Understanding Public Support for Externality-Correcting Taxes and Subsidies: A Lab Experiment

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Abstract

The potential of taxation to correcting environmental externalities has been long recognized among economists. Yet, this welfare-enhancing policy commonly faces strong opposition by citizens. Conversely, externality-correcting subsidies frequently enjoy high levels of public acceptance. We conduct a lab experiment to explore public support for Pigouvian taxes and subsidies. In an experimental market with a negative externality, participants vote on the introduction of Pigouvian taxes and subsidies under full or partial information concerning how the tax revenues will be spent and the subsidy paid for. Theoretically the two instruments should produce identical outcomes. We find substantially greater support for subsidies than taxes. This can partially be explained by the expectation that the subsidy will increase payoffs more than a tax, but not because it could be more effective in changing behavior. Furthermore, we find that under partial information, the preference for subsidies is even stronger.

Key words:

Pigouvian taxes; subsidies; lab experiment; public policy; revenues; effectiveness.

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Acknowledgements:

1. Introduction

The proposals for a congestion charge in Greater Manchester[1], a road user charge in Edinburgh [2], the Balearic ecotax in Spain [3], and a fossil fuel tax in Switzerland [4] were all defeated in public referenda. There are numerous other examples of public opposition defeating proposals for environmental taxes, and of governments and politicians opposing the introduction of such taxes [5]. Subsidies however do not seem to face the same level of public or political opposition. For instance 40 to 64 % of Americans oppose introducing a carbon tax on fossil fuels (depending on what the revenues are spent on), whereas 78 % support providing tax rebates (a subsidy) for people who purchase energy efficient vehicles or solar panels [6]. Taking a more general approach by using a lab experiment that allows different policy instruments to be directly comparable in terms of effectiveness, efficiency and distributional effects, Cherry et al. [7] also find greater support for subsidies than for taxes.

Whereas proposals for environmental taxes are often met with widespread public opposition, policy proposals for subsidies are often welcomed. When it comes to managing externalities such as climate change or congestion, taxes are generally the first best policy instrument [8]. Given the advantage in terms of efficiency, why are subsidies so much more popular than taxes? This is a highly relevant question as political feasibility is often the key constraint on the introduction of efficiency enhancing environmental policies, and public support is in turn a key determinant of political feasibility [9].

There are many potential explanations for the relative preference for subsides over taxes, including perceived effectiveness, distributional and other fairness concerns, and a lack of concern over funding. Using a lab experiment allows us to control for (actual) effectiveness and distributional effects. We can therefore test two of the potential explanations: that subsidies are perceived as more effective than taxes in changing behavior [10], and that any lack of information about how subsidies will be paid for and tax revenues returned will lead to a preference towards subsidies [11].

We review the relevant literature in the remainder of this section, present our experimental design in section 2, our results in section 3, and discuss our results in section 4.

1.1 Literature

There is a large empirical literature exploring public support for Pigouvian taxes, relying largely on surveys, focus groups and lab experiments. There has been a particular focus on the topic within the field of transport policy and environmental taxation. Comparatively little has been done to explore public support for subsidies, likely because this is not considered a problematic topic as the

general level of support is high. Yet, the popularity of subsidies represents an interesting contrast to the lack of support for taxation, which might provide important insights into the determinants of public support for policy instruments. In an economy with pre-existing taxes, Pigouvian taxes are usually more efficient than subsidies as the revenue can be used to reduce other taxes [8]. Depending on how the resources to finance the subsidy schemes are obtained this might even prove to be inefficient [12].

Based on this literature, some key determinants of support for policy instruments have been identified, including self-interest [13], i.e. whether or not the proposed policy will benefit or hurt you personally, trust in government [14], distributional concerns [15] and other fairness concerns [16]. Here we will focus on issues relating to perceptions of policy instruments, specifically their perceived effectiveness and their cost (to society and the individual).

One important reason why taxes are often unpopular is that tax revenues can outweigh net benefits by a large factor [e.g. 17]. This means that unless the public knows how the tax revenue will be spent, and trust this information, they might not trust that there will be a welfare gain. Dresner et al. [14] find that the fundamental problem facing ecological tax reform (in focus groups) is "lack of trust that the government would do what it promised with the revenues". For subsidies there is no equivalent problem. In a focus group study on environmental policy instruments, Kallbekken and Aasen [18] find that "it seems that the strong support for subsidies to a certain extent can be explained by the fact that financing subsides is viewed as rather unproblematic." In other words: the public is not particularly concerned about how the subsidies will be paid for. Given that taxes are paid upfront, whereas subsidies are received upfront, any uncertainty surrounding the budgetary rules should be expected to lead to a preference for subsides, all else equal.

