

$$-\sum n_{ij} V'(x_{ij})\, y_{ij} + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial y_{i2}}{\partial \theta} + \mu \sum n_{ij} \left(y_{ij} + \theta \frac{\partial y_{ij}}{\partial \theta} - \pi'(y_{ij}) \frac{\partial y_{ij}}{\partial \theta} P \right) = 0$$

where $\upsilon_{i2} \equiv \beta_{i2} \pi'(y_{i2}) u(d_{i2}) < 0$ denotes the utility loss that is due to the myopia of type-2 agents.

In order to interpret those conditions, we shall look at the effects of alternative pairs of instruments, holding the others equal to 0. For example, we

consider the pairs (τ, a), (P, a) and (θ, a), a variation in one policy instrument being compensated by a change in the other instrument in such a way as to maintain the budget equilibrium.

For the pair (τ, a), the compensated Lagrangian can be defined as

$$\frac{\partial \tilde{\pounds}}{\partial \tau} \equiv \frac{\partial \pounds}{\partial \tau} + \frac{\partial \pounds}{\partial a}\frac{da}{d\tau} = \frac{\partial \pounds}{\partial \tau} + \frac{\partial \pounds}{\partial a}(1-2\tau)\sum n_{ij} w_i^2$$

where the second term accounts for the effect of a change in the tax rate τ on the first-period demogrant, under the government's budget equilibrium constraint.

Substituting for the above FOCs and equalizing to zero yields

$$\begin{aligned}\frac{\partial \tilde{\pounds}}{\partial \tau} &= -(1-\tau)\sum n_{ij} V'(x_{ij})\left[w_i^2 - \sum n_{ij} w_i^2\right] \\ &\quad -\tau \sum n_{ij} V'(x_{ij}) \sum n_{ij} w_i^2 + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial \tilde{y}_{i2}}{\partial \tau} \\ &= 0\end{aligned}$$

where $\partial \tilde{y}_{i2}/\partial \tau$ denotes the effect of a change of τ on the sin good consumption of type-2 agents, when that change is compensated by a change of the demogrant a in such a way as to maintain the government's budget equilibrium.

Regarding the pair (P, a), the compensated Lagrangian can be defined as

$$\frac{\partial \tilde{\pounds}}{\partial P} \equiv \frac{\partial \pounds}{\partial P} + \frac{\partial \pounds}{\partial a}\frac{da}{dP} = \frac{\partial \pounds}{\partial P} - \frac{\partial \pounds}{\partial a}\sum n_{ij}\pi(y_{ij})$$

where the second term accounts for the effect of a change in the pension P on the first-period demogrant, under the government's budget equilibrium.

Substituting for the above FOCs and equalizing to zero yields

$$\begin{aligned}\frac{\partial \tilde{\pounds}}{\partial P} &= \sum n_{ij} V'(x_{ij})\, \beta_{ij} \pi(y_{ij})\, u'(d_{ij}) - \sum n_{ij} V'(x_{ij}) \sum n_{ij} \pi(y_{ij}) \\ &\quad + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial \tilde{y}_{i2}}{\partial P} - \mu \sum n_{ij} \pi'(y_{ij})\, P \frac{\partial \tilde{y}_{ij}}{\partial P} \\ &= 0\end{aligned}$$

where $\partial \tilde{y}_{ij}/\partial P$ denotes the effect of a change of P on the sin good consumption of agents of type ij, when that change is compensated by a change of the demogrant a in such a way as to maintain the government's budget equilibrium.

In the case of the pair (θ, a), the compensated Lagrangian is

$$\frac{\partial \tilde{\pounds}}{\partial \theta} \equiv \frac{\partial \pounds}{\partial \theta} + \frac{\partial \pounds}{\partial a}\frac{da}{d\theta} = \frac{\partial \pounds}{\partial \theta} + \frac{\partial \pounds}{\partial a}\sum n_{ij} y_{ij}$$

where the second term accounts for the effect of a change in the tax θ on the first-period demogrant, under the government's budget constraint.

Substituting for the above FOCs and equalizing to zero yields

$$\begin{aligned}\frac{\partial \tilde{\pounds}}{\partial \theta} &= -\sum n_{ij} V'(x_{ij})\, y_{ij} + \sum n_{ij} V'(x_{ij}) \sum n_{ij} y_{ij} \\ &\quad + \sum n_{ij} V'(x_{ij})\, \upsilon_{i2} \frac{\partial \tilde{y}_{i2}}{\partial \theta} + \mu\theta \sum n_{ij} \frac{\partial \tilde{y}_{ij}}{\partial \theta} \\ &= 0\end{aligned}$$

where $\partial \tilde{y}_{ij}/\partial\theta$ denotes the effect of a change of θ on the sin good consumption of type-2 agents, when that change is compensated by a change of the demogrant a in such a way as to maintain the government's budget equilibrium.

