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Motivations and collusion among agents in the evasion of indirect taxes: an experimental approach*

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1. Introduction

Since the seminal paper by Allingham and Sandmo (1972) the theoretical microeconomic approach to tax evasion has almost exclusively treated only personal income tax and, more recently and with fewer examples, profit taxes (e.g. Kreutzer and Lee, 1986; Lee, 1997, Yaniv, 1995, Panteghini, 2000). The evasion of indirect taxes, and more precisely of value added tax (VAT), is an almost unexplored topic for microeconomic theory, and the few papers that have explicitly treated it from a theoretical perspective (e.g. Marrelli, 1984) have done so within the production theory framework, i.e. once again as part of a problem of profit maximization. None of these works analyze those interesting aspects of VAT evasion tied to the highly social nature of this kind of tax evasion. The social-psychological dimension of tax evasion is not a new topic, and it has been widely analyzed from both the theoretical (e.g. Gordon, 1989) and the empirical-experimental perspectives (e.g. Webley, P.Robben, H., Elffers, H. and Hessing, D., 1991; Bosco, Mittone, 1997), but once again this literature refers only to income tax.

The most distinctive characteristic of the evasion of VAT is that it typically involves three actors – the seller, the buyer and the state – whereas in the evasion of income tax the interaction concerns only the taxpayer and the state. The interaction among these three agents may give rise to the following phenomena:

a) the taxpayer, i.e. the buyer of a given good or service, can evade only if s/he is able to collude with the seller, who should behave as tax collector for the state.
b) The collusion between the seller and the buyer is facilitated by the mutual advantage accruing to the two agents from the collusion. By colluding, in fact, both agents can reduce their fiscal burdens: the buyer does not pay the VAT and the seller can declare an income lower than the real one because s/he under-reports the amount of his/her business, and consequently must pay less profit tax.
c) The seller can decide to confiscate the tax yield that she has collected from his/her buyers.

According to point (b) the seller has a double incentive to evade: the first is a market incentive due to the opportunity to be more competitive by selling at prices lower than the gross prices (i.e. VAT included) charged by the other sellers; the second is to reduce the

burden of his/her profit tax by hiding the real volume of his/her business. Note that both these incentives for collusion (and therefore for evasion) may be nullified if the seller decides to adopt the strategy described at point (c). For terminological clarity, henceforth I shall define the seller's appropriation of the VAT yield collected from his/her clients as "VAT expropriation".

A second interesting point related to VAT evasion is that the government may introduce incentives intended to induce agents to complain, i.e. forms of reward for agents who report attempts to involve them in collusion. To be effective, the incentives introduced by the state to encourage the reporting of collusion attempts, by either buyers or sellers, should balance the just described incentives to collude, and they therefore should be carefully planned. On the other hand, many national legislatures (Italy's for example) have serious lawmaking problems with regard to these kinds of incentive for informing on miscreants. How to incentivize the denunciation of collusion attempts will not be treated here, given that it would extend the discussion beyond the scope of this paper.

A final point investigated here regards risky behavior. In previous experiments carried out on income tax evasion (Mittone, 1999) an interesting recursive phenomenon was observed in every experiment: a sort of "bomb crater" effect. The term "bomb crater" is taken from the practice of soldiers during the First World War to seek refuge in the craters made by bombs that had just fallen. The soldiers believed that it was almost impossible for another bomb to fall in exactly the same place. Similarly, in Mittone (1999) the tax payers evaded immediately after the fiscal audit even if the probability of being detected was totally independent of previous tax audits. This phenomenon could be analyzed from the wider perspective of the learning by doing literature (e.g. Wieland, 2000) or from the more specific viewpoint of the literature on dynamic tax evasion, e.g. Rickard, Russell and Howroyd, (1982) or Engel and Hines (1999), respectively on the effects that are produced on the tax payers behavior by the introduction of retroactive penalties and by retrospective audits.

Does the more complex environment of VAT evasion produce different effects on the experimental subjects' attitude toward risk? Or does the bomb crater effect persist even in the VAT context?

The approach chosen here to analyze VAT evasion is an experimental one. The main advantage offered by the experimental approach is that it enables isolation of each of the aspects just described and empirical investigation into the individual roles played by these factors in influencing VAT evasion.

2. The theoretical frame: some considerations

The theoretical aspects to be treated before passing to the experimental investigation are closely related to the solution of questions arising from the just described characteristics of VAT evasion. These questions are the following:

1) assuming that the sellers operate in some form of imperfect competition market (i.e. assuming that they can fix their selling price) what is the seller's optimal price-collusion-evasion strategy?
2) Which is the optimal collusion-evasion choice for the buyer?
3) Does the traditional tax evasion theory fit with the seller's decisional problem of keeping the indirect tax yield collected from his/her buyers?

Although these three questions seem to represent new theoretical topics, more accurate analysis shows that they are all easily manageable within the framework of the traditional Alligham-Sandmo model. In fact, unless we introduce into the collusion mechanism some form of asymmetrical advantage for the agents - for example, some form of reward for the agent that decides to denounce an attempt at collusion by the other agent - the decisional problem is very similar to that of income tax evasion.

Both the buyer and the seller can consider VAT evasion from the same perspective of income tax evasion because VAT reduces the disposable income exactly as income tax does. The main difference is that the VAT burden is proportional to the price of the good purchased, while income tax is generally progressively tied to the income level. But this difference does not alter the ingredients of the tax payer problem, which are the same as originally included in the classic Allingham-Sandmo model, i.e. the amount of tax due, amount of the fine to pay if detected, and the probability of being audited.

Another difference between VAT evasion and the traditional theoretical framework of income tax evasion concerns the sellers only. The expropriation of the VAT yield collected by the sellers is linked to the decision to evade profit taxes and can therefore be seen as part of production choices. As anticipated in the introduction, VAT expropriation can be handled within production theory by looking at the literature on profit tax evasion. This topic will not be treated here, because the focus of this paper is on collusion between sellers and buyers and on the effects thus produced on the market dynamic. More precisely, it is assumed here that

the sellers are not concerned with production choices and therefore make choices that closely resemble those taken in the income tax environment. This assumption is realistic because the evasion of VAT mainly arises within transaction contexts where the sellers are very small firms. In the "real world" when the production unit is made by only one worker-owner its choices are typically taken using very simple decisional schemes that cannot realistically be analyzed using the traditional dynamical models of profit-maximization. This is typically the case of small shops, small building firms and artisan firms e.g. plumbers, painters and so on.

In spite of the apparently traditional setting in which the evasion of indirect taxation should be framed, this is nevertheless an innovative perspective on the actual behavior adopted by human actors when confronted with an opportunity to break the law. The interest of indirect evasion resides in the quite complex psychological context in which it takes place. As said at the outset, many experiments on the evasion of income tax have shown that the decision to evade is influenced by psychological factors that may profoundly modify the results of the decisional process of the taxpayers. These factors, which depend on the social dimension of the decision to evade income tax, are even more crucial in a context like that of indirect taxes, where evasion becomes much more explicit than is normally the case in income tax evasion.

Furthermore, the strong psychological impact of indirect tax evasion is a major problem, not only for the buyer, who must obtain the complicity of the seller to be able to evade, but also for the seller, when s/he decides to keep the money collected instead of paying it to the state. In fact, when the seller keeps the money paid as tax, s/he is stealing from both the buyer and the state, and it is therefore reasonable to suppose that awareness of his/her unfair behavior will be stronger than in the case of income tax.

On the other hand, and this time with regard to the buyer, one can argue that the subjective perception of paying a tax is weaker in the case of indirect taxes than it is in the case of income tax. The relatively weaker psychological perception of the fiscal burden caused by the indirect taxes may be due to the fact that tax payers generally consider indirect tax to be an inseparable part of the price that they are paying for a given good. Conversely, in the case of income tax, tax payers clearly see the amount of money that is being taking away from their income.

The basic theoretical framework used here is a simplified version of Allingham and Sandmo's static model.[1] Taxpayers' choices (by both buyers and sellers) are taken with a view to the expected monetary value that they can extract from evasion, and every choice is

[1] For more detailed description of the theoretical frame see Mittone, 1999.

independent of previous decisions and subsequent ones. Time independence is ensured by the following assumption:

H_1) the fiscal authority does not take the past behavior of the taxpayers into account when determining either the fiscal audit probability or the fee to be applied in the case of evasion.

In order to concentrate only on monetary income, it is useful to introduce a further simplifying assumption:

H_2) the agents' utility depends only on monetary income.

The agents considered here are the buyers and sellers of a given homogeneous good. In order to keep the analytical framework as simple as possible, further elementary assumptions must be introduced:

H_3) the buyers' net disposable income (i.e. the income that the buyers can spend to purchase all the other goods after consumption of the homogenous good) at the end of the reference period Γ is the difference between the price paid for the good in each purchase and its reservation price (i.e., $Y_{buyer} = \Sigma_\gamma RE_\gamma - \Sigma_\gamma (P_\gamma + VAT\ P_\gamma)$; with RE_γ = reservation price at time γ; P_γ = price of the good bought at time γ; ($\gamma = 1,\ldots, \Gamma$));

H_4) the sellers' total net income Y_{seller}, computed at the end of a given reference period Γ, depends exclusively on the total gross profit extracted from each sale minus the profit tax (i.e., $Y_{seller} = \Omega^{net}_\Gamma = (\Sigma_\gamma P_\gamma - \Sigma_\gamma CT_\gamma)(1 - t)$; with: Ω^{net}_Γ = total net profit at time Γ; CT_γ = total production costs at time γ; P_γ price of the good sold at time γ; ($\gamma = 1,\ldots, \Gamma$); t = profit tax rate).