A related idea is the concept of fiscal illusion. The concept is that "the institutional manner in which citizens are required to pay for government can affect taxpayer perceptions of the price of government, and, hence, the size of the public sector" [19]. Several studies explore different aspects of this hypothesis [20-22]. Harrison [23] argues that "the indirect and thus less visible nature of the costs to consumers tends not to provoke electoral opposition." This argument can be applied to the case of taxes versus subsidies, as taxes clearly impose more direct and visible costs on households, and this might in part explain why they are less popular than subsidies. For instance, it is probably clear to households that higher fuel taxes would result in higher fuel prices at the pump, whereas it is not equally obvious that a subsidy for installing heat pumps in private homes would necessitate a higher level of taxation that might be costly to the household. A second potential misconception is that people seem to underestimate the effectiveness of taxes, in particular relative to the effectiveness of subsidies (although the evidence is relatively scarce). Epstein et al. [24] show through an experimental purchasing study that the use of taxes for non-healthy food is more effective than subsidising healthy ones. Other studies show similar results [25, 26]. Respondents in a survey on policy measures in

passenger transport generally rated taxes as the least effective policy instruments, for instance "most respondents do not believe that congestion problems can be solved by price measures" [27]. Steg et al. [10] find that respondents perceive pull measures, such as decreasing the price of public transport (a subsidy), to be more effective compared to push measures, such as fuel taxes, a belief which contradicts most research findings on the effectiveness of policy measures.

This misperception could also be produced by a self-serving bias, that is, as Rienstra et al. [27] observed "there seems to be a negative bias in the opinion of respondents on the effectiveness of measures which aim at influencing their behaviour (especially price measures)". This is also consistent with the idea that there are norms against coercive policy instruments [7, 16]. Perceived effectiveness matters as it is an important determinant of acceptability, possibly even the most important determinant [28]. Steg et al. [10] report that the "perceived effectiveness of energy policies was significantly correlated with the acceptability of those policies." In discussions on taxes versus subsidies consumers' perceptions might also be affected by the fact that individuals might not have all the necessary information to ascertain whether or not the revenues from a tax are earmarked, whereas subsidies are always directed to those agents or behaviors that the government has decided to support.

1.2 Research question and hypotheses

The literature review, although not exhaustive, shows that limited budgetary information or fiscal illusion, and (biased) perceptions of the effectiveness of policy instruments can be key determinants of public support. Yet they are both difficult hypotheses to test systematically. It is difficult to probe to what extent voters truly understand budgetary processes and to what extent this influences their policy preferences [but do see 29]. Furthermore, the actual effectiveness of policy instruments differs widely across different contexts – and effectiveness is generally uncertain as there is no counterfactual in the real world against which effects can be measured. Lab experiments offer the possibility of controlled variation in variables which cannot be controlled outside the lab [30]. More specifically, the lab allows us to systematically vary the information subjects receive about the budgetary processes and to control the effectiveness of policy instruments. In the lab we can also design decision environments where we avoid distributional concerns that could otherwise confound the analysis (in particular the comparison of taxes and subsidies).In this study we test the following six hypotheses:

H1: *Public support for subsidies is higher than public support for taxes under both full and partial information about how tax revenues will be spent and subsidies paid for.*

H2: *Public support for both taxes and subsidies is higher with full budgetary information than with partial budgetary information.*

H3: *Providing partial budgetary information reduces support for taxes more than it reduces support for subsidies.*

We will test this by varying the information subjects receive. Some will receive precise instructions regarding how the tax revenues will be spent and the subsidies paid for, whereas a second group will receive less (but still true) information. See section 2.2 for details.

H4: *Subjects expect to earn higher profits with the subsidy than with the tax with full budgetary information.*

H5: *Subjects expect to earn even higher profits with the subsidy, relative to the tax, when they have only partial budgetary information.*

We test the hypothesis 5 and 6 by asking subjects what they expect their change in profit to be, if the tax (subsidy) is implemented.

H6: *Subsidies are expected to be more effective than taxes in reducing the externality with both full and partial budgetary information.*

This hypothesis relates to the literature on expected effectiveness, which finds that pull measures (such as subsidies) are typically perceived to be more effective than push measures (such as taxes). We will test this by asking subjects by how many more or fewer units they expect the group members to purchase in total if the tax (subsidy) is implemented. The experiment is designed to ensure that actual effectiveness (in equilibrium) will be the same for both taxes and subsidies, allowing a clean comparison of perceived effectiveness to actual effectiveness across the two policies.

