2012/4

Responsibility, freedom, and forgiveness in health care

Aitor Calo-Blanco

CORE

DISCUSSION PAPER

Center for Operations Research
and Econometrics

Voie du Roman Pays, 34
B-1348 Louvain-la-Neuve
Belgium
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February 2012

Abstract

This paper focuses on the optimal allocation between health and lifestyle choices when a society is concerned about both fairness and forgiveness. Based on the idea of fresh starts, we construct a social ordering that permits us to make welfare assessments when it is acceptable to compensate individuals who have mismanaged their initial endowment. Our social rule also allows for the inclusion of the fairness approach in the model, to deal with the well-known clash between the principle of compensation and the principle of reward. Based on ethical principles, we propose the application of a minimax criterion to the distance between the individual's final bundle and an ideal allocation.

Keywords: fairness, health care, lifestyle preferences, regret, fresh start.

JEL Classification: D63, H51, I18

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[1] Université catholique de Louvain, CORE, B-1348 Louvain-la-Neuve, Belgium; University of Coruña, Spain. E-mail: aitorcalo@gmail.com.

I would like to thank Juan D. Moreno-Ternero, François Maniquet, as well as participants to conferences and workshops in Malaga and Louvain-la-Neuve for helpful comments

This paper presents research results of the Belgian Program on Interuniversity Poles of Attraction initiated by the Belgian State, Prime Minister's Office, Science Policy Programming. The scientific responsibility is assumed by the author.

1 Introduction

There is a clear consensus that health is one of the most crucial dimensions of individual well-being. As Fleurbaey and Schokkaert (2009) highlight, “health care is also important because it contributes to better health, and perhaps also directly to a higher welfare level”. When evaluating differences in both health and health care, it must be taken into account that they may contain elements of very different origin. From the perspective of the fairness theory, it is crucial to distinguish between legitimate and illegitimate sources of inequality. The former are those variables for which the individual is responsible, such as lifestyle. The latter refers to external circumstances that cannot be controlled by the individual, such as family, cultural, and socioeconomic backgrounds.[1] The central aim of any fairness policy is to remove any outcome differences that are a result of illegitimate sources of inequality (see for instance Rawls 1971, Cohen 1989, Roemer 1998).

Individual preferences are one of the key elements that determine the need for health care. Many of our illnesses are caused by lifestyle choices, such as drinking and smoking too much, having an unhealthy diet, or not getting enough exercise. Although there is some ethical debate regarding purely lifestyle-based differences, they are usually viewed as a legitimate source of inequality in both health and health care (see Fleurbaey and Schokkaert 2011).

However, in certain situations, health and freedom are in tension. A good illustration of this tension is the various smoking bans that have been passed worldwide in the last decade. Apart from preventing the exposure to second-hand smoke, these pieces of legislation clearly aim to restrict the consumption of tobacco. Other such limitations on unhealthy habits include regulations on alcohol and both the size and the advertising of junk food.

We use the concept of forgiveness to model a scenario with restrictions on unhealthy habits. This approach was formally proposed by Fleurbaey (2005a), who designed a mechanism that aims to compensate individuals who *ex post* regret their past decisions. The model includes both initial constraints and subsequent compensation to provide regretful individuals with a fresh start. Likewise, present health policies limit the practice of certain unhealthy habits but they also provide treatment for individuals who are not in good health.

With regard to the issue of fairness and responsibility, extensive research

[1] Fleurbaey and Schokkaert (2009) make an extensive account of what factors should be considered as either legitimate or illegitimate sources of inequality.

has found that alternative definitions of justice may lead to incompatible results (see Fleurbaey 2008). However, research has not yet addressed how the implementation of a fresh start policy impacts **on** these results. **Here**, we seek to unite these two approaches.

The paper is organised as follows. Section 2 describes the existing models that include forgiveness or fairness, and it also shows the impossibility of implementing both principles in relation to health. Section 3 introduces our model and describes the ethical requirements imposed on our social ordering rule; its derivation is presented in Section 4. Section 5 discusses the implications of implementing the fresh start policy, and it presents a numerical computation for a particular parameter configuration of the model. Section 6 reviews the conclusions of this study. All proofs are contained in the Appendix.

2 Fresh starts and fairness

The concept of forgiveness in fairness was presented in a discussion between Dworkin (2000, 2002) and Fleurbaey (2002). Policies based on this principle aim to deal with individuals who experience genuine changes in their preferences and regret preceding decisions. More precisely, forgiveness refers to situations in which individuals make choices according to some initial preferences, but they get utility from alternative final ones, and hence they want their situation to be evaluated with the latter set of preferences. There is still much debate as to whether such agents should be awarded a fresh start, or if they should have to bear the consequences of their earlier choices.

Figure 1 provides a clear illustration of the problem. Let us suppose that each individual has an exogenously given initial amount of resources that she has to allocate between two different goods that we can interpret as present consumption (x), and an alternative good (y) such as future consumption, health status, education, leisure, etc. We use the label prudent (P) to describe all those individuals who present balanced preferences between both goods. Any individual who has a biased preference for one of the two goods, x in our example, is called a spendthrift (S).[2] In the optimal solution, a prudent agent would opt for allocation P, while a spendthrift individual would prefer S. Let us assume now that, after having made their decision, a fraction of the spendthrifts realise that they have made a mistake and wish they had behaved as prudent agents. We call these individuals regretful (R).

[2] Although such a nomenclature may be confusing, throughout this paper we have opted to use that utilised by Fleurbaey (2005a).

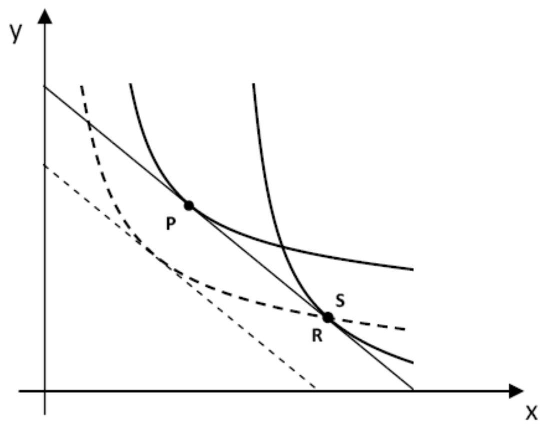


Figure 1: Forgiveness

Therefore, their final or true preferences are given by the dashed indifference curve; therefore, each regretful individual incurs a positive utility loss for their past choice.