Given these assumptions, one can assume that in each period γ the agents compare the sure choice, i.e. they do not collude and benefit from a sure profit, if a seller, or pay the VAT and benefit from a sure net disposable income level if a buyer, with the expected value EV^e obtained respectively from profit tax evasion if a seller and from VAT evasion if a buyer. More precisely, bearing in mind that the agent has only two choices - to collude or not to collude - and recalling the time independence assumption, if the agent is a buyer we have:

$$EV^{e}_{buyer} = (1-\pi)\ VATP + \pi\left[\phi(VAT) + VATP\right] \qquad [2.1]$$

where:

π is the probability that VAT evasion will be discovered;

VAT is the VAT rate;

$\phi(VAT)$ is the punishment scheme.[2]

The buyer's problem, given [2.1], is simply a matter of making a comparison between the value of EV^{e}_{buyer} and the cost of paying the VAT. As well known, in the very special case when $EV^{e}_{buyer} = VATP$ the choice of the buyer is conventionally assumed, by expected utility theory, to be discriminatory between risk aversion and risk attraction.

Similarly, also the seller's expected value from collusion can be computed in the following way:

$$EV^{e}_{seller} = (1-\pi)\ t\Omega + \pi\ f(\Omega) \qquad [2.2]$$

where:

f (Ω) is the punishment scheme for the profit tax evasion.

Given 2.2, the decisional problem of the seller is exactly identical to the buyer's problem, i.e. it is a matter of comparison between his/her expected value from collusion and the value of the profit tax that s/he can avoid paying. On the other hand, the decisional task of the seller is somewhat more complex than the one just described. The seller should in fact consider the option of colluding not only as a way to avoid paying the profit tax, but also as a competition device. The problem is obviously how to compute the competitive advantage offered by collusion.

Finally, it is worth noting that the basic decisional frame does not change even when we allow the seller to expropriate the VAT collected. Also in this case, the problem is that of comparison between the expected value from expropriation and the sure value of paying the yield to the state. The main difference in this case is that we can assume that VAT

[2] I assume that the penalty rate is imposed on evaded tax, an institutional feature common to many developed countries.

expropriation is no longer a dichotomous variable but that it can be “tuned” by the seller. Nevertheless, the expected value formula does not change, except for the fact that instead of a “pay not pay” option we need a “how much to pay” option.

3. The experimental design

The context modeled by the experiments discussed here is that of a market of an homogeneous good with the following features:

1. operating on the market are several sellers and buyers, each characterized by different reservation values. The reservation value for the buyers is depicted by a reservation price, while for the sellers the reservation values are represented by their total production costs;
2. neither the buyers nor the sellers can alter their reservation values;
3. each agent (seller and buyer) can close only one transaction (consisting of only one unit of the good) per each time period (round of the game);
4. the experiment is carried out using computers; the experimental subjects interact via a local net;
5. all relevant items of information are given only via the computer screen;
6. each subject receives a role at the beginning of the experiment – seller or buyer – which does not change throughout the entire experiment;
7. each subject receives an identification number at the beginning of the experiment so that the subjects’ real identities are not known to each other;
8. each subject receives (via the computer screen) her/his “personal information” i.e. her/his production cost if s/he is a seller, or her/his reservation price if s/he is a buyer; this values change over time but the subjects are constantly informed;
9. the money reward for the experimental subjects is given by the difference between the actual value of the transaction and its cost of production, or its reservation price, minus the indirect tax;
10. both the sellers and the buyers can make public offers for the good at the price that they believe most advantageous: obviously the sellers ask for a price to sell while the buyers offer a price to buy the good;

11. both the sellers and the buyers can choose to close a contract from the list of offers shown on the computer screen by left-clicking on the identification number of the agent that has offered the price that they believe good for them;
12. the sellers as well as the buyers can try to collude with a potential partner by clicking on a special button called “collusion” on the screen; when this button is clicked, two buttons appear on the screen : “yes” and “no”; a subject who receives a proposal for collusion can accept by clicking on the yes button or can refuse by clicking on the no button;
13. collusion is always total, i.e. it regards the entire amount of tax due to the state, and it is a private relationship, so that the other players cannot know if a given seller (or buyer) has already agreed to collude with someone else;
14. during the experiment a given number of transactions are monitored by the fiscal authority, and if the subjects have colluded they must pay a fine that will be deducted from their final rewards;
15. the expected value from collusion (i.e. the values of audit probability and of the fine) is the same for both the sellers and the buyers;
16. in correspondence to the equilibrium point the lottery is fair, i.e. the expected value from evasion is equal to the sure choice value;
17. the subjects are informed about the fiscal audit probability and the fine to pay;
18. if the sellers are allowed to expropriate the VAT collected, a special window opens on the computer screen: the “pay tax yield to the state” window; when the subjects decide to expropriate VAT, they must write only the amount of money that they have decided to pay to the government in the window.

At the end of the experiment the subjects are informed about their final money rewards, which may amount to a maximum of 50.000 Italian Liras (just over 25 EURO).

The experiments thus designed are very similar to the seminal Chamberlin (1948) experiment, to Vernon Smith’s relatively more recent competitive market experiment (1962), and to the version of these experiments adopted by the Experimental Economics handbook by Bergstrom and Miller (1997). As in these experiments, use of the neo-classical offer-demand model of perfect competition permits the forecasting of equilibrium prices without collusion and with collusion. It is therefore possible to check whether the behaviors of the subjects conform with the expectations of the model. Furthermore, it enables investigation of issues

not strictly related to the economic apparatus anticipated in the introduction. The most important of these topics is that of the emergence of reputation mechanisms, i.e. a willingness to collude that can be interpreted as the commercial "style" of a given subject and which can be helped or hampered by this reputation.

Nine experiments have been carried out to date at the Computable and Experimental Economics Laboratory (CEEL) of the University of Trento and at the School of Psychology, University of Exeter,[3] and they have involved a total of 166 experimental subjects:

a) experiment α_1 and experiment α_2 – base experiments carried out in Trento with 12 experimental subjects each, and taken as the touchstone for interpretation of the results from the other experiments;
b) experiment α_3 – the same as experiments α_1 and α_2 but with 24 experimental subjects, carried out in Trento;
c) experiment β_1 – intended to investigate the effects produced by allowing the experimental subjects, who played the role of sellers, to keep the money collected as indirect taxes (VAT expropriation in our terminology); 24 experimental subjects were used and the experiment took place in Trento;
d) experiment α_{UK1} – pilot experiment (base experiment) carried out in Exeter (GB) to test whether the experiment can be replicated in other experimental environments; 12 experimental subjects were recruited;
e) experiment α_4 – modified base experiment carried out in Trento[4] with 24 subjects. The modification regarded the cadence of change of the reservation values, i.e. the number of rounds dividing each change in the reservation values was reduced from 5 to 2-3 (whether the change was after 2 or 3 rounds was a matter of random extraction);
f) experiment β_2 – modified VAT expropriation experiment carried out in Trento with 24 subjects;
g) experiment α_{UK2} – modified base experiment carried out in Exeter, 12 subjects, number of rounds reduced to 20;
h) experiment α_{SS1} – modified base experiment carried out during the "2001 Summer School in Experimental Economics" organized by the CEEL and directed by Daniel Friedman, 22 subjects.

[3] The experiments in Exeter were carried out by Paul Webley.
[4] This modification was suggested by Paul Webley after the pilot experiment in Exeter.

The experimental subjects in the experiments carried out in Trento were undergraduate students recruited by means of announcements on the bulletin board of the Faculty of Economics. A similar recruitment procedure was also used at Exeter, while for the Summer School sample we recruited post-graduate students at the School itself. Females in all the experiments, with the exception of the Summer School one, made up 50% of the sample. Each experiment lasted 25 rounds.

The reservation values and the distribution of the reservation values among the subjects for the experiments with 12 subjects are reported in figures 3.1 and 3.2. The production costs and the reservation values for the experiments with 24 subjects were obtained by the same values used for the experiments with 12 subjects multiplied by 2; therefore the curves are identical but translated towards the right. Thus the equilibrium prices remain the same while the equilibrium quantities increase.

Figs. 3.1 and 3.2 show that the only effect of including VAT is to increase and broaden the range of the equilibrium prices.