2. Experimental design and procedures

Whereas there is plenty of research analysing the (expected) impacts of different taxes and subsidies, and whereas there is a large theoretical and model-based literature comparing taxes and subsidies, there are very few studies that allow a comparison between the two instruments in a setting where their effectiveness and distributional impact is equivalent [one exception is 7]. That is, most methods do not allow controlling for distributional aspects, efficiency impacts or the level of budgetary information of the policies. This is why we use a lab experiment to explore our hypotheses.

With this purpose, we use a 2x2 between subjects design. The two treatments are policy type (tax or subsidy) and information (full or partial). The treatments are described in greater detail in section 2.2.

2.1 The market

We construct an experimental market where subjects trade a fictitious good that causes a negative externality (this is presented in more neutral terms, as "additional costs" to the subjects). There are five buyers in each market. In each round they choose the number of units of the good they want to purchase (between 0 and 6) at a fixed price from an automated seller. All monetary amounts are presented to subjects in terms of the experimental currency "pesetas", and earnings are converted to euros at the end of the experiment at the rate of 150 pesetas per euro.1

The amount of money each subject earns depends on the number of units purchased by the individual and the number of purchases by the other subjects in the same market (as this imposes external costs). The resale values for the first to the sixth unit are the same for every individual: respectively, 76, 60, 46, 34, 28, and 24 pesetas. The per unit market price is 26, which means that the market equilibrium is for each buyer to purchase five units.

Each unit of the good purchased by a subject imposes external costs of 3 pesetas on each of the other players (but not on him or herself). The marginal social cost is therefore 12 pesetas per unit. Hence, the social optimum is for each buyer to purchase three units. The social optimum represents a 26 % efficiency gain over the market equilibrium (total group payoff increases from 270 to 340 pesetas). By reducing their purchases by a total of 10 units, the buyers forego profits of 50 pesetas, but external costs are reduced by 120 pesetas, yielding a net gain of 70 pesetas.

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[1] The "Peseta" was the currency in Spain until the euro was introduced in 1998-2002 at the exchange rate of 166.386 peseta per euro. We used this currency for the experiment as it still is a useful monetary reference for most of the participants.

2.2 Policies and treatments

In the experiment, subjects vote on the potential introduction of two different policies that can internalize the externality: a tax and a subsidy. The tax and subsidy rates are both set equal to the marginal social cost (12 pesetas per unit) and are therefore equally efficient, and both will produce the socially optimal outcome in equilibrium. The tax is imposed on each unit of the good purchased, whereas the subsidy is paid for each unit not purchased out of the maximum of six. The subsidy can be seen as a payment for not exercising the right to purchase units, which is equivalent to the scheme in Cherry et al. [7].

The tax revenues collected in each group are returned to the subjects with an equal share (1/5) at the end of each round. The subsidy is paid for through an equal (1/5) lump-sum payment by each subject at the end of each round. This design ensures that the tax and the subsidy produce identical incentives in all situations: For every distribution of the number of units purchased, the payoffs to each subject will be identical under the tax and the subsidy policy. This means there are no inherent differences in distributional impact between taxes and subsidies, which allow us to control for fairness considerations.

We vary the information given to the subjects regarding how the subsidy will be paid for and how the tax revenues will be spent. In the "full information" treatments subjects receive all the information described in the paragraph above (see the appendix for the exact wording). In the "partial information" treatment subjects are only informed that the budget will be balanced at the end of each round through personal transfers of pesetas. If the policy is implemented, information regarding the calculation of these transfers is revealed on the screen summarizing earnings that is shown at the end of every round.

Table 1 summarizes the stages of each experiment that begins with 10 unregulated rounds before the subjects vote on whether or not to implement the policy proposal. In the tax (subsidy) treatment, subjects first vote on tax (subsidy) versus no policy, then subsidy (tax) versus no policy, and finally the two policies are paired in a vote between the two. Each vote is followed by 5 rounds in which subjects purchase units under the rules of the policy option chosen by the majority of the group. There are 10 groups per treatment except for the tax and full information treatment in which 9 groups participated.

Table 1. Game stages in each experimental session (tax treatment*)

Stage 1	10 market rounds under no policy
Stage 2	Vote between tax and no policy followed by 5 market rounds under the option chosen by the majority of the group
Stage 3	Vote between subsidy and no policy followed by 5 market rounds under the option chosen by the majority of the group
Stage 4	Vote between tax and subsidy followed by 5 market rounds under the option chosen by the majority of the group

* The order of stages 2 and 3 is reversed in the subsidy treatments.