With those simplifications, we can now obtain a formula for each tax instrument, keeping in mind that the other instruments are, in each case (except the demogrant), set equal to zero.[19]

$$\tau = \frac{-cov\left(V'(x), w^2\right) + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial \tilde{y}_{i2}}{\partial \tau}}{-cov\left(V'(x), w^2\right) + EV'(x) E w^2}$$

$$P = \frac{-cov\left(V'(x), \pi\right) - \sum_{2,3} n_{ij} V'(x_{ij}) \pi(y_{ij}) \left(1 - \beta_{ij} u'(P)\right) + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial \tilde{y}_{i2}}{\partial P}}{-\mu E \pi'(y) \frac{\partial \tilde{y}}{\partial P}}$$

$$\theta = \frac{-cov\left(V'(x), y\right) + \sum n_{i2} V'(x_{i2})\, \upsilon_{i2} \frac{\partial \tilde{y}_{i2}}{\partial \theta}}{-\mu E \frac{\partial \tilde{y}}{\partial \theta}}$$

In order to interpret the formulae of the optimal tax instruments τ, P and θ, let us first examine the structure that is common to all those expressions.

The denominators of those expressions reflect the efficiency effect of the tax instrument: for τ, the effect of τ on aggregate labor supply; for P, the effect of pensions on longevity, and, for θ, the effect of the tax on the sinful consumption. Obviously, the larger those effects are, the lower the tax instruments should be *ceteris paribus*.

In the numerators, the covariance terms reflect the equity effect of the tax instrument. The covariance terms are likely to be negative, and are closely linked to the concavity of $V(x)$. Actually, we expect agents with a higher x to be also more productive, to live longer, and to consume more sin good (even though this latter point is more debatable). This leads to negative covariance terms, which tend, in the present framework, to raise the optimal levels of the tax instruments. The higher the covariance terms are in absolute value, and the larger the optimal values of tax instruments are, everything else being unchanged.

The terms including υ_{i2} - the utility loss due to myopia - at the numerators indicate how the tax instruments induce myopic agents to choose the right amount of sin good y. Those terms depend on the effect of a rise in the instrument on sin good consumption when this is compensated by a change in the transfer a in such a way as to maintain the budget equilibrium. The sign of

[19] We use here the E operator for expected values.

those compensated changes $\partial\tilde{y}_{i2}/\partial\theta$, $\partial\tilde{y}_{i2}/\partial\tau$ and $\partial\tilde{y}_{i2}/\partial P$ is likely to be negative, but it is not easy to see how large those compensated changes are. Note that the size of the terms including υ_{i2} depends also on how sizeable the type-2 group is: the larger that group is, the larger the social planner's concern for those agents is, and thus the more the optimal tax instruments will reflect the correction of type-2 agents' myopia.

Finally, there is the second term of the numerator of the P formula, which has to be distinguished between types 2 and 3. For type-3 agents, $\beta_{i3} = 0$, and thus this term is positive, pushing P down. For type-2, it is negative ($\beta_{i2} > 0$), and pushes P up.

5.3 Which uniform tax on sin goods?

Having described the major features of the optimal levels of τ, P, and θ, let us now investigate what those formulae tell us for the optimal taxation of sin goods in our real market economies. As shown above, the optimal level of sin goods taxation depends on three major determinants: (1) how reactive average sin good consumption is to the tax (i.e. the denominator); (2) how large the correction of the myopia induced by the tax is (i.e. the terms including υ_{i2}); (3) how correlated sin good consumption and individual welfare are (i.e. the covariance term).

Regarding point (1), sin good consumption seems, in general, relatively little elastic to changes in the tax, implying a low denominator, which would support the necessity of a large tax θ. This intuition for a low elasticity is confirmed by the literature on the price elasticity of the demand for cigarettes, which yields estimations ranging between -0.3 and -0.5. For instance, Lewit and Coate (1982) estimated an (uncompensated) price elasticity of -0.42, while Chaloupka and Wechsler (1997) estimated an (uncompensated) price elasticity of -0.58.[20] Those relatively low elasticity values support, from the point of view of efficiency, a large taxation. Note, however, that if myopic agents are also little sensitive to sin good taxation, then, by point (2), it would not make sense to tax sin good too much, which reduces the optimal θ *ceteris paribus*. The little reactivity of sin good consumption to taxation seems thus to yield ambiguous results in terms of sin good taxation: on the one hand, the low elasticity makes the taxation of that good efficient, but, on the other hand, the perspectives of lowering, through the tax, the welfare loss due to myopia are also reduced.

Moreover, regarding the second term of the numerator of θ [i.e. point (2)], it appears that the optimal tax on the sin good is also larger if a large proportion of the population suffers from myopia (i.e. a large n_{i2}). In other words, the extent to which sin good consumers formulate regrets or not *ex post* affects the optimal tax to a large extent. As stressed in Section 1, the proportion of regret-makers is, in the light of various studies, especially large among smokers - about 80 to

[20] More recently, Grignon (2007) finds, in France, a price elasticity of starting smoking equal to 0.203, meaning that higher prices tend to delay smoking initiation less than proportionally. The population having hyperbolic time preferences exhibits a slightly larger price elasticity of staring smoking, equal to 0.347.