Fig. 3.1 Reservation and equilibrium values with 12 subjects (experiments α_1 and α_2)

Sellers	Cost +Vat
3	50
2	150

Buyers	Res. values
3	200
2	100
2	75

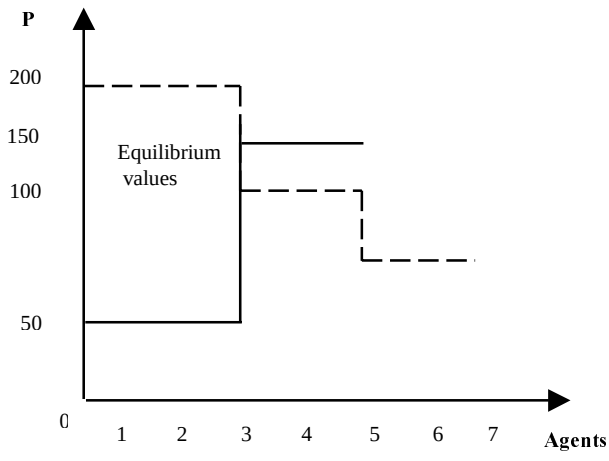
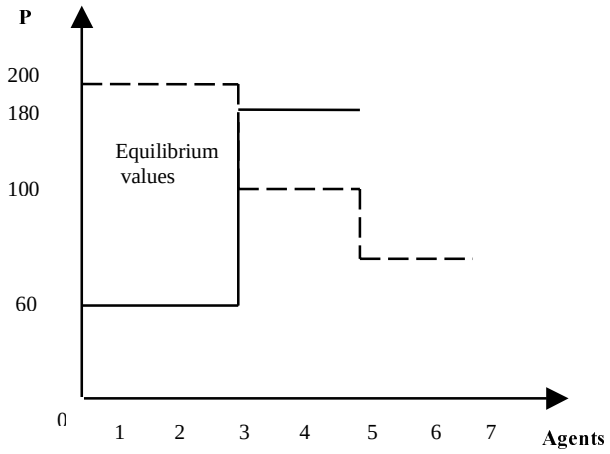


Fig. 3.2 Reservation and equilibrium values with VAT; with 12 subjects (experiments α_1 and α_2)

Sellers	Cost +Vat
3	60
2	180

Buyers	Res. values
3	200
2	100
2	75



4. The results

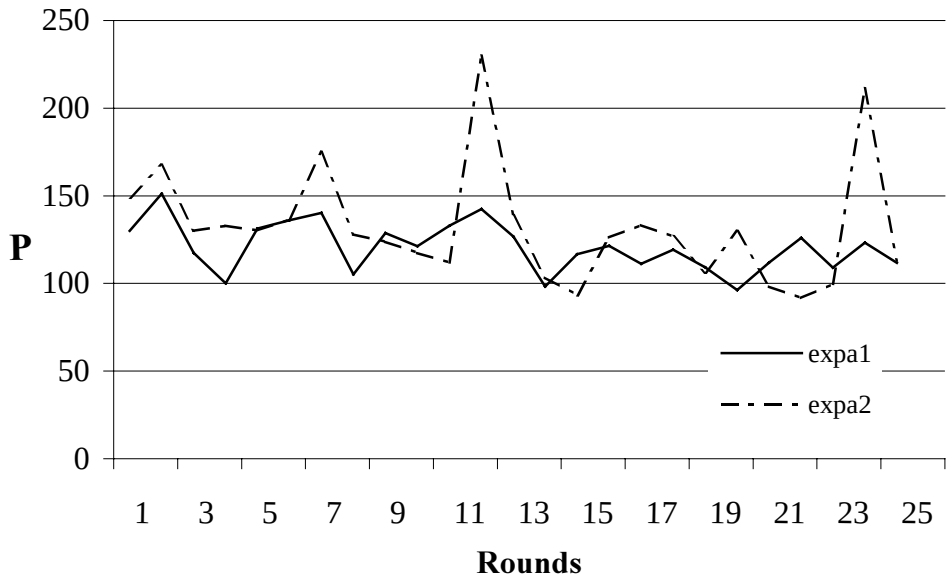
To return to the objectives of the research as described in the previous sections, I was interested in the following issues:

a) analysis of the equilibrium values dynamic – comparison between the equilibrium values (predicted by the theory without evasion) and the observed behaviors;
b) analysis of the VAT expropriation phenomenon;
c) the emergence of "notoriety" phenomena, i.e. consumer loyalty towards a given seller grounded not on a virtuous link but on a collusive mechanism aimed at evading taxes;
d) testing the "bomb crater" effect observed in the previous experiments on income tax evasion (Mittone, 1999);
e) searching for successful payoff strategies, i.e. if by looking at the behaviors observed one can build a theory of how to improve the payoff.

4.1 The equilibrium values and VAT expropriation

To analyze the first two topics, it is useful to plot the equilibrium values (i.e. the average prices) obtained from the experiments. Figures from 4.1 to 4.6 report the observed average prices obtained respectively from experiments α_1 and α_2 (4.1); from experiments α_3 and β_1 (4.2), from experiments α_4 and β_2 (4.3), from experiments α_1 and α_{UK2} (4.4), from experiments α_3 and α_4 (4.5) and from experiments β_1 and β_2 (4.6). There are no plots for experiments α_{UK1} and for experiment α_{SS1} because the former was only a pilot experiment and therefore the data are not comparable with the data obtained from the other experiments. For a similar reason there are no plots for experiment α_{SS1} because it was quite different from

Fig. 4.1 Equilibrium prices exp. α1 and α2



the others (different composition of the sample, different number of subjects) and they are therefore not directly comparable.

Fig. 4.2 Equilibrium prices exp $\alpha 3$ and $\beta 1$

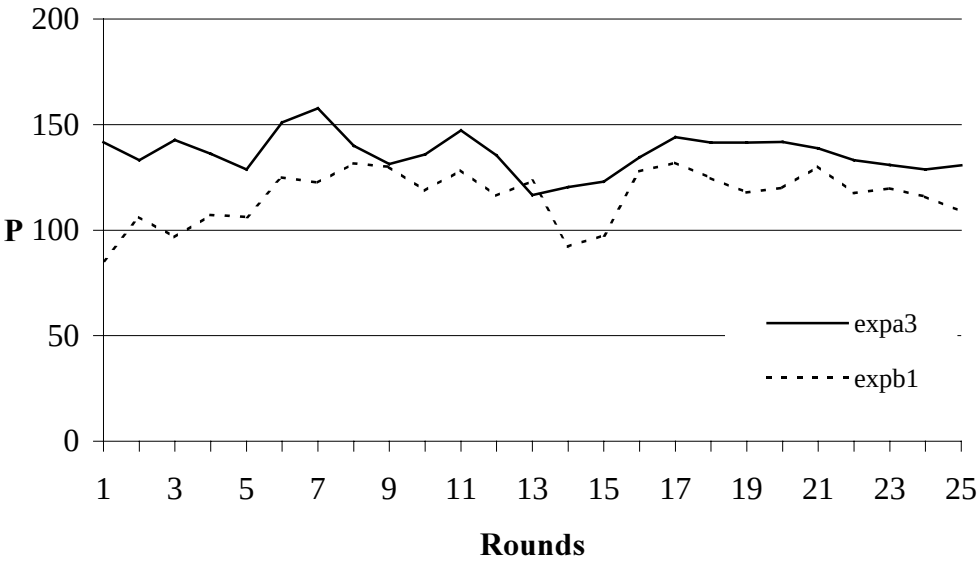


Fig. 4.3 Equilibrium prices exp. α_4 and β_2

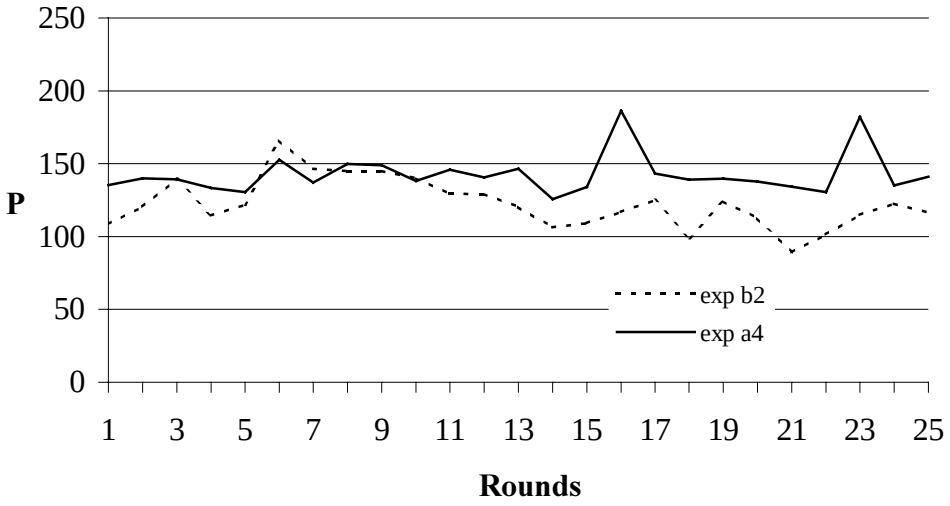
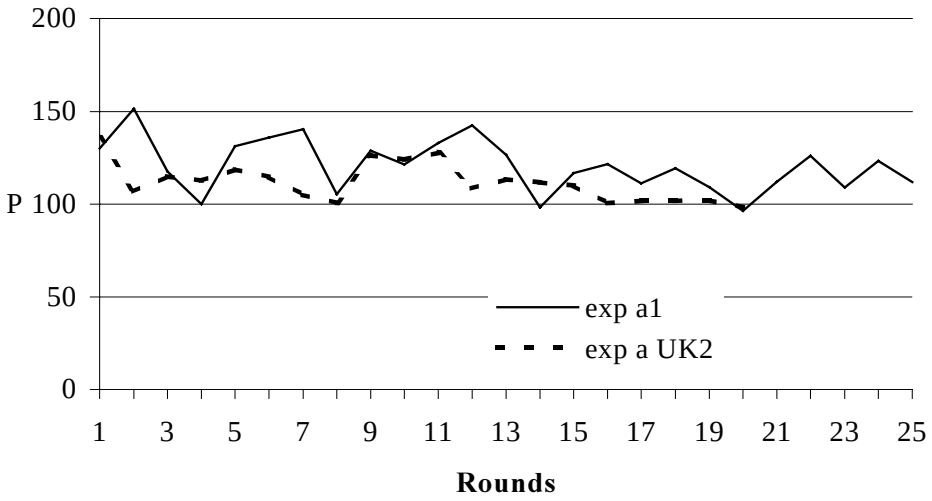


Fig. 4.4 Equilibrium prices exp. α1 and αUK 2



On first glance at the figures one notes that all the average prices reported by the experiments are almost always well approximated by the equilibrium values computed using the supply-demand theory (and almost always nearer to the lower bound than to the upper). The average prices computed for all the rounds in experiments α_1, α_2, α_3, α_4, β_1, and α_{UK2} are respectively: 121.28 Liras (α_1); 132.16 Liras (α_2); 136.78 (α_3); 142.62 (α_4); 116.27(β_1); 123.55 (β_2); 112.50 (α_{UK2}). Similarly, also the experiment carried out using the students at the Summer School reports an average price of 102.03, which is the lowest but still falls within the interval of the expected equilibrium prices.