There is an interesting debate of how individuals who regret their past choices should be handled. Some authors argue that it may be extremely unforgiving to deny them any help. Others, such as Arneson (1989) or Dworkin (2002), assert that rewarding spendthrift individuals for hard work they have never performed may generate a perverse incentive scheme. Along the same lines, the equal opportunity principle states that individuals should be held responsible for their previous choices. This ethical view is challenged by Fleurbaey (2005a), who proposes setting up an *ex ante* incentive-compatible mechanism with the aim of giving more possibilities to those who mismanage their initial share of resources. He shows that, *ex ante*, one cannot unambiguously assert that the forgiveness policy reduces freedom.

To verify the validity of any principle, including forgiveness, we must define an equivalent situation that allows us to make interpersonal comparisons regardless of the specific form of the utility functions. Such equivalents must be grounded in individual preferences. For instance, Fleurbaey (2005a) makes use of the *Equivalent Initial Share* (EIS), which is defined as the minimum amount of resources that the individual would need to obtain an allocation that yields exactly the same level of utility as the current allocation. In our previous example, this value equals the initial endowment for both the prudent and the spendthrifts. In the case of the regretful, this value is smaller because they could have reached the same level of utility with a lower amount of resources. Therefore, the difference between the ini-

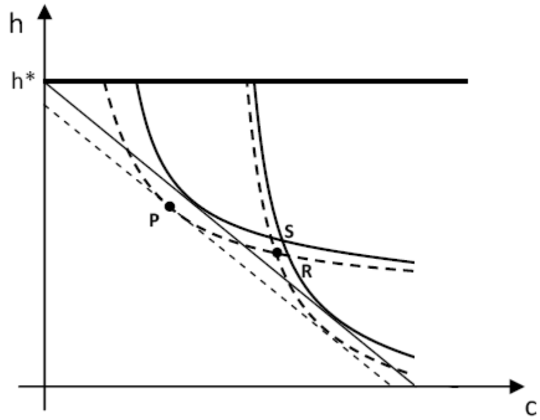


Figure 2: Equivalent Initial Share

tial endowment and the EIS can be used to correctly build inter-comparable measures of utility loss. More precisely, Fleurbaey (2005a) suggests that the optimal redistribution policy should make the smallest EIS as high as possible. This policy entails a compromise between respecting individual preferences and giving all agents the possibility of a fresh start. The policy can be easily implemented by means of a specific scheme of initial taxes and subsequent transfers (see Figure 2).

Such a mechanism sounds natural when dealing with the allocation of money between two periods, but is not so simple when dealing with health. In that scenario, we cannot assure that a transfer from the rich to the poor will always improve social welfare because the final result also depends on the individuals' health status. Fleurbaey and Trannoy (2003) show that, to respect the Pareto criterion, interpersonal comparisons should be made at the value of the perfect health status, h^*. As it is shown in Figure 2, maximising the minimum EIS does not take into account such a reference value.

Additionally, if we want to include the idea of responsibility in the model, we should be well aware that there are two mainstream approaches to its inclusion. The *principle of compensation* states that differences not due to responsibility should be eliminated. Conversely, the *principle of reward* says that inequalities due to responsibility should be left untouched. There is extensive proof that it is impossible to simultaneously put these two principles into practice.[3] The most commonly used strategy to address this

[3] See Fleurbaey (2008) for a detailed explanation of the problem.

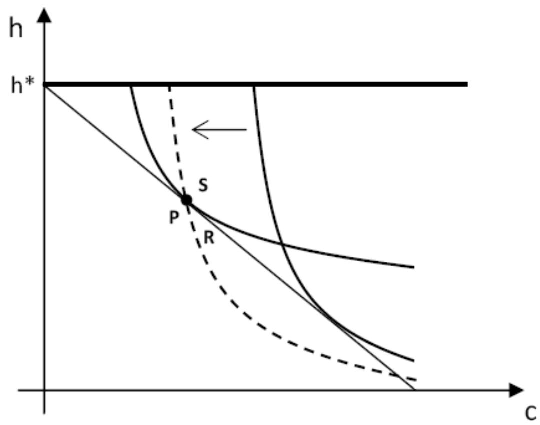


Figure 3: Healthy-Equivalent Consumption

difficulty is to focus on the first principle, and afterwards implement the second principle to the maximum extent possible. Examples of this strategy are Fleurbaey (2005b) and Valletta (2009). The former study deals with the problem of responsibility in a specific model of health, while the latter study extends the strategy to a more general framework. These authors propose focusing on the *Healthy-Equivalent Consumption*, which consists of the minimum amount of money that any individual would accept to increase her current level of health to the state of perfect health. Graphically speaking, this amount would be the point where the indifference curve intersects with the line of perfect health status. Therefore, the solution would lie in maximising the minimum healthy-equivalent consumption while trying to move the indifference curves as far away as possible. The result of using the healthy-equivalent consumption is depicted in Figure 3.

In such a case, all agents would be obliged to behave as if they were prudent individuals and no further redistribution would be needed. Interestingly, despite the fact that the problem was triggered by the regretful group, such agents would end up in their most preferred feasible allocation, and their mistake would be borne entirely by the spendthrifts.[4]

Therefore, if we want to solve the problem of forgiveness, it is not optimal to directly utilise the notion of healthy-equivalent consumption; in short, these two concepts clash with one another.

[4]Moreover, if at the time of collecting taxes the planner could differentiate between individuals, we would obtain the bizarre result that the spendthrifts should have to make additional transfers to the rest of agents.