Finally, to elicit the subjects beliefs about the effectiveness of the policies, after submitting each of their first two votes we ask them "by how many pesetas do you think your earnings per round would vary if a tax (subsidy) is implemented?" and "by how many units do you think total group purchases per round would vary if a tax (subsidy) is implemented?".

2.3 Procedures

The experiment was conducted in the experimental laboratory of the University of the Basque Country in Bilbao2 (Spain) using the software Z-Tree [31]. A total of 195 subjects were recruited through announcements made at the University to participate in one of eight experimental sessions conducted between February and March of 2012.3 Participants anonymously interacted in groups of 5 through computer terminals. The average earnings per subject were 15.20 euros paid in cash at the end of sessions that lasted between 60 and 80 minutes.

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[2] http://www.bilbaolabean.com/

[3] Except for 25 subjects, all of the participants were students from the University of the Basque Country. The exclusion of these 25 non-student individuals from the analysis does not affect the results shown in the next section.

3. Results

The experimental design allows us to test our hypotheses based on individual decisions. In the following the results from the statistical analysis of individual votes and perceived efficiency of the measures are reported. Market efficiencies across policy environments are also compared to theoretical predictions.

3.1 Votes

Table 2 shows the percentage of approval votes for the policy being considered for implementation. The table separates votes by the order of referenda, the policy alternative (tax or subsidy), and the information given.

The first important finding is that the results from our experiment strongly support our first hypothesis: holding the information environment constant, subsidies receive more support than taxes. The results also support our second hypothesis. In the first vote, acceptability of taxes and subsidies is, respectively, 33% and 18% higher when full information about the budgetary rules is provided. These statistically significant differences are also in agreement with our third hypothesis.4 That is, the effect of the partial information treatment is to reduce support for taxation by a greater amount than it reduces support for the subsidy. Providing full information cuts the difference in support between taxes and subsidies in half - from 32 percentage points to 17.

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[4] We also implemented probability models in order to include covariates such as subjects' characteristics and profits made in previous stages of the game. These variables are not statistically significant in any of the models, and results reported here are invariant to their inclusion.

Table 2. Public support for tax and subsidies (percentage of individuals that voted for the policy alternative)

Treatment	First Vote			Second Vote		
	Tax	Subsidy	Difference in support (subsidy – tax)	Tax	Subsidy	Difference in support (subsidy – tax)
Partial Information	40% [50]	72% [50]	0.32 (0.09)**	32% [50]	76% [50]	0.44 (0.09)**
Full Information	73% [45]	90% [50]	0.17 (0.08)*	68% [50]	73% [45]	0.05 (0.09)
Difference in support (full – partial)	0.33 (0.10) **	0.18 (0.08)*		0.36 (0.09)**	-0.03 (0.09)	

Number of observations in brackets and standard errors in parentheses.

*5% and ** 1% statistically significant difference in means from a two-sided t-test.

The second vote is potentially affected by previous decisions made by individuals and the group they are in. Whereas support for the tax is still positively affected by the degree of information provided (36% increase), support for the subsidy is not. This might reflect a learning process where participants foresee equivalent impacts of both policies; or at least that the assumed superiority of subsidies over taxes might not be real. Furthermore, in the second vote, the gap between tax and subsidy acceptability under full information vanishes, mostly due to a decrease in support for the subsidy compared to the treatments where the subsidy referenda takes place first. This might also relate to the previous explanation of learning.

For the third referenda, when tax and subsidy policy options are paired in a vote between the two, individuals seem indifferent about supporting one or the other independently of the information environment. By the third vote, many individuals may have realized or learned that the impact of the two policies on their profits is the same. In other words, this could be the result of the experience gained in several groups that chose to implement the policies during previous rounds. Table 3 presents the percentage of individuals that voted for the tax option. The only significant difference is the surprisingly large support for taxes in the referenda against subsidies under full information when the tax versus no policy referenda took place in the second vote. Whether this result is related to changes in perceptions towards possible distributional aspects remains to be seen.

Table 3. Public support for taxes (percentage of individuals that voted for tax)

Treatment	Third vote (Tax vs. Subsidy)		
	Pooled	Tax First	Tax Second
Partial Information	41% [100]	46% [50]	36% [50]
Full Information	47% [95]	37% [45]	56% [50]
Full - Partial	0.06 (0.07)	-0.09 (0.08)	0.20 (0.10)*

Number of observations in brackets and standard errors in parentheses.

*Significant at 5%, ** Significant at 1%.