Notwithstanding this general rule of correspondence between the average and the expected prices, more careful analysis of the figures shows some exceptions . Examples of "anomalous" prices arise in rounds 12 and 24 of experiment α_2, in rounds 1, 3, 14 and 15 of experiment β□, in rounds 16 and 23 of experiment α_4 and in rounds 18 and 21 of experiment β_2. These anomalous prices can be explained by two main reasons: the first is that the errors are due to some mistake committed by the subjects in conducting their business, while the second is the emergence of some form of trend during the experiment.

Examples of mistakes are the "wrong" average prices[5] of both experiment α_2 and experiment α_4, while the anomalies registered in the prices of experiments β_1 and β_2 seemed

[5] E.g. during round 24 of experiment α_2 subject "5" reported a loss of 525 Italian Liras because s/he agreed to pay 500 Italian Liras for a good that for her/him had a value of 75 Italian liras. Similarly, in round 12 - again

to be the result of a general tendency that pushed the entire time series down towards the lowest value of the equilibrium interval. This consideration is grounded on the fact that all the anomalous prices recorded in both β_1 and in β_2 always fall below the expected equilibrium prices and are never above the highest limit of the equilibrium interval. Furthermore, while the anomalous prices reported by experiment α_2 and experiment α_4 represent something akin to strong shocks (especially the values reported by experiment α_2) , this is not the case of the values for both experiment β_1 and β_2, which are always quite close to the general trend.

Final confirmation of the different nature of the anomalies reported respectively in the α_2, α_4 and in the β_1, β_2 experiments is provided if we look at the total average prices computed without (by eliminating) the anomalous values. The total average price in experiment α_1 and the total average price in experiment α_2 – computed by eliminating the anomalous prices – are in fact very close (the average prices are respectively 120.7 It. Liras for α_1 and 117 for α_2), while the same average prices computed and "cleaned" by eliminating the anomalous prices for experiments α_3 and β_1 (i.e. the 24 subjects experiments) show a substantial difference (the average prices are respectively 136 It. Liras for α_3 and 101,9 for β_1). Consistently with this, also the total average price computed by eliminating the anomalous values from the experiment α_4 comes very close to the value obtained from experiment α_3 (the average price for α_4 is 138), while the value computed in the same way for experiment β_2 is lower than the average price of both α_3 and α_4 , although it is not particularly close to the average price computed for β_1 (the average "cleaned" price for β_2 is 125).

The results obtained from the experiment at Exeter are very similar to those already described for the experiments carried out in Trento. Fig. 4.4 shows that the observed values always fall within the equilibrium interval, and that the general trend is quite similar to the one shown by the graph of the experiment α_1. The external context (i.e. the location of the experiment) therefore seemed not to affect the price dynamic.

Unfortunately, it is almost impossible to obtain statistical confirmation of the difference between the experiments, because one cannot rule out that the individual values are interrelated; that is, one cannot exclude for certain that the observations are independent. On the contrary, it is reasonable to assume that the choices observed during the experiment are interrelated as a consequence of some learning mechanism employed by the experimental

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during experiment α_2 - experimental subject 6 reported a loss of 400 Italian Liras because s/he bought for 500 Italian Liras a good that for her/him had a value of 100 Liras.

subjects. Therefore the most common statistical tests used to check whether two samples of data belong to the same population cannot be used.

It is also of interest to check whether the modification made to the cadence of change of the reservation values in experiment α_4 and in β_2 had any effect on the average prices. This question can be answered by looking at figures 4.5 and 4.6, which plot the trends of α_2 and of α_4 and the trends of β_1 and of β_2. It appears from the plots that the trends are very similar, both for the alpha and for the beta families of experiments. One may therefore conclude that the change in the cadence of the reservation values had little effect.

Fig. 4.5 Equilibrium prices exp. α3 and α4

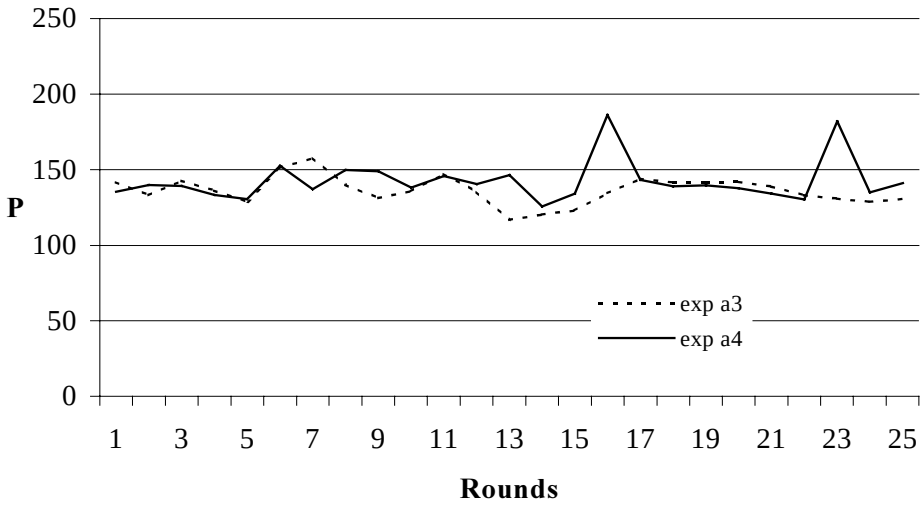
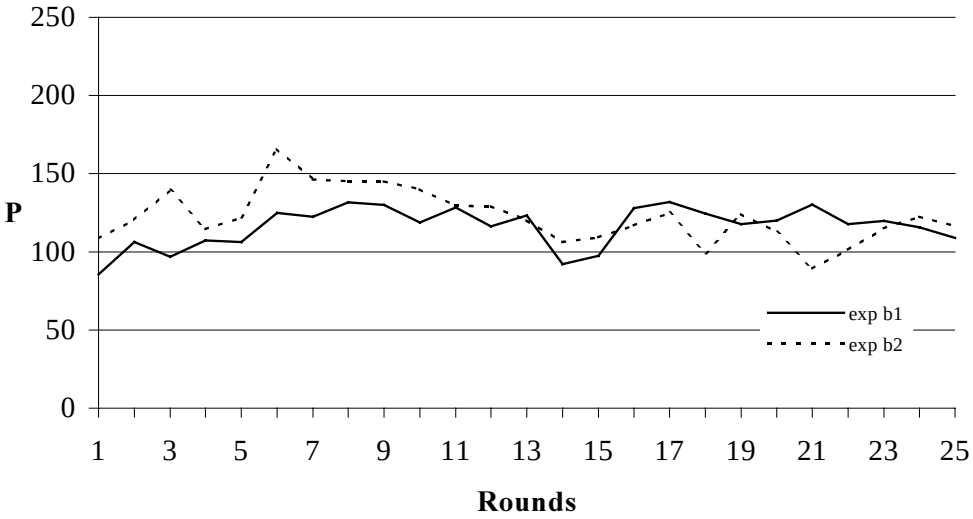


Fig. 4.6 Equilibrium prices exp. β1 and β2



To summarize the foregoing discussion of the comparison between the trends of the alpha and the beta experiments, the main result seems to be that a generalized price reduction was the main effect produced by allowing the subjects to expropriate VAT. A possible explanation for this phenomenon is that the sellers decided to systematically expropriate VAT, considering this option as a way to reduce their production costs and thereby engage in? more "aggressive" price competition. In figs. 4.7 and 4.8, the average VAT expropriation values per round have been added to the average prices in order to check whether the intuition just described was correct.

Fig. 4.7 shows that the VAT expropriation plus price line demonstrates quite clearly that at least one of the sellers in experiment β_1 decided in every round to expropriate the tax yield collected by her/his buyers. The new line approximates the average price line computed for experiment α_3, and the VAT expropriation plus price level is almost constantly higher that the average price recorded in experiment α_3. On the other hand, it should be noted that the VAT expropriation does not modify the average prices dynamic in a way coherent with the "real" price dynamic of experiment α_3.

Considerations quite similar to those just made with reference to experiment β_1 arise from fig. 4.8; i.e. by looking at the results from experiment β_2. The VAT expropriation plus price level in experiment β_2 is always higher than the β_2 line, which means that in this experiment, too, at least one player always expropriated the tax yield. The main difference between experiment β_1 and experiment β_2 is that in experiment β_2 the amount of VAT expropriated was almost always slightly lower than it was in experiment β_1 (the average per round amount of VAT expropriated in experiment β_1 was 37.42, while in experiment β_2 was 35.73). Another difference is that the average prices of α_3 were often lower than the VAT expropriation plus prices reported for β_1, while the average prices of α_4 were lower than the VAT expropriation plus prices reported for β_2 at the beginning of the experiment, but after round 12 until the end, they become higher.

The differences between experiment β_1 and experiment β_2 therefore seem negligible and do not require any further comment.

Fig. 4.7 Equilibrium prices exp α3; β1 and β1+VATexpr.

