Consumer's Externality

Smoker Or Non-Smoker?

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Introduction

This project analyses the main arguments that the Economy makes when judging tobacco control policies and describes with detail the issue of market failures. From this review shows that smoking is a personal choice that can generate net losses of welfare for the rest of the society. On this basis there is economic justification for interventions, in the that the recommendation of the prohibition of smoking is supported and the increase in taxes on tobacco products.

What is an externality

We refer to externalities when we speak of situations in which the costs or benefits of producing or consuming a good or service are not reflected in its market price despite having an external impact. In other words, externalities are secondary effects (good or bad) that occur when a person or a company performs an activity and does not assume all the costs of the same, or all the benefits that could be reported. In this way we can distinguish:

- **Negative externality:** arises when not all the costs of a negative effect are assumed. We speak of negative externalities when, for example, a company pollutes its environment or when a person throws garbage into the street. In these two cases, a social cost is generated, since it is the whole society alike that suffers the consequences of their actions. And the market price does not include this cost.
- **Positive externality:** arises from a positive effect that is not reported as a benefit. An example of positive externality that we can mention is scientific research, which benefits society in general. Another example would be the use of renewable energy, which benefits society because the person or company that uses them is not polluting. In these cases, market prices do not reflect the real benefits

Externalities are one of the failures of the market, and therefore one of the reasons why the action of the government in the economic activity of a country is justified.

To deal with negative externalities, the State can establish taxes on activities that negatively affect society or put quantitative limits to restrict them. The proposal of the president of France a few years ago that the countries that emit the most CO2 pay a tax is a way to make them pay for the negative externality of increasing the deterioration of the environment in the world.

Regarding positive externalities, the government can intervene to favour these activities through, for example subsidies.

Market failures associated with the use of tobacco: Externalities

When the act of consuming a product generates effects (either negative or positive) that affect not only the user but also other members of society, and these do not they are compensated, the private cost (or benefit) is lower than the social cost (or benefit). In these circumstances there will tend to be an excess of (insufficient) consumption of well from the social point of view. One of the proposed solutions for correction of this market failure, especially relevant to the case of tobacco, is the application of taxes. The tax is a tool that serves to make the cost of private consumption includes the external cost.

The problem with the negative externalities is that the action is done by an agent who does not internalize, in terms of his decision, the negative impact that has on the others. The agents do not pay the fair price for their actions. The private marginal cost of consuming one more unit of the good which generates the negative externality is inferior of the social marginal cost. Therefore, the supplier of the externality is not taking into account in his cost the social cost. This agent will produce that rational quantity which maximizes benefits or utility, independently of the external impact of this action.

So, in a perfect competitive economy, the agent will produce that quantity that equals its private marginal cost with the selling price. CMg=P=BMg

The balance between taxes on tobacco production and estimates of external costs frequently reach the average driven by both pro-health groups (arguing that the tax burden does not cover external costs) as pro-industry groups (which hold what contrary). Obviously, it is an empirical question that depends on a certain measure of the institutional context of each society, for which it is convenient to detail what are the cost items that intervene in the balance. A first category of external costs of tobacco are the damages to health that generates environmental smoke to passive smokers. Second, the calls "Financial or fiscal externalities" originate in companies with systems of health and social security financed by general taxes or by public insurance that do not adjust the premium because of the higher risk associated with tobacco consumption. In these circumstances it is possible that smokers generate externalities in the form of more health costs, lower work and less pension payments, than those it would originate, in equality of the rest of the conditions, a non-smoker. Other external effects potentially significant are the material and human damage caused by fires caused by cigarettes and the costs of cleaning public spaces. It is useful point out that an important part of the costs not strictly private of tobacco, specifically the environmental smoke derivatives, falls on the members of the family of the smoker.

In Economics, in the first instance, tend to contemplate these costs as "internal" costs, and therefore not included in external cost accounting, according to the idea that the families of the smoker have the capacity to obtain compensation for the damage caused. However, this assumption is questionable, particularly when those affected are children (or foetuses). Before the controversy, the usual practice is to classify these costs as a departure intermediate, sometimes called "quasi-external" costs.

To quantify the costs and benefits attributable to tobacco consumption, it is necessary to take into account that the components of the items are flows made along the life cycle of smokers. For example, since you start smoking, you pay tobacco excise taxes, but the treatment costs of a possible lung cancer will materialize much later. On the other hand, the computation must take into account what would be the "counterfactual" flow of costs and benefits. That is, a smoker can generate health expenses for treatment of a disease caused by tobacco but if that same person did not smoke not only would not have paid taxes for consumption of tobacco, but it is likely that it would also have generated sanitary for treatments of other types of diseases.