90 % of the smokers population - (see Slovic, 2001; Jarvis *et al*, 2002; Fong *et al*, 2004). Such a large proportion of smokers with regrets supports a large n_{i2}, and, thus, as far as cigarette is concerned, a large tax rate. Under such a high proportion of regret-makers (i.e. type-2 agents), the tax on cigarettes would be mainly driven by the task of reducing the welfare burden from myopia.

Finally, it should be stressed that point (3) may tend to play in the opposite direction, that is, towards a lower taxation of the sin good. Clearly, if sin goods are mainly consumed by agents with a low productivity, then the term $cov\left(V'\left(x\right),y\right)$ is positive, which would support a subsidization rather than a taxation of sin goods in the name of equity concerns, and play against the other concerns defended above. If one takes, once again, the example of cigarettes, the existing literature supports that smoking prevalence is clearly decreasing with the education level, and, thus, with productivity. For instance, in the U.S. (2007), the lowest rates of smoking prevalence are found among undergraduates (11.4 %) and graduates (6.2 %).[21] Moreover, independently from education, the individuals whose earnings are below the federal poverty lines exhibit also a larger average smoking prevalence than the ones whose earnings are above the poverty line (28.8 % against 20.3 %).[22] All those figures suggest that $cov\left(V'\left(x\right),y\right)$ might be positive, which would tend to lower, *ceteris paribus*, the optimal tax on cigarettes.

All in all, the design of the optimal uniform tax on sin goods is not trivial, as there seem to exist tensions between, on the one hand, efficiency concerns and myopia reduction, which support a heavy taxation of the sin good, and, on the other hand, equity concerns, which tend to lower the optimal tax rate.

6 Conclusions

This paper aimed at studying the optimal taxation of sin goods, in an economy where sin good consumption follows from different motivations, but where externalities are absent. In general, there exist, in such an economy, at least three justifications for a uniform treatment of sin good consumers by governments: (1) old paternalism (sin goods are "bad" for everyone); (2) Good Samaritan effect (the State anticipates that it will have, *in fine*, to help the persons in need, whatever their responsibility is); (3) informational imperfection at the government's level (impossibility for policy-makers to distinguish between different motivations behind a given choice). The present study focused on the third justification, and left the two other ones aside.

We showed that informational imperfection does not suffice, on its own, to justify a uniform treatement of all sin goods consumers. For that purpose, we considered, in Section 2, a heterogeneous population of agents, some agents being farsighted, others being risk-takers with regrets, while others are risk-takers without regrets. Under the laissez-faire, a high consumption of sin goods may result from various concerns, which cannot be regarded as equivalent by

[21] Data: the *National Health Interview Survey 2007*.
[22] Data: the *National Health Interview Survey 2007*.

governments, as some risky behaviors lead to regrets, while others do not. As a consequence, the social optimum involves a differentiated treatment of rational risk-takers and inconsistent ones, so that some type-specific taxation on sin goods is required to decentralize the social optimum (see Section 3). It was also shown that the second-best optimum, although introducing some distorsions with respect to the first-best (to avoid pooling equilibria), would nonetheless still recommend a differentiated treatment of sin goods consumers, depending on the motivations underlying their choices (see Section 4). An interesting feature of the second-best optimum is that it would not only interfere with myopics' choices, but, also, bring a lower utility to rational risk-takers, to prevent the former from pretending to be the latter.

Hence, if some theoretical support is to be found for the existing uniform treatment, by the governments, of all smookers, drinkers, fast-drivers, and risk-takers of all kinds, this cannot be in the informational constraints faced by governments. On the contrary, this theoretical support must lie either in old paternalism, or in the Good Samaritan effect. Whereas the former seems hardly defendable, the latter does not seem to provide a strong support for a uniform treatment of all sin goods consumers, but seems to invite, on the contrary, further research on how a government could make its commitments more plausible, making thus a differentiated treatment possible again.

Those conclusions, which support the need for a differentiated treatment of sin good consumers having different motivations, were drawn under the assumption of a full homogeneity of earnings in the population, which is a strong simplification. Actually, as we showed in Section 5, under a set of linear taxation instruments, the introduction of heterogeneity in individual earnings tends to complexify the optimal intervention of the government even more. The reason for those additional difficulties lies in the potential conflicts between, on the one hand, efficiency concerns and myopia correction, and, on the other hand, equity concerns, as sin goods are likely to be more consumed by agents with lower earnings. The former concerns support a high taxation of sin goods, while the latter support the opposite, so that the optimal sign and level of the uniform tax on sin good is ambiguous.

In sum, this paper emphasizes not only that the existing uniform taxation of sin goods cannot be justified on the grounds of informational imperfection, but, also, that such a uniform treatment is likely to be quite costly in terms of social justice. Actually, if the correlation between earnings and risk-taking behaviors is negative rather than positive, correcting uniformly for a myopia may be in strong opposition with basic equity concerns. Hence the limitation of the government's tools to a uniform tax may not only penalize non-myopic risk-takers, but may also penalize the myopic ones. Heterogeneity in earnings consists thus of an additional reason for a differentiated treatment of risk-takers.

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