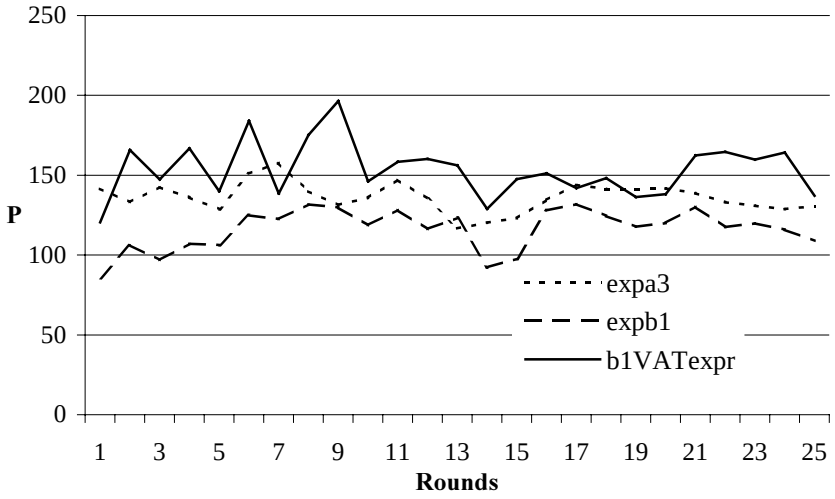
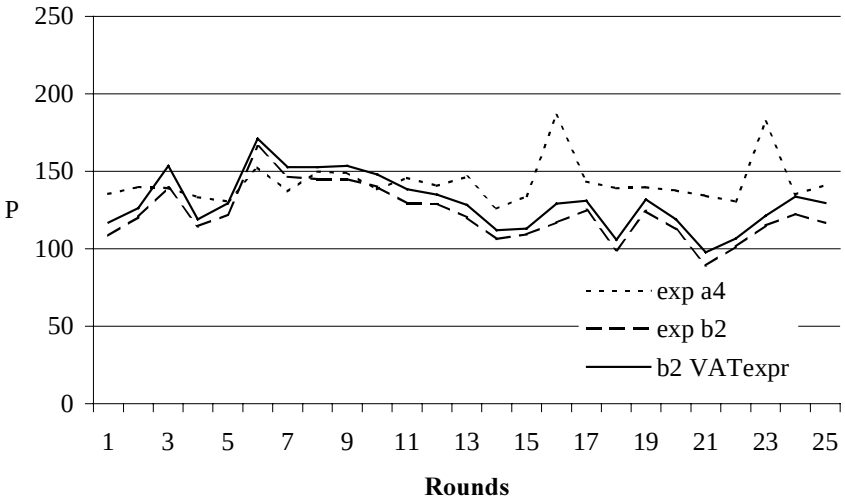


Fig. 4.8 Equilibrium prices exp. α4, β2 and β2+VATexpr.



The price-VAT expropriation strategy implemented by the sellers in both experiment β_1 and in experiment β_2 makes it rather difficult to reach firm conclusions as to the psychological constraint that VAT stealing should produce when it is perceived as harmful to the welfare of the other participants in the experiment. In fact, by offering prices lower than those offered in α_3 the sellers in experiment β_1 implicitly shared the advantage provided by

the opportunity to expropriate the VAT with the buyers. Furthermore, and conversely to the case of collusion, they alone run the risk of being punished by the fiscal audit, so that their behaviour can paradoxically be seen as "altruistic" because they share the advantage offered by VAT expropriation (through a reduction of the prices) without imposing the risk of paying a fine. On the other hand, we cannot rule out that this strategy was only a matter of price competition, and therefore that no psychological complication really arose in conditioning the decision to expropriate the VAT yield.

4.2 Sellers' reputation and the "bomb crater" effects

The third and fourth questions raised at the outset concerned the emergence of some form of sellers' reputation effect, and the existence of a "bomb crater" effect, also in the VAT evasion context. The reputation effect can be analyzed by looking at tab 4.3, which synthesizes the results from all the experiments.

Tab. 4.3 Reputation effect

	% max of "linkage" between a seller and a buyer	n° of sellers with "linkage" to a buyer ≥ 30%	% max of "linkage" between a buyer and a seller	n° of buyers with "linkage" to a seller ≥ 30%
α_1	43,75	4 on 5	46,20	7 on 7
α_2	47,06	4 on 5	72,70	7 on 7
α_3	27,30	0 on 10	33,30	2 on 14
α_4	35,30	2 on 10	45,50	8 on 14
α_{UK1}	42,10	4 on 5	61,50	7 on 7
α_{UK2}	45,50	4 on 5	50,00	6 on 7
α_{SSI}	42,90	3 on 9	35,70	3 on 9
β_1	33,30	2 on 10	45,50	7 on 14
β_2	26,10	0 on 10	41,70	6 on 14

The data should be be read as follows (e.g. first row):
1st column: 43.75% of the total number of transactions performed by seller X were concluded with buyer Y.
2nd column: of the total number of sellers, 4 out of 5 concluded more than 30% of their transactions with the same buyer.
3rd column: 46.2% of the total number of transactions performed by buyer Z were concluded with seller W.
4th column: of the total number of buyers, 7 out of 7 concluded more than 30% of their transactions with the same seller.

The results shown by table 4.3 are rather difficult to interpret. On inspecting the second and fourth columns of tab. 4.3, one might reach the ambiguous conclusion that high levels of linkage are common in the small-scale experiments (i.e. with 12 participants), while they are

less frequent in the larger-scale ones (with 22-24 subjects). For example, in experiment α_1 subject 2 (seller) and subject 7 (buyer) closed 7 contracts out of a total of 16 (43.75 %) closed by subject 2; and in experiment α_2 subject 1 (seller) and subject 7 (buyer) closed 8 contracts out of a total of 17 (47.06%). Unfortunately, this phenomenon is not particularly relevant because is obviously related to the absolute number of sellers, and therefore to the size of the sample. Paradoxically, one could conclude that the smaller percentages of linkage between buyers and sellers reported in the 24-subject experiments are not as small as one might expect considering the larger number (double) of sellers i.e. the greater choice for the buyers.

More in general, the results shown in tab. 4.3 do not seem sufficiently robust to clarify the role of collusion as a way to attract buyers. Collusion proposals as a non-price competition tool can be better investigated by looking at Tab. 4.4. which reports the number of collusions proposed and actually undertaken.

Tab. 4.4 Proposal and collusion

	Max n° of trans. closed by a single player	**Avg. n° of trans. closed by a single player**	**Max n° of prop. done by a single player**	**Avg. n° of prop. done by a single player**	**Max n° of collus. done by a single player**	**Avg. n° of collus. done by a single player**	**Pearson corr. n. prop. - payoff**	**Sig. (2-tails)**	**Pearson corr. n. collus - payoff**	**Sig. (2-tails)**
α_1	25 on 25	16.50	12	6.58	6	2.50	-.149*	.036	-.075	.295
α_2	22 on 25	16.00	12	5.42	7	1.83	-.199**	.006	.037	.606
α_3	22 on 25	15.76	15	5.66	6	2.00	-.056	.279	-.113*	.028
α_4	20 on 25	15.08	16	6.46	11	3.42	-.043	.420	-.114*	.030
α_{UK2}	16 on 20	10.50	14	5.16	4	2.00	-.103	.250	-.106	.240
α_{SS1}	19 on 25	14.50	19	7.55	8	3.33	-.111	.074	-.053	.397
β_1	25 on 25	15.75	19	6.54	10	2.58	-.153**	.003	-.058	.259
β_2	25 on 25	16.50	19	5.29	7	1.83	-.278**	.000	-.073	.149

** correlation sig. 0.01
* correlation sig. 0.05

It seems from the results shown in tab. 4.4 that there are no marked differences among the experiments, particularly as regards average values. One interesting aspect emerging from tab. 4.4 is that collusion and a proposal for collusion are negatively correlated with the

total payoff. This result is coherent with the experimental design, because the penalty system was – as in the real world – based on an unfair lottery. I shall return to the relationship between the payoff and the game? strategy in the next section.

There is a further question concerning the collusion proposal : was this device interpreted by the experimental subjects as an opportunity for the sellers or for the buyers? The question is not trivial one because in the real world (at least in countries like Italy) collusion on VAT evasion may start with a proposal by either a seller or a buyer. To investigate this question, we may usefully look at table 4.5, which reports the total and average numbers of collusion proposals made by sellers and buyers respectively.