3.2 Expected effects of the policies

Policy support is likely to depend on the perceived effectiveness of the policies [28]. As can be inferred from the results in the referenda, the way in which budgetary rules are explained to individuals has a clear impact on their palatability. Table 4 shows the mean expected changes in individual profits in the hypothetical case that the respective policy is implemented. The results support our fourth and fifth hypotheses as subsidies are expected to increase individual profits more than taxes, but the difference is reduced under full information from 15.4 to 8.6 pesetas in the first vote. In the second vote, the difference is reduced to 9 when budgetary rules are partially revealed, and it is not statistically significant under full information (potentially an indication of learning). Importantly, information about the budget balancing mechanisms of the policies does not seem to affect the expected improvements from a subsidy, but it changes the expectation for taxes from a negative to a positive change in profits in both the first and the second vote.

Table 4. Expected changes in individual profits in pesetas if the policy is implemented

Treatment	After first vote			After second vote		
	Tax	Subsidy	Subsidy - Tax	Tax	Subsidy	Subsidy - Tax
Partial Information	-5.8 [50]	9.6 [50]	15.4 (3.2)**	-0.2 [50]	8.8 [50]	9.0 (3.0)**
Full Information	4.2 [45]	12.8 [50]	8.6 (2.7)**	8.4 [50]	4.7 [45]	-3.7 (2.3)
Full - Partial	10.0 (3.4) **	3.2 (2.7)		8.6 (3.0)**	-4.1 (2.4)	

Number of observations in brackets and standard errors in parentheses.

*5% and ** 1% statistically significant difference in means from a two-sided t-test.

Table 5. Expected changes in units purchased by the group if the policy is implemented

Treatment	After first vote			After second vote		
	Tax	Subsidy	Subsidy - Tax	Tax	Subsidy	Subsidy - Tax
Partial Information	-5.8 [50]	-0.4 [50]	5.4 (2.5)*	-4.4 [50]	-4.2 [50]	0.2 (2.9)
Full Information	-4.4 [45]	-1.0 [50]	3.4 (2.8)	-4.4 [50]	-6.9 [45]	-2.5 (2.6)
Full - Partial	1.4 (2.2)	-0.6 (3.1)		0.0 (2.8)	-2.7 (2.8)	

Observations in brackets and standard errors in parentheses.

*5% and ** 1% statistically significant difference in means from a two-sided t-test.

Expected changes in the number of units purchased by the group do not vary across the information treatments (see table 5). Since budgetary rules do not directly affect the number of units purchased in a group, expected changes in the latter should be less sensitive to the description of the policy compared to expected changes in profits. In the first vote, however, taxes are perceived to affect behaviour more than subsidies when only partial information is provided. Based on this we have to reject hypothesis 6. It is particularly interesting to note that whereas subjects expect to earn lower profits with a tax and partial information, they expect the group as a whole to buy fewer units. As this reduces the external cost, the only explanation that reconciles the two beliefs (unless they are truly inconsistent) is that subjects do not expect to receive a (significant) share of the revenues at the end of the period. This would, in turn, be consistent with the finding that tax with partial information is the policy option that receives the least support (by a wide margin).

3.3 Efficiency

The theoretical prediction (market at equilibrium and fully rational subjects) is an efficiency gain of 70 pesetas (26%) from the implementation of either of the two policies, as compared to the market without regulation. Observed efficiency gains (see table 6) are somewhat lower than the theoretical prediction, at 32-34 pesetas in the second stage, and 30-32 pesetas in the third stage. The finding that the market "overperforms" in the absence of regulation relative to the theoretical prediction, whereas the policies "underperform", is consistent with previous studies [7]. The main reason for this is probably caused by the simple asymmetry that if subjects make (random) mistakes (i.e. if they do not purchase the individually optimal number of units), there are more opportunities for making welfare improving mistakes with no regulation, than there are with either policy implemented.

Similarly, the reduction in the number of units purchased by the groups resulting from the introduction of a tax or a subsidy, was only between 5 and 7 instead of the 10 predicted units.

Table 6. Market efficiency across policy environments (median group units and profits)

Stage	Policy	Units	Profits (pesetas)	Profits (% of social optimum)
1	No Policy	21	288	84.7%
2	No Policy	21	290	85.3%
	Tax	16	324	95.3%
	Subsidy	16	322	94.7%
3	No Policy	22	294	86.5%
	Tax	15	324	95.3%
	Subsidy	15	326	95.9%
4	Tax	16	326	95.9%
	Subsidy	16	332	97.6%

4. Discussion

There are many potential explanations of why individuals usually prefer subsidies to taxes. In this paper we have explored two potential explanations experimentally by holding factors that affect other explanations constant. On the one hand, individual earnings may be thought to be larger if a subsidy is provided than if a tax is charged. On the other hand, the two policies could be perceived to result in different effectiveness in changing behavior and thus reducing the externality.