Proposition 1 *There is no social ordering that maximises both the minimum Equivalent Initial Share and the minimum healthy-equivalent consumption.*

Proposition 1 indicates that both principles aim to solve very different problems. Our objective in the remainder of the paper is twofold. First, we propose a social ordering capable of bringing these two approaches together; and second, we study the consequences of implementing such an ordering.

3 The model and the ethical principles

Consider an economy that consists of one social planner and a finite set of individuals $N = \{1, \dots, i, \dots, n\}$. Health is a variable that ranges from 0 (full ill-health) to 1 (perfect health), that is, $H = [0, 1]$, where $h^* := 1$. Consumption is interpreted as the expenditure on unhealthy goods $c_i \in C \subseteq \mathbb{R}_{++}$ (unhealthy lifestyle). The price of the latter is given by $p_c \in \mathbb{R}_{++}$, while the cost of health is $p_h \in \mathbb{R}_{++}$. Agent $i \in N$ has an initial endowment $w_i \in \mathbb{R}_{++}$ that she allocates in a health-consumption bundle $z_i = (c_i, h_i) \in Z := C \times H$, which designates the situation in which the individual has a chronic health state h_i and consumption c_i. We define the *health-consumption feasible set* as the set of bundles that the individual can afford, that is:

Definition 1 *$\forall i \in N$, we define the individual i's health-consumption feasible set M_i as:*

$$M_i = \{(c, h) \in Z : c * p_c + h * p_h \leq w_i\}$$

Every agent $i \in N$ has well-defined preferences R_i over the space $Z := C \times H$, which are described by a complete preorder, that is to say a binary relation that is reflexive, transitive, and complete. The preferences, apart from being a complete preorder, must also be continuous, convex, and strictly monotonic. Let $\mathcal{R}$ denote the set of such preferences. $(c, h) \succsim_i (c', h')$ means that the individual i weakly prefers to live in a health state h with consumption c, rather than consume c' in a health state h'. Strict preference and indifference are denoted by $\succ_i$ and $\sim_i$ respectively. Moreover, preferences are assumed to satisfy the *single-crossing property*; that is, any two indifference curves of two different preferences cross no more than once. In other words, for any $(c, h), (c', h') \in Z$, we say that individual preferences $R_i \in \mathcal{R}$ present a higher concern for health than those of $R_j \in \mathcal{R}$ if the following relations hold:

$$\left\{ \begin{array}{l} c' > c \text{ and } (c,h) \sim_j (c',h') \Rightarrow (c,h) \succ_i (c',h') \\ c' < c \text{ and } (c,h) \sim_i (c',h') \Rightarrow (c,h) \succ_j (c',h') \end{array} \right\}$$

It is important to stress that such an ordering refers to the agents' final preferences, that is, the ones that are going to be used to evaluate overall welfare, and not to the initial ones. However, we have to take into account that the individuals' bundles are determined by some initial preferences that may or may not coincide with the final ones.

An allocation describes all individuals' bundles, that is, $z = (z_1, \ldots, z_n) \in Z^n$. Under such conditions it is possible to define the agent i's *healthy-equivalent consumption* as follows:

Definition 2 *$\forall i \in N$ and $R_i \in \mathcal{R}$, with $z \in Z^n$, we define the individual i's healthy-equivalent consumption $c_i^*(z)$ as:*

$$c_i^*(z) = \min\{c' \in C : (c', h^*) \succsim_i (c_i, h_i)\}$$

that is, $c_i^*(z)$ is the smallest consumption the individual would be willing to accept to exchange her present bundle for one in which she has perfect health.

Before we continue our analysis it is important to discuss the effect of uncertainty on the final level of health. We have assumed that this value is perfectly determined by the expenditure on unhealthy consumption alone. Alternatively, we can understand such a deterministic relation as the health status in which the agent will be left, given her previous lifestyle. Any agent that does not get sick would be in a sort of ideal situation, in which there is no trade-off between lifestyle and health whatsoever.

Finally, we characterise the situation that maximises the agent's true preferences. More precisely, we define the individual i's *most preferred bundle* as the point in which she would be maximising her final preferences if she were the richest individual in the society. Formally:

Definition 3 *$\forall i \in N$ and $R_i \in \mathcal{R}$, we define the individual i's most preferred bundle $z_0^i \in \bar{M}$ as the bundle that satisfies:*

$$z_0^i \succsim_i (c,h), \quad \forall (c,h) \in \bar{M}$$

where $\bar{M} = max_i M_i$ is the largest health-consumption feasible set.

The reason why we propose this specific definition is twofold. First, it will allow us to describe the gap between the individual's actual and most preferred bundle. Second, the idea of fixing the highest endowment as the reference value permits us to introduce the inequality of opportunity principle in the model. Let us then denote $z_0 = (z_0^1, \ldots, z_0^n) \in Z^n$ as the *most preferred allocation.*

With a profile of preferences, $R = (R_1, \ldots, R_n) \in \mathcal{D}$, we can define a social order $\mathbf{R}(R)$ ($\mathbf{P}(R)$) over all allocations, where $z\mathbf{R}(R)z'$ ($z\mathbf{P}(R)z'$) means that the allocation z is at least as good as (preferred to) z'. We assume that social preferences are described by a complete preorder.

According to such a profile of preferences, we can define the following ethical principles. The first one is Pareto efficiency, which is a minimal requirement that ensures the solution is efficient:

Axiom 1 *(Strong Pareto): $\forall R \in \mathcal{D}; z, z' \in Z^n$, if $z_i \succsim_i z_i'$ for all $i \in N$, and $z_j \succ_j z_j'$ for some $j \in N$, then $z\boldsymbol{P}(R)z'$.*

The final result will be driven by the way in which transfers are proposed. For instance, the result obtained by Fleurbaey (2005b) is given by the Pigou-Dalton axiom, in which a transfer from a rich individual to a poor one is always desirable provided they are in perfect health. Valletta (2009) obtains his result by assuming that transfers do not need to add up to zero; that is, it does not matter how much wealth the rich lose, as long as the poor are better off and still poorer than the rich. Here we opt for a slight variation of Hammond's (1976) equity axiom:

Axiom 2 *(Hammond Transfer) $\forall R \in \mathcal{D}; z, z' \in Z^n$; if there exist $i, j \in N$ such that,*

$$c_i^*(z_0) - c_i^*(z') \geq c_i^*(z_0) - c_i^*(z) > c_j^*(z_0) - c_j^*(z) \geq c_j^*(z_0) - c_j^*(z')$$

with $z_k = z_k'$ $\forall k \neq i, j$, then $z\boldsymbol{P}(R)z'$.