Tab. 4.5 Collusion proposals

experiment	n. proposal buyers	n. buyers	n. proposal sellers	n. sellers	avg. prop. buyers	avg. prop. sellers
α_1	33	7	46	5	4,71	9,20
α_2	47	7	18	5	6,71	3,60
α_3	75	14	61	10	5,36	6,10
α_4	78	14	77	10	5,57	7,70
α_{SSI}	78	9	58	9	8,67	6,44
α_{UK1}	59	7	54	5	8,43	10,80
α_{UK2}	17	7	45	5	2,43	9,00
β_1	99	14	58	10	7,07	5,80
β_2	87	14	40	10	6,21	4,00

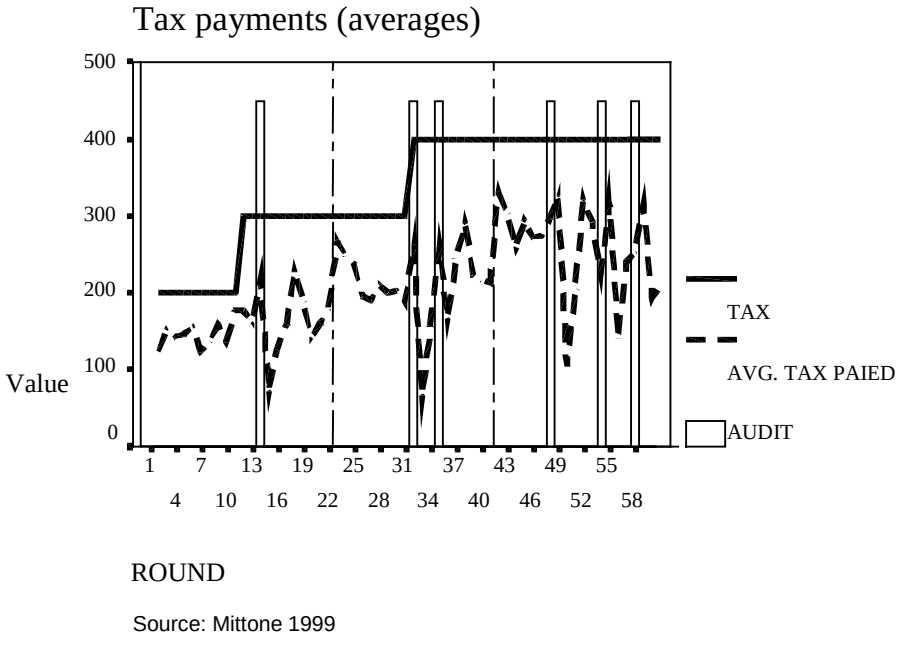
Table 4.4, however, does not give an unequivocal answer to the question about the use of collusion proposals. In fact, the results from some of the experiments (e.g. α_1, α_{UK2}) suggest that it was mainly sellers who used collusion proposals to attract buyers; but this result is completely different from the one obtained from other experiments (e.g. α_2, β_2), where the buyers made more collusion proposals on average than did the sellers.

It therefore seems that a collusion proposal was interpreted by the experimental subjects either as a competitive mechanism on the supply side or as a way to save money by evading VAT on the demand side. It is worth noting that these two different interpretations of collusion in the experiments seem to show that some form of internal coordination among the experimental subjects may take place. In other words, one can hypothesize that the task of proposing collusion is mainly a matter of a given role (seller or buyer) in accordance with some spontaneous selection of behaviors during the first stages of the game. In other words it seemed that, through some sort of spontaneous coordination at the beginning of the game, the

players decided to attribute the role of proposing collusion to the sellers or to the buyers; thereafter this role remained assigned until the end of the experiment. This hypothesis can be checked by analyzing the initial rounds of each experiment in order to see whether the dynamic of the collusion proposals follows a different pattern .

Turning to the "bomb crater" effect, it is rather difficult to investigate the attitude toward risk displayed by the experimental subjects. The difficulty arises mainly from the fact that the fiscal audits were randomized so that each subject could be audited in different rounds of the game. On average, when a tax audit was carried out, 3 to 4 transactions were investigated in experiments with 12 subjects, and 7 to 8 transactions in experiments with 24 subjects, which meant that whenever an audit was performed about 50-60% of the subjects were checked. The aggregated results can therefore be used to test the bomb crater effect, even though one may expect it to be less marked than in the income tax experiments, when all the subjects were investigated simultaneously (Mittone, 1999). Figure 4.9 shows one of the plots obtained from the experiments on income tax evasion for the sake of comparison. In order to provide examples of the dynamic of the collusions and of the collusion proposals, figs. 4.10, 4.11, 4.12 and 4.13 report the graphs from experiment α_1, α_3, β_1 and α_{UK2} respectively.

Fig. 4.9 Experiment on income tax evasion



Source: Mittone 1999

Fig. 4.10 Collusions, proposals and fiscal audits

experiment alpha1

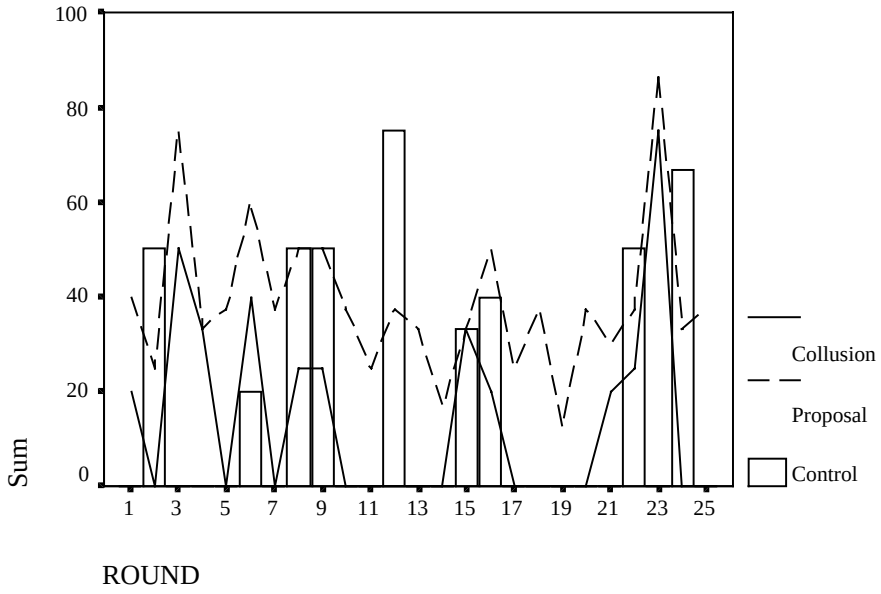


Fig. 4.11 Collusions, proposals and fiscal audits

Experiment alpha3

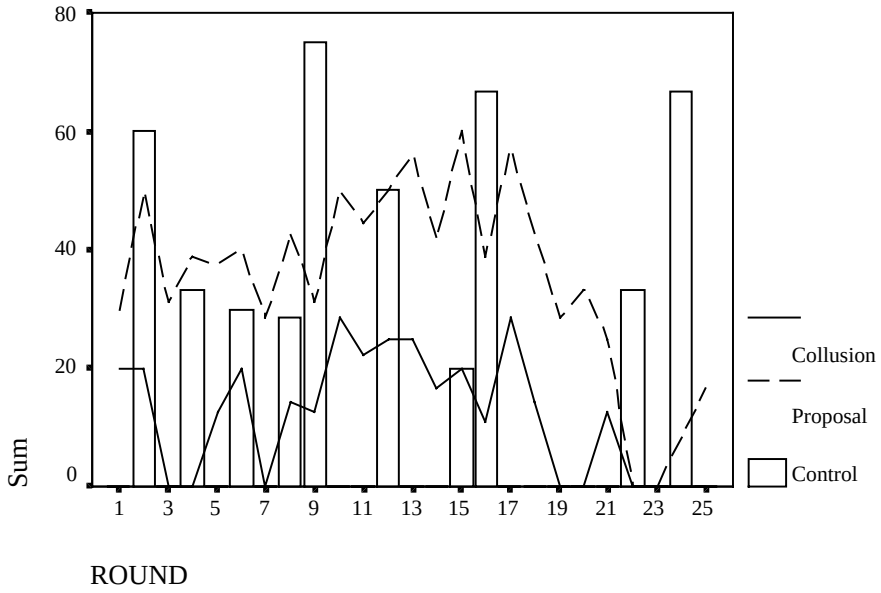


Fig. 4.12 Collusions, proposals and fiscal audits

Experiment beta1

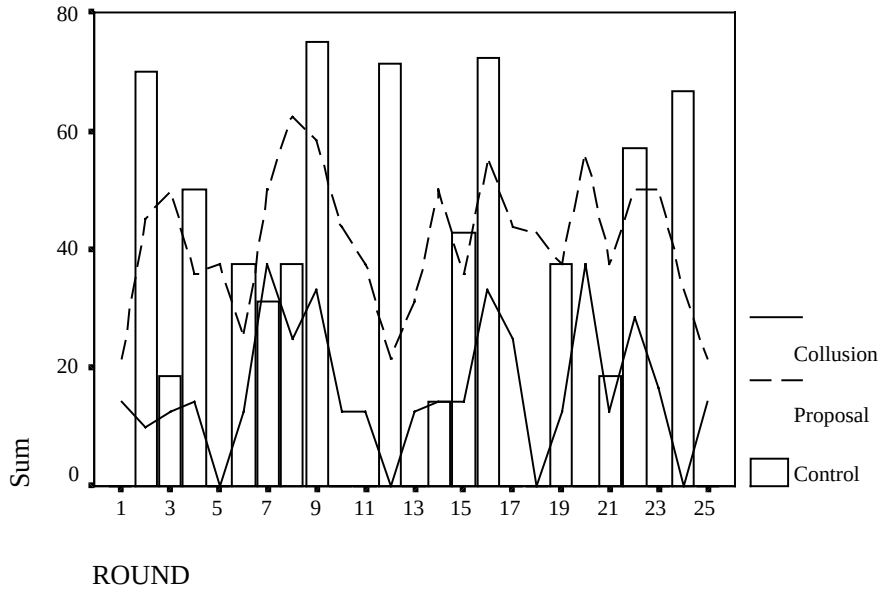
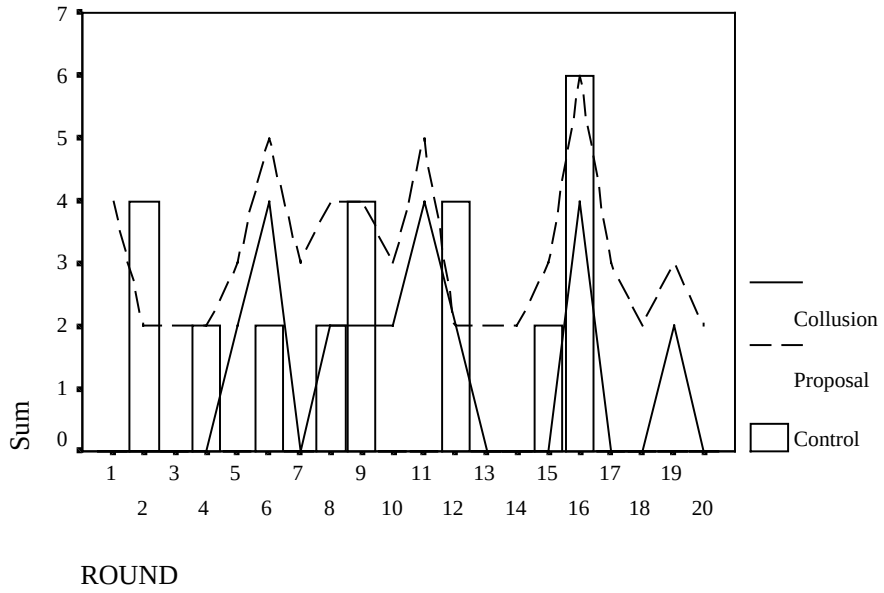