The results from the experiment strongly support that acceptability of taxes and subsidies increases significantly when there is complete budgetary information. This increases support for taxes relatively more than it increases support for subsidies. This is consistent with loss aversion and the idea that people are more concerned about paying money for which they might get nothing in return, than they are concerned about receiving a benefit which they might have to pay for later. The results of the experiment also suggest that subsidies are expected to increase individual profits more than taxes when information is incomplete. It is particularly noteworthy, that with full budgetary information, individual expectations of the benefits from taxes switch from loss to gain. In other

words, it seems subjects do not expect to receive a (significant) share of the tax revenues, unless they are reassured of this.

One surprising, and potentially inconsistent result is that, whereas subsidies are expected to yield higher profits than taxes, subjects expect taxes to be more effective in reducing the number of units purchased by the group as a while. These two findings appear contradictory, and the finding that subjects expect taxes to be more effective is potentially at odds with findings from other studies [10, 27]. These two findings are, however, reconciled if subjects do not expect to receive a significant share of the tax revenues (in that case overall efficiency can increase without an increase in the individual's profit).

Our results point to the central role of the use of revenues in explaining the lower levels of support for taxes compared to subsidies. It seems that people do not support taxes because they are worried they will not see (any) benefits from the use of the revenues. Providing better information on the use of the revenues seems to alleviate this fear, and increases support.

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Appendix: Instructions for participants

The following is a translation from Spanish of the instructions given to participants in paper and read aloud in the room. Text in italics was not provided in partial information treatments and was substituted by that in brackets. The order of the sections of this set of instructions is the one used in "tax treatments". Section 3 preceded Section 2 in "subsidy treatments". Headings were not numbered in the instructions given to participants.

1. General Instructions

You are about to participate in a decision-making experiment. At the end of the experiment you will obtain a cash-payment that will depend on the decisions that you and other participants make. This payment will be added to your initial fee for showing up to this experimental session.

Each of you will be randomly assigned to a **group of 5 persons**. The members of your group will not be necessarily those who are seated next to you. We remind you that all the decisions you make will be anonymous and will only affect you and your group.

The experiment will consist of **25 rounds**. In each of these rounds you will decide how many units of a good you want to buy. **This good is fictitious, but, as explained below, it has value to each of the participants.** Decisions made in one round do not affect earnings in other rounds.

You and 4 other participants are buyers in a market. Each of you can buy up to 6 units of a good **at a fixed price. Each of you have been** assigned a table representing the value each unit of that good has for each one. **These values will play a crucial role in your final payment**. Both the value per unit of the good and the price per unit are in pesetas and will be revealed to you before the first round. All your earnings **will be converted to euros** at a rate of **150 pesetas per euro and given to you at the conclusion of the experiment.**

In each of the 25 rounds you will introduce the number of units you want to buy on a similar screen to the one shown on the room's main screen. It is important to remember that the **numbers in these examples are different to those you will see during the experiment**. On this screen you will choose a number between 0 and 6. Selecting 6, for example, means you have bought the 6 units.

Should you introduce a smaller number than 6, then you automatically buy those units with a higher value to you. As you will see, **each unit has a different value, which is independent from the price of the good**. A calculator will be at your disposal by clicking on the corresponding icon on the screen. Click **"Continue"** after you have made your choice.

In order to buy, you do not need to spend the money you have earned by coming on time to this session. Each time you decide to buy units, you will automatically get a credit for the pesetas you need in order to cover the cost of the units you decide to buy. You will automatically pay back this credit without any extra costs at the end of each round. In short, **the profit that you make for each unit you buy is the difference between the value of this specific unit and the price you pay for it** (the credit does not affect your profit for the unit as the credit you receive is equal to the payment of the credit):

profit of unit=value of purchased unit + credit received - price - credit payment

> **profit of unit=value of purchased unit - price**

Example:

In the example shown on the main screen, the participant decides to buy all six units at a fixed price of 15 pesetas. Therefore profits for this participant will be 65, 50, 35, 15, 10, and -5 for the units 1 to 6 respectively, resulting in total profit from units purchased of 170 pesetas.