Our variation of this equity axiom entails some properties that must be carefully explained. Firstly, it implies an infinite aversion to inequality because monetary transfers are always desirable so long as the 'rich' remain 'richer' than the 'poor'. The main distinction from the more standard principles, such as the Pigou-Dalton axiom, is that we use the healthy-equivalent consumption in the most preferred allocation as a point of reference to check whether the transfer is in fact welfare-enhancing. If there were no budget constraints, the most preferred allocation would tend to infinity and our axiom would coincide with traditional principles.

Furthermore, the *Equal Preferences Priority principle*[5] can be derived from Axiom 2, implying that, ideally, two equally responsible individuals should end up with the same final bundle. This is exactly the spirit of the principle of compensation, so our social ordering approach is going to be in line with the literature that gives priority to that principle.

Finally, notice that we have anchored the transfers at the value of perfect health. In this case, the healthy-equivalent consumption would equal the individual's consumption, making interpersonal comparisons more tractable. Moreover, as Fleurbaey and Trannoy (2003) prove, the application of a multi-dimensional version of the Pigou-Dalton transfer principle may clash with the Pareto condition.

4 Social ordering and forgiveness

Having defined the basic elements of our model, we proceed to describe the optimal social ordering that, without violating the principle of responsibility, aims to give the regretful a fresh start. To carry out the analysis we first introduce the following concept.

Definition 4 *$\forall i \in N$, let the regret function $\rho_i(z)$ be the individual i's healthy-equivalent consumption deviation between the most preferred allocation and her actual bundle, as shown in the following equation:*

$$\rho_i(z) = c_i^*(z_0) - c_i^*(z)$$

This function provides us with a specific (monetary) measure of the utility loss due to not being in the most preferred bundle. Notice that such a gap can be caused both by changes in the preferences and by differences in the initial amount of resources. This function permits us to obtain the main proposition of the present paper.

Proposition 2 *If social preferences satisfy Strong Pareto, and Hammond Transfer, then for any profile $R \in \mathcal{D}$ and allocations $z, z' \in Z$ we have that:*

$$max_i \ \rho_i(z) < max_i \ \rho_i(z') \Rightarrow z\boldsymbol{P}(R)z'$$

Specifically, the social ordering minimises the maximum value of the regret function across the population. A graphical representation of this measure is given in Figure 4.

[5]Formally, $\forall z, z' \in Z^n$, if there exist $i, j \in N$ with $R_i = R_j$ such that, $(c_j', h_j') \succ_j (c_j, h_j) \succ_j (c_i, h_i) \succ_i (c_i', h_i')$ with $z_k = z_k'$ $\forall k \neq i, j$, then $z\mathbf{P}(R)z'$.

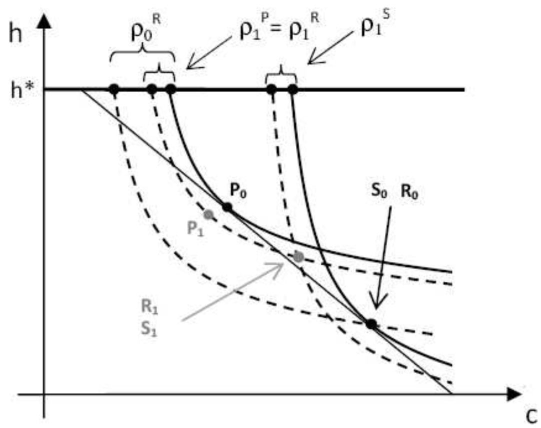


Figure 4: Minimisation of the regret function

For ease of exposition, let us assume that there are just two kind of preferences, those of the prudent (P) and those of the spendthrifts (S), with the former having a higher concern for health than the latter. Additionally, the regretful individuals (R) are those agents who share their choice with the spendthrifts but get utility according to the prudent's preferences. Under a *laissez-faire* policy, the prudent, the spendthrifts, and the regretful would choose P_0, S_0 and R_0 respectively, which are the most preferred bundles for the first two types. However, this is not the case for a regretful agent, who suffers a positive well-being loss. In this scenario Proposition 2 states that moving to an alternative allocation in which the individuals' bundles are P_1, S_1 and R_1 will improve welfare, since the largest regret function is smaller than that of the initial scenario.

A remarkable facet of our social ordering is that the final result is driven by the hypothetical allocation z_0, and hence it says nothing about the individual initial share of resources. The equal opportunity principle is also included in our model, as we are assuming that within each type the most preferred bundle is exactly the same for all, that is, for any pair $i, j \in N$ who belongs to the same type $t \in T = \{P, S, R\}$, we have that $z_0^i = z_0^j = z_0^t$. In this case, the regret function takes into account not only the welfare loss due to the changes in preferences, but also the loss derived from the unequal distribution of the initial endowment. Consequently, within every type of individuals there exists equality of opportunity when all individuals belonging to the same type have also the same regret function value.

To conclude, we would like to stress once more that if there were no endowment limitations, the hypothetical allocation z_0 would tend to infinity.

Under such a scenario, our social ordering would recommend maximising the minimum healthy-equivalent consumption, and hence our result would converge to that proposed by Fleurbaey (2005b)

So far we have established a specific rule that permits us to make welfare assessments in the present context; however, we have said nothing about the way in which compensation should be paid. This task will be undertaken in the next section.

5 Implementing the fresh start policy

When implementing forgiveness, we opt to keep the model as simple as possible. From this moment on we assume that all individuals have the same initial endowment, $\forall i \in N, w_i = w \in R_{++}$; that is, we no longer consider the existence of differences in opportunity. Put differently, the health-consumption feasible set is the same for all agents, $M_i = \bar{M}, \forall i \in N$. As in the general framework, the amount of resources devoted to medical consumption determines the individual's final level of health. For ease of exposition, we assume that the price of both goods is equal to 1.