When an individual consumes a good or service his action reveals that the benefit, he gets exceeds the cost supported. This is one of the fundamental principles of Economics and based on the assumption of rationality. If the consumer knows and consciously pays the cost total of your choice (and by ignoring the problem of external costs discussed previously), there is no "market failure" and there is no need for public intervention. While the existence of addiction would seem to invalidate this interpretation in the case of tobacco, we find behaviour models where addiction was compatible with the full sovereignty of the consumer. In particular, the model of "rational addiction" postulates that if smokers become addicted, this will be a consequence of a decision in which all future costs and benefits have been considered.

Is there economic justification for tobacco control policies?

Control measures of the smoking can generate a net increase in the welfare of some smokers, provide self-control mechanisms and/or bring the future cost imposed on themselves (internalities) to the contemporary monetary cost. This joins the justification of the measures aimed at correcting costs on other members of society (externalities).

The question that arises next is do they justify the possible welfare gains that these measures would generate in some individuals the presumable cost that they would impose on others? The answer must come from the analysis in terms of cost benefit, as for the rest of public policies. The techniques standard of welfare measurement is designed for cases where sovereignty prevails of the consumer, so that the actions observed serve to estimate the value derived from consume a good or service. In other words, the opinion of smokers about the different tobacco control measures can help to clarify the question, in the absence of another type of analysis that in any case must be undertaken. However, the support does not become a majority among smokers, not even among those who wish to stop smoking (about one third (31%) declares to agree with measures that increase the price of cigarettes, and 39.5% with the total prohibition of smoking in restaurants).

This provoke some reflections. In the first place, should the preferences of never smokers and ex-smokers when judging measures that are going to affect smokers (who reject them mostly even if they want to leave the tobacco). The preferences declared by never smokers and former smokers could be guided by the desire to avoid environmental smoke or displace a greater tax burden towards the smokers. However, they could also respond to the desire to erect barriers to a possible start or a possible relapse. Nor can it be ruled out that they reflect the desire to erect barriers so that other people in the family do not smoke. What a fraction of smokers who do not wish to quit smoking supports the measures is consistent with that potential motive. The second reflection is motivated by the realization that, although the increase in taxes and the total prohibition in restaurants seem to be measures with good reception in most of the population including a non-negligible minority of smokers, there are most smokers declaring disagreement, especially among those who they declare they do not want to give up tobacco. In these circumstances it is appropriate to investigate measures that facilitate the option of not smoking by distorting as little as possible the set of choice of those who in a rational way want to smoke. In recent economic literature this the type of measures would be classified as liberal paternalism or light paternalism. Discuss different possibilities in the context of tobacco, among which you can find the smoking card. It is a voluntary obtaining permit without which It is not possible to buy cigarettes.

It offers to those who want a mechanism of self-control the possibility of committing to not smoking by simply abstaining from withdraw the permit. The implementation of this type of measure is not immediate. However, the policies that in one way or another increase the set of choice through voluntary self-control mechanisms, and therefore generate the minimum interference with those who genuinely want to smoke, will be welcomed by the economists. It is worth noting the relevance of the health sector in this regard. There is success of a consistent tobacco cessation aid program primary care professionals can influence the behaviours of citizens simply using the consultations to inform about the future consequences of smoking and, in cases of need for specialized treatment, of the possibilities of help for the abandonment. In technical terminology these interventions could be described as nudges that help individuals opt for the decision not to smoke if they wish to do so.

Computing our approach

1. Theoretical approach to the problem

In order to be able to simplify the whole problem and focus in what is important for us, we will analyse a very simple economy but with all the actors that are interesting for us. In our economy we can find: two goods, cigarettes and money. These two goods are in the utility function of our two individuals: Smoker and Non-smoker and both work for the only producer who produces the cigarettes and pays a wage to our two individuals.

2. Adding the dictionaries into the programme

Basic tools for the program:

Import math: This module provides access to the mathematical functions defined by the C standard.

import numpy as np: This module contains among other things the following:

- a powerful N-dimensional array object
- sophisticated (broadcasting) functions
- tools for integrating C/C++ and Fortran code
- useful linear algebra, Fourier transform, and random number capabilities

NumPy can also be used as an efficient multi-dimensional container of generic data.

import scipy: This module provides access to the mathematical functions defined by the to solve the most common issue related to Scientific Computation.

from scipy.optimize import minimize: This module provides access to the mathematical tools in order to get the minimization of scalar function of one or more variables.

3. Producer problem

$$\pi = pq - lw$$

Where "π" is the revenue. In one hand we have "p" is the price which is equal to the wage expressed as "w". In the other hand we have "q" that is the quantity of cigarettes produced through the work of the employees, which is quantified as "l".

4. **Utility Function:**

This is the main core of our analysis. As it is said previously, we have two individuals: Smoker and Non-Smoker and they both have different utility equations.

Smoker:

$$U_s = aq_s^{\alpha} - pq + wl_s - cl_s^{\delta} - tq_s$$

We can see this procedure between

This equation represents the amount of satisfaction that the Smoker gets from consuming cigarettes and getting money from working. We can see also that utility is deducted from spending money consuming cigarettes, paying taxes and the fact that the smoker does not like to work.