Fig. 4.13 Collusions, proposals and fiscal audits

Experiment alphaUK2



All the graphs in figs. 4.10; 4.11; 4.12; 4.13 report whether the subjects were audited (variable “control”); whether they proposed collusion (variable “proposal”); and whether they actually colluded (variable “collusion”). Fig. 4.9 shows the results from one of the income tax evasion experiments and reports the amount of tax due (variable “tax”), the amount of tax

actually paid by the subjects (variable “avg. tax paid”), and whether the subjects were audited (variable audit).

The bomb crater phenomenon arose whenever there was a strong increase in the number of evasions in the round immediately after a fiscal audit. This effect is very clear and easy to identify in fig. 4.9. Similarly, the figures for the VAT evasion experiments also show that the bomb crater effect was always present, albeit with different degrees of regularity. The different degrees of magnitude and regularity are obviously due to the fact that the subjects audited were always different in the VAT evasion experiments. This intuition can be verified more effectively by computing two simple indicators:

$$CP1 = \frac{\text{no. of collusion proposals out of control}}{\text{no. transactions out of control}}$$

$$CP2 = \frac{\text{no. of collusion proposals round after control}}{\text{no. transactions after control}}$$

Indicators CP1 and CP2 allow comparison among the aggregate behaviors of the subjects during rounds which were not immediately preceded by a fiscal audit (CP1) and during rounds that followed a fiscal audit (CP2). More precisely, the value of both indicators is between 0 and 1. A value of 1 means that the experimental subjects – who concluded a transaction - e always made a collusion proposal, a value of 0 means that no subject suggested collusion. The results are given in table 4.6.

Tab. 4.6 CP1 and CP2 average values

experiment	CP 1	CP 2
α_1	0,388	0,433
α_2	0,338	0,519
α_3	0,355	0,431
α_4	0,418	0,453
α_{SS1}	0,502	0,593
α_{UK1}	0,601	0,622
α_{UK2}	0,434	0,472
β_1	0,432	0,497
β_2	0,314	0,377

It is evident from tab. 4.6 i that the value of CP1 is always lower than the value of CP2. This means that some form of relationship between a fiscal audit and the decision to try to

evade (i.e. to propose a collusion) immediately after the control emerges in all the experiments.

5. Multiple analysis

It was said in the second section that building a theoretical model of the payoff function for both the sellers and buyers is quite trivial. This is because, given the assumptions made here and the experimental design chosen, the decisional task of the experimental subjects can be reduced to a classical problem of expected income maximization. In fact the experimental design used here eliminates complications from the patterns of both the buyers' and the sellers' behavior because they do have neither a complex utility function nor a production function to cope with. The problem for both agents is therefore simply that of finding the best price-collusion strategy. More precisely, they perform a two step process: in the first stage, they must decide a price, either if they "offer" a price or if they "accept" a price suggested by someone else; in the second step, they must decide on collusion, i.e. they can "offer" collusion to their partner or they can "accept" collusion if their partner "offers" it.

By inspecting the structure of the decisional process we can therefore distinguish between two totally opposite styles of behavior: a wholly passive one and a wholly active one. The totally passive style is adopted when the experimental subject decides to wait for the best price, without offering any price and in the meantime never offering to collude; the perfectly active style is adopted when the subject makes numerous price offers and always offers collusion. Obviously, one can then imagine many different intermediate game styles between these two extreme behaviors. It should be noted that being "passive" does not mean not closing contracts. On the contrary, a passive player may be more efficient in closing contracts because s/he is more concentrated on the prices offered and therefore faster to accept the best price (in other words s/he is faster in clicking on a good price) than the "active" players, who are diverted by the task of offering prices.

Returning to the model of the payoff strategy, we can therefore imagine that the degree of success is related to the game style chosen by the experimental subject. A first attempt to model the game style is the following:

$$Y = f(Su, Tr, Op, Ro) \qquad [5.1]$$

Where:

Su = percentage of successful collusion proposals

Tr = number of transactions concluded

Op = number of price offers

Ro = role of the player (dichotomous variable: 0 = buyer; 1 = seller)

Time is another important element that may influence the degree of success (the payoff level) of a game strategy . The speed of choice, i.e. how fast a player is in clicking a price and closing a contract, can influence the amount of money that s/he earns in the end. More precisely, a player should be fast in clicking the best price when it appears on the computer screen but at the same time patient enough to wait for it. It is worth noting that a hasty player will generally close her/his contracts quickly but in this way may make bad bargains, in a similar but opposite way, an overly contemplative player may miss a chance to close a good contract and thereby increase her/his final payoff. The new payoff model to test is therefore the following:

$$Y = f(Su, Tr, Op, Ro, Ti) \qquad [5.2]$$

Where Ti = number of seconds between the beginning of the round and the choice of a price by the player.

[5.1] and [5.2] show that the behavior of the subjects described by the model is entirely unaffected by the probability of being inspected, and fined if found guilty of VAT evasion. The model must therefore be improved by including some measure of the fiscal audit probability perceived by the experimental subjects. From the analysis of the results on the bomb crater effect we know that the subjects were strongly influenced by the real experience of an audit. Hence, a good way of approximating the perceived audit probability is to include in the model the number of audits carried out during the experiment. The assumption behind the introduction of this variable is that agents are in some way influenced by the direct experience of a fiscal audit. The final model is therefore the following:

$$Y = f(Su, Tr, Ro, Op , Ti, Co) \qquad [5.3]$$

Where Co = number of fiscal audits (controls)

The econometric analysis was restricted to experiments α_1; α_2; α_3; α_4 and β_1; β_2 . The databases were constructed by summing the values of the variables during the 25 rounds for

each player and aggregating the results from the alpha and the beta experiments. Therefore two databases were used: the first one (alpha) consisted of 72 cases, and the second of 48 cases. The results obtained from the more extended model [5.3] estimated using the alpha data set are summarized in table 5.1.

Table 5.1 Regression results: alpha data set, model [5.3]

Model [5.3] summary

R	R-square	Adjusted R-square	Std. Error of the estimate
.827	.684	.655	344.8096

Independent variables: (Constant), success of collusion proposals, seconds, fiscal audits, price offers, role, transactions

ANOVA

	Sum of squares	df	Mean square	F	Sig.
Regression	16709103.240	6	2784850.540	23.423	.000
Residual	7728087.371	65	118893.652		
Total	24437190.611	71			

a) Independent variables: (Constant), success of collusion proposals, seconds, fiscal audits, price offers, role, transactions
b) Dependent variable: Y – Payoff

Coefficients

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	1587.417	346.585		4.580	.000
Tr – transactions	-29.061	20.103	-.181	-1.446	.153
Co – fiscal audits	-25.520	44.595	-.052	-.572	.569
Ro – role	-1089.716	124.524	-.922	-8.751	.000
Op – price offers	4.594E-02	1.076	.003	.043	.966
Ti – seconds	3.355	1.433	.169	2.342	.022
Su – success of collusion proposals	6.804	168.581	.003	.040	.968
Su – success of collusion proposals	6.804	168.581	.003	.040	.968

Dependent variable: Y – Payoff

On inspecting the statistical results obtained from the OLS regression carried out using the alpha data set, one notes that the overall quality of the model [5.3] is good. The regression explains just under 70% (0.68) of the variance of the dependent variable, and the F test

allows rejection of the null hypothesis of no linear relationship between the payoff and the independent variables.

The statistics for the variables in the equation allow the size of the model to be reduced by eliminating three variables which do not significantly influence the dependent variable. The variables to be eliminated are: the fiscal audits, the price offers and the success of collusion proposals. The results for the new model are reported in tab. 5.2.