There is another feature of this market that affects your earnings. All the buyers use the good in a way that creates **"additional costs"** on the other buyers. Although your purchases do not generate additional costs to the calculation of your own earnings, the purchases of other members of the group may affect you negatively, in the same way that your purchases will add costs to the other 4 members of your group. Note that even if you decide not to buy any units, you may still have a cost depending on the purchases of the other 4 members of your group. IYou will be able to see what your additional costs from others' purchases are in the screen that summarizes your round earnings at the end of each round. This summary will be shown for 30 seconds but you may click **"Continue"** before the time is over. Your earnings in a round will consist of:

+profits from units purchased

- additional costs

=earnings per round

Example:

In this example, every unit purchased by a member of the group generates an additional cost of 5 pesetas to the rest of the members of the group. In this particular example, the participant bought 6 units at a price of 15 pesetas each resulting in profits from units purchased of 170 pesetas. Each of the purchases of this participant generated additional costs in cash balances of the other buyers (but not in this participant's own balance). Similarly, all the purchases from other buyers generated additional costs to this participant. In this example, the rest of the participants in the group bought a total of 19 units, generating 95 pesetas of additional costs to this participant. Earnings in this round for this participant were 170-95=75 pesetas.

The 25 rounds of the experiment are divided into 4 stages. The first stage consists of 10 rounds as described above.

The 25 rounds of this experiment are divided into **4 stages**. The first stage consists of 10 rounds with the characteristics described.

At the beginning of the second stage, **round 11**, you will be asked **to vote** for a policy proposal. You will be informed of two policy proposals subject to a vote at that moment. The proposal receiving the majority of votes in the group will be implemented during the next 5 rounds. Similarly, at the beginning of the third and fourth rounds, rounds 16 and 21 respectively, you will be asked to vote for other policy options. **The option receiving the majority of votes in your group will be implemented during the next 5 rounds.**

The details of the proposals will be revealed to you on your screen before you are prompted to cast your vote. All participants will be informed of the policy option that received the majority of votes in the group. However, nobody will be informed of the individual votes of other participants. Different options may be elected in other groups.

During all the rounds of this experiment:

The **unit price** of the good is <u>26</u> pesetas.

The **additional costs** for the purchase of a unit are <u>3</u> pesetas. As there are 4 more members in your group, each unit you buy generates a total additional cost of 12 pesetas (3 for each other member). Similarly, each time another member of the group buys a unit, it will generate you an additional cost of 3 pesetas.

The values for each purchased unit will be shown on your screen at the beginning of the experiment. It is not necessary for you to memorize them since they will be shown to you again at the beginning of every round before you make your purchasing decision.

2. Voting whether to introduce a <u>Tax</u> or to continue <u>Without Regulation</u>

The rules of the experiment that will be put into practice during the next 5 rounds may be changed according to the preferences of the majority of the group. The policy options to be voted are the following:

1) Without Regulation. The rules for this option are the same as those from the 10 first rounds of the experiment.

2) Tax. The rules of the "Without Regulation" option would be implemented with a modification with which your profits would be affected in two ways:

(i) Aside form the price, you will have to pay a tax for each unit that you purchase.

(ii) *The revenue collected by tax payments in the group will be equally distributed among the members of the group at the end of each round.* [Your group's budget will be balanced through personal transfers of pesetas by all members of the group at the end of each round.]

Example:

> Assuming a value for the first unit of 80 pesetas and a price of 15 pesetas, the participant in the example would have a profit before taxes of 65 pesetas when buying the first unit. Should the tax be 20 pesetas, the profit for the purchase of this unit would be reduced to 45 pesetas. If the participant buys a fifth unit for a value of 25 at the same price of 15, the profit before taxes would be of 10 pesetas. Having assumed the same tax of 20, the net profit for the fifth unit would be of -10 pesetas. It's important to note that this negative profit could be avoided by simply not buying this last unit as there is no tax for not purchased units.

The revenue from taxes obtained in each group will be distributed equally among the members of the group at the end of each round. Your earnings in a round with a tax would consist of:

+profits from units purchased net of taxes

-additional costs

+*share of tax revenues* [personal transfer]

=earnings per round with taxes

Example:

In this example, every unit purchased by a member of the group generates an additional cost of 5 pesetas to the rest of the members of the group. In this particular example, the participant bought 4 units at a price of 15 pesetas each resulting in profits from units purchased before taxes of 145 pesetas but 80 pesetas must be paid for taxes (20 for each purchased unit). Therefore, profits from units purchased net of taxes were 65 pesetas. In this example, the rest of the participants of the group purchased a total of 12 units, generating 60 pesetas of additional costs to this participant. *In the group there were 16 units that were bought (4 by this buyer and 12 by the rest) generating an tax revenue of 320 pesetas (16 units x 20 pesetas) that are distributed equally among the 5 members of the group (64 pesetas). Each participant of this group receives a share of the tax revenues of 64 pesetas.* Earnings in this round for this participant were *65-60+64=89 pesetas* [65-60+transfer=5 pesetas plus personal transfer].