- aq_s^{α} expresses the satisfaction obtained by the smoker through the cigarettes consumption. $q_s^{\alpha}$is the quantity of cigarettes consumed and it is squared to α that represents the importance of the cigarettes for the smoker.
- $-pq$ is the amount that the smoker spends in the cigarettes consumption. p is the price of the cigarettes. It has a negative symbol as it produces disutility on the smoker.
- wl_s is the total salary obtained by the smoker through the wage and the labour amount provided into the market by the Smoker.
- cl_s^{δ} is the mathematical expression of the fact that the smoker does not like to work. It has a negative symbol as it produces disutility on the smoker.
- tq_s is the tax set by the government on the consume of cigarettes and it has a negative symbol as it produces disutility.

Non-Smoker

$$U_N = -bq_s^{\beta} + wl_n - cl_n^{\delta}$$

This equation represents the amount of satisfaction that the Non-smoker gets from obtaining money from working. We can see also that utility is deducted from the quantity of cigarettes that the Smoker smokes, that is when the externality is seen as the actions of a third party affect in the satisfaction of this individual, and the fact that the smoker does not like to work.

- $-bq_s^{\beta}$ this expresses the disutility that the fact of the Smoker smoking produces on the Non-smoker utility, that is why it has a negative symbol.
- cl_n^{δ} is the mathematical expression of the fact that the Non-smoker does not like to work. It has a negative symbol as it produces disutility on the Non-smoker.
- wl_n is the total salary obtained by the smoker through the wage and the labour amount provided into the market by the Non-smoker.

So, the total utility of this society is:

$$U_T = aq_s^{\alpha} - bq_s^{\beta} - pq + wl - cl^{\delta} - tq_s$$

The main function of the government is to maximize this function and that is what our program works for. We can see this procedure in between line 73 to 76.

1. The first step is that the user of the program decides the parameters a, b, c, α, β and δ, we can see that in the lines 59 to 65 using the tool float.
2. The second step is that we can proceed to calculate the equilibrium without the government, this means calculating the equilibrium without taking into account the term $-tq_s$. This procedure can be seen between line 66 and line 69.
3. The third step is to proceed to calculate the loss of utility for the Non-smoker, so first calculating the utility without the presence of the Smoker and deducting the utility that the Non-smoker has when in presence of the Smoker, it is the calculus of the utility itself. We can see this procedure in the program from line 9 to line 55 we are calculating.
4. The fourth step is to calculate the utility of the society previously explained.
5. The fifth step is to calculate the right tax to internalize the externality, this procedure can be seen from line78 to line 91, using the tools:
   For I in range (10)
   The range () function generates the integer numbers between the given start integer to the stop integer.

   If…elif…else: The elif is short for else if. It allows us to check for multiple expressions. If the condition for if is False, it checks the condition of the next elif block and so on. If all the conditions are False, body of else is executed. Only one block among the several if...elif...else blocks is executed according to the condition.

   Break : If break statement is inside a nested loop (loop inside another loop), break will terminate the innermost loop.

Conclusion

In the economy there is plenty of externalities, some of them are good, like itself education because a person which is educated gives an added value to the society making it a little bit better, and some of them are bad like our study case: the cigarette consumption because with the consumption of this good by some individuals these are giving disutility to other individuals who are not consumer of these goods.

Internalizing the bad externalities is the mechanism that society uses to transfer resources from those who give disutility to others to those suffering from the effects of pollution, that is, to mitigate or compensate for the effects it has on the health of people, the physical environment or the built environment.

Another way of saying it would be, the polluter pays, if we want to consume polluting goods we should pay for the negative effects (externalities) that they produce. They are, in essence, price mechanisms or if you want incentives to reduce a behaviour or process with a negative balance for society. This mechanism is led by the government as is the impartial institution which pursuit the welfare of the society as a whole, we interpreted this as the function of utility for the society which is the summation of all the individuals, and the way that the government has to correct the externality is the tax in order to lower the demand of cigarettes to give the smokers utility enough but still taking into account the utility of the non-smokers.

What we could see in our model is that:

1. If aq_s^{α} is smaller than tq_s the smoker will not be interested in smoking because money gives utility to the Smoker and this will not be willing to spend too much money on cigarettes. In this case the utility of the Non-smoker is not affected by the Smoker, so there will not be any externality.
2. If a and α are bigger than b and β then it is better the tax to be as low as possible because the utility of the Smoker gives more utility to the society than the disutility taken to the Non-smoker.
3. If a and α are lower than b and β, the government would like to set the tax higher enough because the disutility take to the Non-smoker would be bigger that the utility added to the Smoker.

In conclusion what we can see in real life is a middle ground between these three scenarios therefore the tax would not be that high, so the smoker has to stop smoking but not too low, so the demand of cigarettes rises, and the non-smokers give too much disutility to society. There are other ways to internalize these externalities like regulations to respect each other's spaces so there are spaces to smoke and space to not smoke.