Table 5.2 Regression results: alpha data set model [5.3] simplified

Simplified model [5.3] summary

R	R-square	Adjusted R-square	Std. Error of the estimate
.826	.682	.668	337.9712

a Independent variables: (Constant), seconds, transactions, role

ANOVA

	Sum of squares	df	Mean square	F	Sig.
Regression	16669922.914	3	5556640.971	48.647	.000
Residual	7767267.697	68	114224.525		
Total	24437190.611	71			

a) Independent variables: (Constant), seconds, transactions, role
b) Dependent variable: Y – Payoff

Coefficients

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	1595.905	319.502		4.995	.000
Tr – transactions	-34.518	16.036	-.215	-2.153	.035
Ro – role	-1091.574	119.431	-.924	-9.140	.000
Ti – seconds	3.402	1.379	.171	2.467	.016

Dependent variable: Y – Payoff

The overall statistical quality of the simplified model is very good, and all the independent variables are significant in explaining the payoff. The signs of the independent variables yield two quite interesting pieces of information: the first is that is more profitable to be a seller than to be a buyer (remember that the Ro variable was a dummy with 0=seller and 1=buyer), while the second is that none of the signs of the two continuous independent variables is coherent with the assumptions made. A large number of transactions are negatively

correlated with the payoff, which means that numerous transactions were concluded at a "bad" price for one or both the contracting agents. This result is reinforced by the negative sign of the variable measuring the speed in clicking on a price. The lower this speed, the greater the payoff, which means that players who close their contracts too rapidly often miss better opportunities that arise later in the round. It therefore seems that the winning strategy was the "passive" one: i.e. the highest payoffs were obtained by the players who chose to conclude a few good transactions, patiently waiting for the best price.

On running the regression using the beta data base, the results are quite similar to those obtained from the alpha data set. Table 5.3 reports the statistical results obtained by using model [5.3].

Table 5.3 Regression results: beta data set, model [5.3]

Model [5.3] summary

R	R-square	Adjusted R-square	Std. Error of the estimate
.751	.564	.500	320.0308

Independent variables: (Constant), success of collusion proposals, fiscal audits, price offers, role, seconds, transactions

ANOVA

	Sum of squares	df	Mean square	F	Sig.
Regression	5436757.322	6	906126.220	8.847	.000
Residual	4199208.657	41	102419.723		
Total	9635965.979	47			

a) Independent variables: (Constant), success of collusion proposals, fiscal audits, price offers, role, seconds, transactions
b) Dependent variable: Y – Payoff

Coefficients

	Unstandardized coefficients		Standardized coefficients	t	Sig.
	B	Std. error	Beta		
(Constant)	2305.858	331.006		6.966	.000
Tr – transactions	-66.227	18.579	-.608	-3.565	.001
Co – fiscal audits	-51.289	46.685	-.159	-1.099	.278
Ro – role	-865.978	130.886	-.953	-6.616	.000
Op – price offers	2.869	2.128	.178	1.348	.185
Ti – seconds	-1.666	1.969	-.109	-.846	.402
Su – success of collusion proposals	-68.851	160.147	-.045	-.430	.670

Dependent variable: Y – Payoff

The main differences between the results from the alpha and beta data sets are a lower R square and the fact that the variable measuring rapidity in choosing a price (Ti) is no longer significant in explaining the dependent. The sign of the dependent variables linearly correlated with the payoff (i.e. Tr and Ro) are of the same sign as observed in the alpha experiments This result reinforces the above remark about interpretation of the regression run using the data of the alpha experiments.

Further information on the role played by the independent variables can be obtained by running a regression tree with the extended model (i.e. model [5.3]). The results of the regression tree for the alpha data set are reported in fig. 5.1, while the results for the beta data set are reported in fig. 5.2.

Fig. 5.1 Regression tree, alpha data set

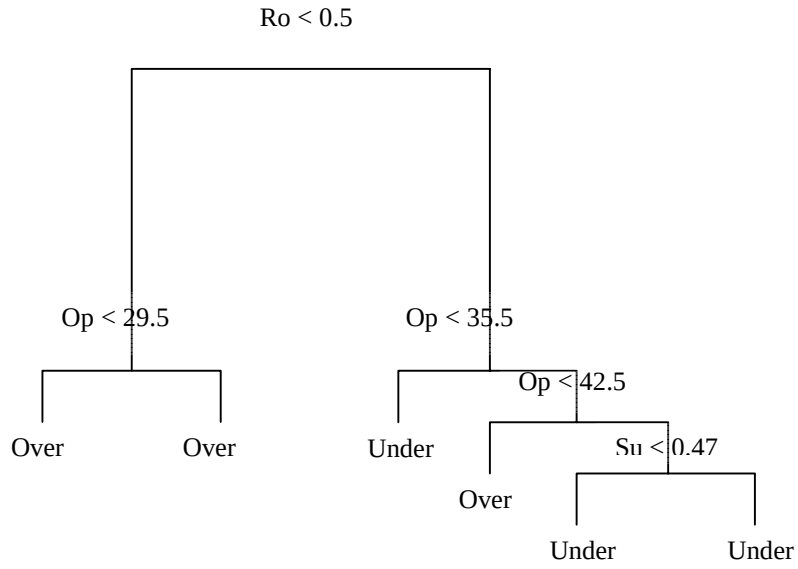
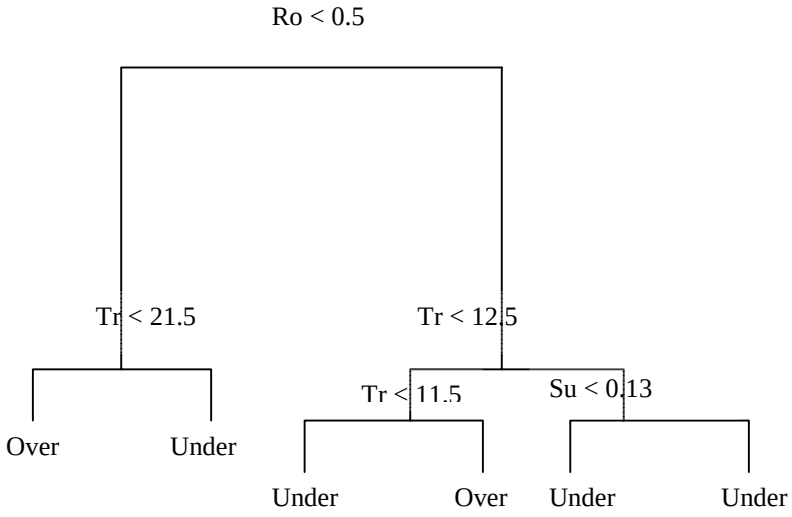


Fig. 5.1 shows that the most influential variable is role, and it confirms that the sellers have better chances of obtaining a higher reward than the buyers . In fact when the value of the variable Ro is lower than 0.5, and the number of price offers is less than 29.5, the players always gain a payoff greater than the average payoff, while if Ro is above 0.5 the payoff is lower than the average payoff. As Ro is a dichotomous variable with 0 = sellers and 1 = buyers, it follows that the sellers always achieve higher-than-average payoffs, while the

buyers receive a payoff above the average only when the total number of price offers is between 35.5 and 42.5 and the percentage of successful collusion proposals is greater than 47%.

Fig. 5.2 Regression tree, beta data set



It emerges from the second regression tree (fig. 5.2) that, for the beta data set, the role of seller does not always ensure a payoff above the average. In fact, the sellers are able to finish the game with a payoff higher – but not always – than the average only when the total number of transactions is less than 21.5. On the other hand, in the beta data set also the buyers can achieve a higher-than-average payoff – while this was never the case for the buyers in the alpha experiments – but only when they perform a total number of transactions which is less than 11.5. The importance of the negative sign of the relationship between payoff and number of transactions is therefore confirmed by a new discovery: the rule of higher payoffs with few transactions is even stricter for buyers than for sellers.

Two general conclusions can be drawn from the regression analysis. The first is that the design of the experiment induces many players to play too rapidly, and this phenomenon indubitably has some effect on the price level; the second is that the players do not fully understand that VAT evasion in a context like the one designed here does not pay. This latter point is the more important one, and it follows from the fact that variable Su (success of collusion proposals) has no effect on the level of the payoff . Because the dynamic of collusion proposals does not decrease during the experiments, it is clear that the subjects were unable to handle this variable correctly in their strategies.

6. Conclusions: back to the real world

The first and more interesting result that emerges from the experiments carried out is that the opportunity to expropriate VAT produces noticeable effects on the equilibrium prices and is seen by both the sellers and the buyers as an opportunity to modify their bargaining strategies. More precisely, when the sellers are able to expropriate the VAT, the price level is lower than it is in the absence of VAT expropriation. A more effective fiscal audit system, one able to reduce opportunities for VAT expropriation, should therefore produce not only – as is obvious – an increase in the tax yield but also an increase in the price level. An increase in the price level is not a trivial consequence for a fiscal policy, and it may prove to be undesirable in a more general economic policy context.

The second significant result is that individual choices concerning collusion and risk may differ greatly from subject to subject. At the same time, however, it seems that some form of social consensus (at least on who should suggest collusion) arises spontaneously in the artificial societies created for the experiments. This result, too, should have important consequences on fiscal policies, because it aids refinement of measures to combat VAT evasion. A good example of different approaches towards the rules regulating VAT payment is provided by the British and Italian systems. In the British fiscal system, only sellers must pay VAT , while buyers have no formal obligation to do so: if the sellers do not apply VAT. they are not guilty of anything. In the Italian system, by contrast, responsibility is shared between sellers and buyers. Obviously, "spontaneous" mechanisms of collusion proposal like those observed during the experiments can only arise in systems like the Italian one. In British-style systems, the spontaneous onset of collusion proposals can only start from the sellers, who alone assume the risk of being fined.

The most important finding that emerges from analysis of the payoff strategy is that the experimental subjects tend to over-evaluate the importance of VAT collusion, using it even if it does not influence the final level of the payoff. From this point of view it seems that no learning process takes place in the subjects, who seem locked into a relatively rigid strategy which they do not revise even when it is obviously unsatisfactory.

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