We focus on the case of the three types of individuals defined at the end of the previous section. A fraction $\lambda \in (0,1)$ of the population are spendthrifts, and after having determined their expenditure on unhealthy habits, a proportion $\alpha \in (0,1)$ of them regret their choices and wish they had behaved as prudent agents.

According to what can be currently observed in western societies, there are two main ways of designing a national health care system. First, there exists the traditional model of collecting taxes to fund a public health care service that treats all individuals that are not in good health. Second, several countries have recently passed numerous pieces of legislation to limit or ban certain unhealthy habits. The first measure affects all individuals in the society, but particularly impacts on those who are prudent because they are being taxed to fund a public service they are unlikely to use. The second measure affects only those agents that lead an unhealthy lifestyle, in our case the non-regretful spendthrifts.

Therefore, social planners should aim to find a *fair* balance between both measures. That is precisely what we describe in the following proposition.

Proposition 3 *If a fraction $\alpha \in (0,1)$ of spendthrifts become prudent ex post, the allocation that minimises the highest $\rho_i(z)$ across the economy is such that:*

- *The well-being loss, measured by the regret function, is the same for all individuals.*
- *The final policy is determined by both the agents' preferences and the proportion of spendthrifts within the economy.*
- *Prudent individuals have the highest level of health in the economy, while the spendthrifts and the regretful spend more on unhealthy habits.*

As mentioned previously, a public authority has two different tools; namely, it can tax agents to treat ill individuals, and it can limit the consumption of goods that are harmful to health. Therefore, the planner's policy consists of both a consumption restriction $\widehat{c}$, and an income tax t that can be used to treat individuals in bad health status. As shown in Figure 5, a prudent agent faces a positive utility loss because the introduction of the tax leaves her with less resources. Spendthrifts are also worse off because they too have less money, and they also cannot consume their preferred quantity of the unhealthy goods. In fact, the spendthrifts always choose the maximum permitted level of unhealthy consumption. After all individuals have made their choices, the planner must treat the spendthrifts and the regretful equally because it is not possible to distinguish between them. The final health treatments must leave both in the same indifference curve as the prudent, and it must also make the utility loss equal for all types. It is important to stress that perfect equality may not be achieved in a different scenario. If we add an additional type of preferences, we can no longer assure that a transfer from one type to another would not affect the well-being of an individual from the third group. Therefore, our equality result cannot be extended to a more generalised framework.

We conclude our analysis by presenting a numerical example of how such a public policy may be designed. The utility function in our example is taken from Fleurbaey (2005b). Let us assume that any individual $i \in N$ has preferences represented by the function,

$$u_i(c_i, h_i) = c_i h_i^{\delta_i}$$

with $\delta_P = 1.5 > 0.5 = \delta_S$. Every individual is also characterised by her initial endowment, which is assumed to be equal for all agents; more precisely, $w_i = 1, \forall i \in N$. The population is equally split between prudent and regretful agents. The results of the optimal allocation are presented in Table 1.

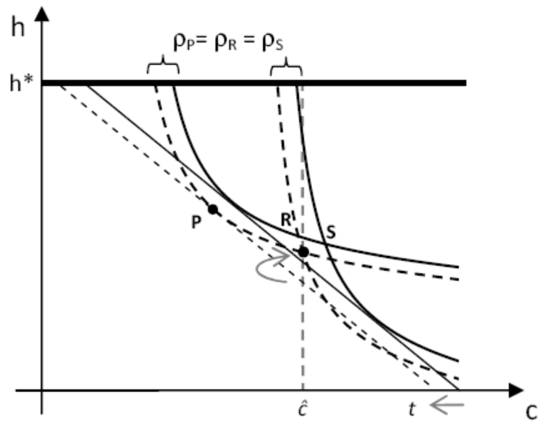


Figure 5: Implementation of the social ordering

Table 1: Results of the numerical example

Prudent	Spendthrift	Regretful
$z_P = (0.4; 0.6)$	$z_S = (0.66; 0.33)$	$z_R = (0.66; 0.33)$
$\rho_P = 0$	$\rho_S = 0$	$\rho_R = 0.0576031$
$z'_P = (0.395; 0.5925)$	$z'_S = (0.55; 0.4751)$	$z'_R = (0.55; 0.4751)$
$\rho'_P = 0.0058$	$\rho'_S = 0.0058$	$\rho'_R = 0.0058$

Without the planner's intervention, the prudent clearly consume less than the spendthrifts, and hence their level of health is higher. The regret of these two types is obviously 0 because both are properly maximising utility, which is not the case for the regretful.

To compensate the regretful, the public authority taxes all individuals ($t = 1.26\%$) to treat those who are in bad health status, but at the same time limits the consumption of unhealthy habits ($\widehat{c} = 55\%$). As a result, the prudent end up with a lower level of both health and consumption, and hence their well-being decreases. This policy means that both the spendthrift and the regretful consume less but will increase their health status. However, as the spendthrifts have stronger preferences for consumption, they also experience a positive utility loss. Notice that, as expected, all individuals finish with the same loss of well-being; that is, the burden of the mistake made by the regretful is borne equally by all members of the society. However, the situation of the regretful would otherwise be so poor that the redistribution means that the overall society is *ex post* better off.