If the tax proposal is chosen by the majority of the group, the **tax** for each unit you buy would be **12** pesetas.

3. Voting whether to introduce a Subsidy or to continue Without Regulation

The rules of the experiment that will be put into practice during the next 5 rounds may be changed according to the preferences of the majority of the group. The policy options to be voted are the following:

1) Without Regulation. The rules for this option are the same as those from the 10 first rounds of the experiment.

2) Subsidy. The rules of the "Without Regulation" option would be implemented with a modification with which your profits would be affected in two ways:

(i) You will obtain a payment (subsidy) for each unit you do **not** buy.

(ii) *The total cost of the subsidy in the group will be paid with equal contributions by all the members of the group at the end of each round.* [Your group's budget will be balanced through personal transfers of pesetas by all members of the group at the end of each round.]

Example:

Assuming a value for the fifth unit of 25 pesetas and a price of 15 pesetas, the participant in the example would receive 10 pesetas of profit when buying this fifth unit. However, assuming a subsidy of 20 pesetas per non-purchased-unit, not buying this unit would result in a higher profit (20 pesetas).

The costs the group incurs for paying subsidies will be covered with equal contributions by all the members of the group at the end of each round. Your earnings in a round with subsidy would consist of:

+**profits from units purchased**

+**profits from non-purchased-units (subsidy)**

-**additional costs**

-*contribution to the payment of the total cost of the subsidy* [**personal transfer**]

=**earnings per round with subsidy**

Example:

In this example, every units purchased by a member of the group generates an additional cost of 5 pesetas to the rest of the members of the group. In this particular example, the participant bought 3 units at a price of 15 pesetas each. Profits from units purchased were 150 pesetas. For the fourth, fifth and sixth units the participant receives a total subsidy of 60 pesetas (20 per each non-purchased unit). In this example, the rest of participants of the group bought 13 units, generating 65 pesetas of additional costs to this participant. In the group there were a total of 16 purchased units (3 by this buyer and 13 by the rest). *The group could have bought up to 30 units (6 units by each of the 5 members) so that there were 14 non-purchased-units for which a subsidy was given (30 maximum minus 16 purchased). This resulted in 280 pesetas paid for subsidies in the group (14 units x 20 pesetas) that are covered with equal contributions by all the members of the group (56 pesetas). Each participant of this group contributed 56 pesetas to the payment of the total cost of the subsidy.* Earnings in this round for this participant were *150+60-65-56=89 pesetas* [150+60-65-transfer=145 pesetas minus personal transfer].

If the subsidy proposal is chosen by the majority of the group, the **subsidy** for each unit you do not purchase would be __12__ pesetas.

4. Voting whether to introduce a Tax or a Subsidy

The rules of the experiment that will be put into practice during the next 5 rounds may be changed according to the preferences of the majority of the group. The policy options to be voted are the following:

1) **Tax.** The rules of the "Without Regulation" option would be implemented with a modification with which your profits would be affected in two ways:

(i) Aside form the price, you will have to pay a tax for each unit that you purchase.

(ii) *The revenue collected by tax payments in the group will be equally distributed among the members of the group at the end of each round.* [Your group's budget will be balanced through personal transfers of pesetas by all members of the group at the end of each round.]

Your earnings in a round with a tax would consist of:

> **+profits from units purchased net of taxes**
> **-additional costs**
> **+*share of tax revenues* [personal transfer]**
> **=earnings per round with taxes**

2) **Subsidy.** The rules of the "Without Regulation" option would be implemented with a modification with which your profits would be affected in two ways:

(i) You will obtain a payment (subsidy) for each unit you do **not** buy.

(ii) *The total cost of the subsidy in the group will be paid with equal contributions by all the members of the group at the end of each round.* [Your group's budget will be balanced through personal transfers of pesetas by all members of the group at the end of each round.]

Your earnings in a round with subsidy would consist of:

+profits from units purchased

+profits from non-purchased-units (subsidy)

-additional costs

-*contribution to the payment of the total cost of the subsidy* [personal transfer]

=earnings per round with subsidy

If either the tax or the subsidy proposals are chosen by the majority of the group, the **tax** and the **subsidy** would both be **12** pesetas.

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