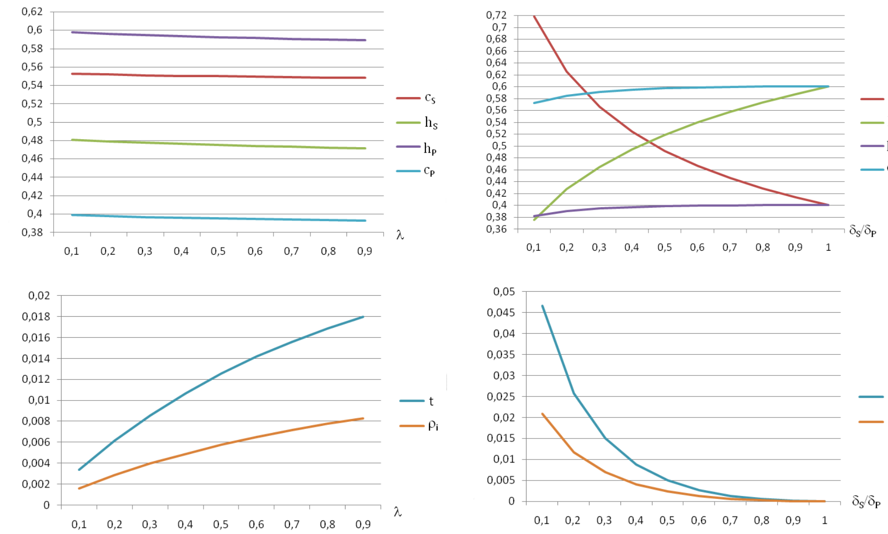
Finally, the optimal policy is affected by changes in the exogenous parameters. Figure 6a shows that as the proportion of spendthrifts tends to zero ($\lambda \to 0$), the optimal policy leaves the prudent with the same bundle as in the case in which they choose freely. This is an obvious result because the other types are vanishing, and hence the public authority is no longer needed. In principle, the values of the final allocation do not change significantly with λ, although the actual health policy is extremely influenced by the actual value of that parameter.

In Figure 6b we show how the policy changes with individual valuations of health. The solution becomes extreme when the spendthrifts do not care about health at all. In this scenario, any restriction on unhealthy habits has such a high utility cost that it cannot be implemented; consequently, the social planner is forced to raise more money because the spendthrifts have a very poor health status. The level of the social planner's intervention disappears as both attitudes towards health converge.

6 Concluding remarks

In this paper, we have derived a social rule for a scenario in which a society cares about both the fairness and the forgiveness principles.

We have devoted the first part of the paper to introducing two different issues. First, we have presented the framework of forgiveness, a largely unstudied approach that advocates compensating those individuals that re-



(a) Variations in the proportion of agents (b) Variations in the discount factor

Figure 6: Variations in the exogenous parameters

gret their past choices. Second, we have discussed the theories of fairness and responsibility, along with the clash between the compensation and reward principles. We have shown that traditional policies dealing with both frameworks are incompatible in relation to health.

In the second part of the paper we have made use of some ethical principles to reach a compromise between the principles of forgiveness and fairness. To make interpersonal comparisons of utility, we have proposed using the distance between the actual allocation and a hypothetical most preferred one. Such a definition allows us to compare individuals with different preferences and different endowments, introducing the opportunity principle in the model. Our social rule establishes that any redistribution policy should aim to minimise the highest well-being loss in the population, suggesting that the burden of the regretful individual's mistakes should be borne by all individuals.

In the last part of the paper, we have proposed a specific way of making compensations when a trade-off between health and lifestyle preferences exists. We have advocated balancing legislation that limits unhealthy habits and raising money through taxation to treat patients. The need for balance comes from the fact that taxes mostly harm responsible agents, whereas the consumption restrictions harm only those individuals that prefer to lead an unhealthy lifestyle. These two measures give the public authority the possibility of compensating individuals that regret their past choices.

In closing, we would like to discuss two aspects of the assumptions we have made. First, we have dealt with health from a one-dimensional viewpoint. In reality, it is a multidimensional issue that includes various matters such as heart condition, motor function, mental condition, etc. However, when evaluating overall health status many economists prefer to use measures that summarise all these conditions in a single variable, such as the popular quality-adjusted life year (QALY). Therefore, we can consider our definition of health as the final value of such variable. Second, we have considered any level of health as acceptable as long as it maximises the individual well-being. This is controversial in the field of health as it implies that any agent can freely choose her level of health. In the real world, we find that the public authority guarantees all individuals a minimum level of health, no matter their preferences. We can easily introduce this requirement into our model by assuming that all individuals must have a certain minimum health status. The optimal policy would then be more extreme, but it would keep the same spirit of the policy presented here.

A Appendix: Proofs

A.1 Proof of Proposition 1

Proof. Take an economy with two agents that have the same initial endowment w, but different preferences between health and consumption. According to Figure 7 individual x presents a higher preference for health than individual y. We also have that the minimum EIS is maximised at value w, since it is impossible to increase the utility of one individual without making the other one worse off. Notice that this allocation does not maximise the minimum healthy-equivalent consumption, which is given by $c^*(x)$. To maximise such a value, the planner must transfer money from individual y to individual x until both end up consuming bundles y' and x' respectively. In this case the healthy-equivalent consumption values are equal for both individuals, that is $c^*(x') = c^*(y')$. However, this new situation implies that agent x's new EIS is $w + t$, which is clearly bigger than the individual y's one, $w - t$. Therefore, the initial condition of equal EIS no longer holds. ■

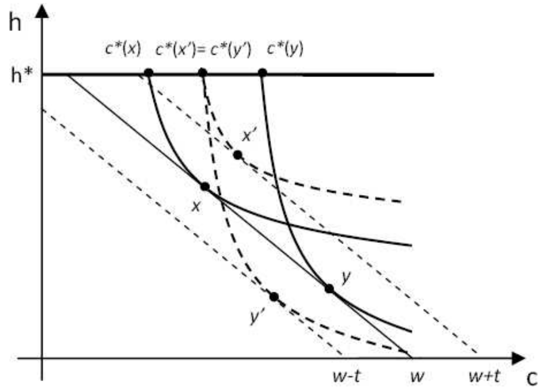


Figure 7: Proof of Proposition 1

A.2 Proof of Proposition 2

Proof. This proof is based on the result obtained by Valletta (2009). Let us consider two different individuals $j, k \in N$ and two allocations $z, z' \in Z^n$ such that $z_m = z'_m \; \forall m \neq j, k$; with $\rho_j(z') > max\{\rho_j(z), \rho_k(z), \rho_k(z')\}$. First, we are going to prove that if $max_i \; \rho_i(z) < max_i \; \rho_i(z')$, then $z\mathbf{P}(R)z'$. If $\rho_k(z) < \rho_k(z')$, using strong Pareto we directly obtain that $z\mathbf{P}(R)z'$. Let us consider the case that $\rho_k(z) > \rho_k(z')$. Contrary to the desired result, let us assume that $z'\mathbf{R}(R)z$. Take any allocation $z'' \in Z^n$ such that $\forall m \neq j, k, \; z''_m = z_m$, whereas z''_j and z''_k are chosen such that $\rho_j(z'') = \rho_j(z') - \varepsilon$ and $\rho_k(z'') = \rho_j(z') - 2\varepsilon$, where $\varepsilon > 0$ is an arbitrarily small number. Therefore, by Hammond transfer we have that $z''\mathbf{P}(R)z'$. Assume now that $\rho_j(z) < \rho_k(z)$ (when the relation is the other way round the proof is analogous to the one presented here). Let us choose a new allocation $z''' \in Z^n$ such that $\forall m \neq j, k, \; z'''_m = z_m$, whereas z'''_j and z'''_k are chosen such that $\rho_j(z''') = \rho_j(z) - \varepsilon$ and $\rho_k(z''') = \rho_k(z) + \varepsilon < \rho_k(z'')$. Because both individuals are better off, by strong Pareto we have then that $z'''\mathbf{P}(R)z''$. Since $\rho_k(z''') > \rho_k(z) > \rho_j(z) > \rho_j(z''')$, using Hammond transfer and strong Pareto it is straightforward to check that $z\mathbf{P}(R)z'''$. Finally, by transitivity we have that $z\mathbf{P}(R)z'$, which yields the desired contradiction.

Take now two allocations $z, z' \in Z^n$ such that $max_i \; \rho_i(z) < max_i \; \rho_i(z')$. By monotonicity of preferences, one can find two allocations x, x' such that $\forall i, h_i = h^*$, and $z \succ_i x, x' \succ_i z'$. Moreover, there exists i_0 such that for all $i \neq i_0$

$$\rho_i(x'_i) < \rho_i(x_i) < \rho_{i_0}(x_{i_0}) < \rho_{i_0}(x'_{i_0})$$

From now on, all allocations considered have perfect health for all agents.

Let $Q = N \setminus \{i_0\}$ and let us assume a sequence of allocations $(x^q)_{1 \leq q \leq |Q|+1}$ such that

$$c_i^*(x^q) = c_i^*(x'), \quad \forall i \in Q : \ i \geq q$$
$$c_i^*(x^q) = c_i^*(x), \quad \forall i \in Q : \ i < q$$

while

$$c_{i_0}^*(x) = c_{i_0}^*(x^{|Q|+1}) > c_{i_0}^*(x^{|Q|}) > \ldots > c_{i_0}^*(x^1) = c_{i_0}^*(x')$$

This implies that $\rho_{i_0}(x^q) > \rho_{i_0}(x^{q+1}) > \rho_q(x^{q+1}) > \rho_q(x^q)$, while for all $j \neq q, i_0$, we have that $\rho_j(x^q) = \rho_j(x^{q+1})$. As we have previously proved, it must be the case that $x^{q+1}\mathbf{P}(R)x^q$, $\forall q \in Q$. According to the initial assumptions, $z\mathbf{P}(R)x^{|Q|+1}$ and $x^1\mathbf{P}(R)z'$. Finally, by transitivity we have that $z\mathbf{P}(R)z'$. ■

A.3 Proof of Proposition 3

Proof. Let $z = (z_P, z_S, z_R) \in Z^n$ denote an allocation, with $z_t = (c_t^z, h_t^z), \forall t \in T = \{P, S, R\}$. Incentive compatibility requires that for all types $t, t' \in T$, $z_t \succsim_t z_{t'}$. Moreover, the regretful and the spendthrifts must end up with the same bundle, $z_R = z_S$, as they make the same initial choice and afterwards it is impossible to distinguish between them. Fleurbaey (2005a) shows that for any incentive-compatible allocation z, there exists another incentive-compatible allocation x such that $z_{t'} = x_{t'}$ for all $t' \in L \subset T$, and $\sum_{t \in T} p_t(c_t^x + h_t^x) < \sum_{t \in T} p_t(c_t^z + h_t^z)$, where p_t is the proportion of the population that have preferences t. It must be the case that in any optimal allocation, all resources are exhausted, that is, $\sum_{t \in T} p_t(h_t^z + c_t^z) = w$. Let us assume an incentive-compatible allocation $x \in Z^n$ such that $\sum_{t \in T} p_t(h_t^x + c_t^x) < w$. If $x_P = x_S$, we can find $\varepsilon_P, \varepsilon_S > 0$, such that replacing the original allocation x by $(c_P^x + \varepsilon_P, h_P^x)$ and $(c_S^x + \varepsilon_S, h_S^x)$, we would obtain a new feasible incentive-compatible allocation in which all individuals are better off. Let us take now that $x_P \neq x_S$. Because of the single-crossing property and incentive-compatibility it must be the case that $x_P \succsim_P x_S$ and $x_S \succsim_S x_P$. By monotonicity there exists $\varepsilon, \delta > 0$ such that replacing x_P and x_S by $x_P^\varepsilon = (c_P^x + \varepsilon, h_P^x)$ and $x_S^\delta = (c_S^x + \delta, h_S^x)$ yields a feasible and incentive-compatible allocation in which all individuals are better off, see Figure 8. Therefore, an allocation $x \in Z^n$ such that $\sum_{t \in T} p_t(h_t^x + c_t^x) < w$ cannot be optimal.

• We start the proof showing that in the final allocation all bundles must be in the indifference curve of the prudent. Let us assume an incentive-compatible allocation $z \in Z^n$ in which, for some t, $z_t \succ_P z_{t'}$. Additionally, we know that it must be the case that $z_R = z_S$. In this case we have

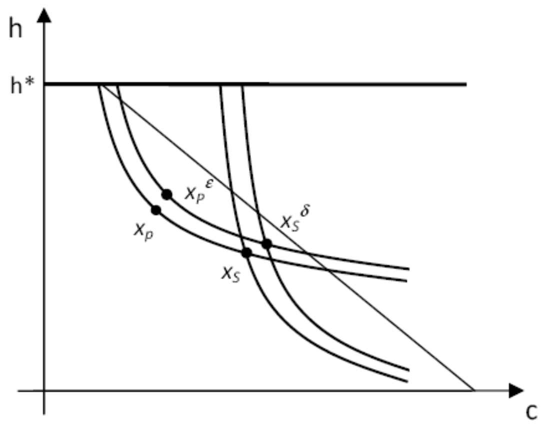
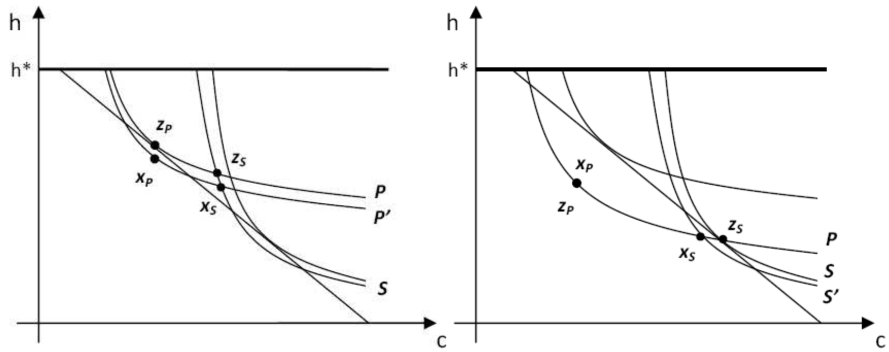


Figure 8: Proof of Proposition 3

that $z_P \succ_P z_R$, because $z_R \succ_P z_P$ is not incentive-compatible. Since the bundles of the regretful and the prudent individuals are not equivalent it must be the case that $\rho_P \neq \rho_R$, but in this case incentive-compatibility does not hold. Therefore, such an allocation cannot be optimal, and hence $z_t \sim_P z_{t'}$, $\forall t, t' \in T$.

Regarding the value of the well-being loss experienced by any type t, because the prudent and the regretful individuals have to be evaluated with the preferences of the former, it follows that $\rho_P = \rho_R$. Let us assume now that the regret function of the regretful individual is strictly smaller than the one of the spendthrift. We know that in the optimal allocation average expenditure must equal the per capita amount of resources. Given that all money collected via taxes is intended to treat just the regretful and the spendthrifts, and that $\rho_S > 0$, it must be the case that bundle z_S is between the budget line and the indifference curve that defines the level of utility of her most preferred bundle. In such a situation, we can move to a new incentive-compatible allocation x in which the prudent and the regretful individuals have more unhealthy habits and receive less treatment, maintaining the value of the spendthrifts' regret function. In the same allocation a regretful individual would be worse off, albeit the value of her regret function would still be smaller than that of the spendthrifts. Therefore, we would be keeping the highest value of ρ while saving a positive amount of resources, and hence this situation cannot be optimal. The graphic representation is provided in Figure 9a.

Let us suppose now the relation is the other way round, that is, $\rho_R > \rho_S$. In this case, if the public authority both limits the unhealthy consumption



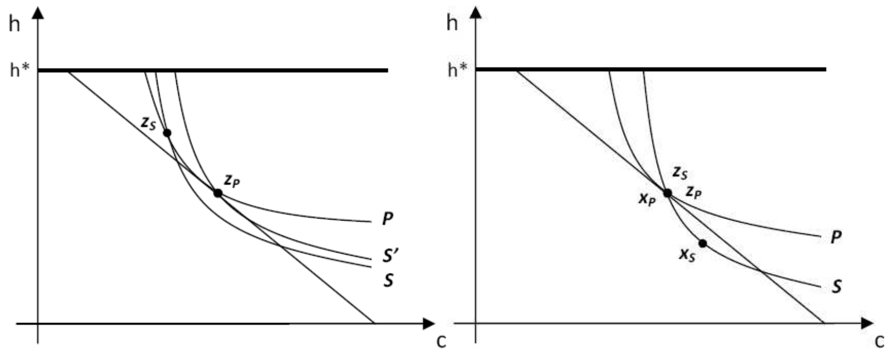
(a) case $\rho_R < \rho_S$ (b) case $\rho_R > \rho_S$

Figure 9: Proof of proposition 3.a

and taxes the individuals, it is possible to reach a new incentive compatible allocation x in which the planner saves some money, and the regretful remain with the same value of ρ_S. Again, this allocation cannot be optimal. The graphic representation of this case is provided in Figure 9b.

• The second conclusion of Proposition 3 is an obvious result that comes directly from the fact that it is impossible to distinguish between those that regret their past choices and the spendthrifts. Therefore, the relevant parameter is not the fraction of the regretful, α, but the final number of people that must be treated, λ.

• Let us take an allocation $z \in Z^n$. First, we are going to prove that $h_P^z > h_S^z$. Let us assume, contrary to the desired result, that $h_P^z < h_S^z$. We already know that all bundles must be in the indifference curve of the prudent, that is $z_P \sim_S z_S$. Because of the single crossing-property and the definition of the preferences, under $h_P^z < h_S^z$ we have that $z_P \sim_S z_S \Rightarrow z_P \succ_S z_S$, and hence the allocation cannot be incentive-compatible (see Figure 10a). In the latter scenario, based again on the same properties, it is possible to find an alternative allocation x in which the bundle of one type remains fixed, while the other type, S in Figure 10b, can be moved to a new bundle in which their utility level is kept at a strictly lower cost. Therefore, such an allocation cannot be optimal. This result, combined with the first part of the proposition, also entails that in optimal allocation $z \in Z^n$ we have that $c_S^z > c_P^z$. ■



(a) case $h^z_P < h^z_S$ (b) case $h^z_P = h^z_S$

Figure 10: Proof of proposition 3.c

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