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Andrea Morone, Francesco Nemore, Simone Nuzzo

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EXPERIMENTAL EVIDENCE ON TAX SALIENCE AND TAX INCIDENCE

Andrea Morone[a,b], Francesco Nemore[a], Simone Nuzzo[a]

ABSTRACT

While a basic theoretical principle in public economics assumes that individuals'behaviour is fully- optimizer with respect to the introduction of a tax, an increasing body of research is presenting evidence that agents decision-making is often affected by non-negligible cognitive biases, which could be responsible for lower market performance as well as for deviations from standard theoretical predictions. This paper extends the latter strand of research focusing on two trend topics in public economics: tax salience and tax incidence. While the former refers to the prominence of the tax, the latter places emphasis on the statutory *vs.* factual division of tax payments. Is market performance affected by the salience of the tax? Is the incidence of a tax independent of which side of the market it is levied on (Liability-Side-Equivalence-Principle, LES)? We address these questions through a laboratory experiment in which one unit of a fictitious good is traded through a double-auction market institution. Based on a panel data analysis, our contribution shows that a non-salient tax reduces both the allocational and informational efficiency of the market with respect to the instance in which the tax is salient. Moreover, we show that the LES does not hold in practice.

Keywords: Tax incidence, Tax salience, Liability Side Equivalence, choice behaviour, laboratory

[a] Università degli Studi di Bari Aldo Moro, Largo Abbazia Santa Scolastica 53, 70124, Bari (Italy)

[b] Università degli Studi di Bari Aldo Moro, Largo Abbazia Santa Scolastica 53, 70124, Bari (Italy), and Universidad Jaume I, Campus del Riu Sec, 12071, Castellón (Spain), e-mail: andrea.morone@uniba.it

1. Introduction

Neoclassical economic theory relies on the principle that agents' decision making is always rational and self-interested, which is individuals behave as utility maximizers and properly process the available information. These principles also built up the foundation of public economic theory, leading to the central assumption that individuals fully optimize with respect to tax policies. While many classical contributions rely on this assumption (see, for example, Ramsey, 1927 and Miller, 1971), an increasing and leading body of research is showing that individuals' behaviour often deviates from what the hypothesis of rational, self-interested and utility maximizer decision making would predict. Indeed, the recent development of behavioural economics has shed light on some heuristics and cognitive biases[3] that undermine the pillars of classical economic theory. The relevant heuristics in our work is that of availability. The latter refers to the evidence that people overweight that kind of information which is more visible and prominent, i.e. more salient. While the concept of salience is widespread and attributable to countless economic fields (see Akerlof, 1991 for a betimes application of the concept of salience to economics), the first aim of this contribution is to explore the impact of the salience with respect to taxes. In the taxation framework, we use the concept of salience to represent the extent to which a tax provision is visible or prominent to taxpayers.

Tax salience and the implication of tax perception was first recognised by John Stuart Mill (1848), who stated that:

> *"Perhaps [...] the money which [the taxpayer] is required to pay directly out of his pocket is the only taxation which he is quite sure that he pays at all. [...]. If all taxes were direct, taxation would be much more perceived than at present; and there would be a security which now there is not, for economy in the public expenditure.".*

Sausgruber and Tyran (2005) investigated whether the incorrect perception of the tax can translate into distorted fiscial choices by using a referendum mechanism. This tax misperception can be traced to the so-called phenomenon of fiscal illusion, which more generally suggests that, when government revenues are not completely transparent or are not fully perceived by taxpayers, the cost of government is seen to be less expensive than it actually is. They showed that subjects who are experienced with one tax regime make better decisions in the other tax regime than subjects without such experience. Therefore the direct tax regime leads to correct tax perception.

In a seminal paper, Chetty et al. (2009) empirically studied the impact of tax salience on consumers' price perception as well as the subsequent effect on the demand for the taxed goods. The authors implemented the following experiment at a Northern California grocery: while preserving the usual practice of posting tax-exclusive prices for control group products, the authors posted a tag reporting tax-inclusive prices below the original price tag for treatment group products. As a main result, Chetty et al. (2009) found that consumers were less prone to buy those products for which the tax-

[3] See DellaVigna (2009) for a comprehensive review.

inclusive price was shown. More interestingly, given the demand price elasticity, they found that the demand reduction induced by showing tax-inclusive prices was roughly the same as that induced by a price increase equal to the excluded sales tax from the shelf. As a consequence, the only plausible conclusion was that consumers simply did not account for the tax scheme in making their purchasing decisions. In other words, the lesser salient the tax was, the lesser it was accounted for.

Several papers report findings which are consistent with those of Chetty et al. (2009), see for example Sausgruber and Tyran (2008, 2011), Finkelstein (2009), Gallager and Muehlegger (2008). Then, the main insight we learn from this literature is that people overweight more prominent information, with the consequence that when the tax is less salient it induces a smaller response in subjects' behaviour. As a second contribution, this paper aims at testing the experimental relevance of tax incidence.

The latter is nowadays one of the most debated issues in public economics. The relevance of the topic comes from the fact that, in order to study the distributional effect of a tax system, it becomes crucial to understand who ultimately suffers the burden of the tax. In this sense, the well-known Liability-Side Equivalence Principle (LES) holds that the burden of a unit tax on buyers and sellers is independent of who actually pays the tax. In the Handbook of Public Economics, Fullerton and Metcalf (2002) distinguish between "economic incidence" and "statutory incidence": that is the person who is legally committed to pay the tax may not be the person who ultimately bears the real tax burden. Thus, according to neoclassical public economic theory, the economic incidence of a tax depends solely on the relative elasticity of supply and demand, i.e. the more inelastic one bears the tax burden. In other words, buyers will bear more of the tax burden if demand schedule is more inelastic than supply and vice-versa. Nevertheless, there is growing literature (see, for example, DellaVigna, 2009; Chetty et al., 2009; Slemrod, 2008; Biswas et al., 1993; Krishna et al., 2002), showing that other factors, such as behavioural and institutional factors might affect tax incidence. In this sense, Cox et al. (2012) studied the potential influence of market institutions on tax incidence. Effectively, there are many different types of markets, each of which has different properties and mechanisms for determining the price and the quantity traded between sellers and buyers. It is plausible to suppose that different market configurations might lead to different incidence results. Cox et al. (2012) address two important research questions: (A) Is tax incidence independent of the assignment of the liability to pay tax in experimental markets? (B) Is tax incidence independent of the market institution in experimental markets? In a laboratory experiment the authors compare two different market institutions: a double-auction market and a posted-offer market[4]. The experimental design was specifically designed to test whether the change of market institution or the assignment of the liability to pay tax may cause different results in terms of incidence. Contrarily to neoclassical predictions, Cox et al. (2012) findings reject both the hypotheses that tax incidence is independent of the assignment of liability to pay and that tax incidence is independent of the market institution[5].

While some research has shown that the theoretical prediction of LES holds in actuality (see, for example, Bork et al. 2002; Ruffle, 2005; Kachelmeier et al. 1994), other studies have reported a deviation from the standard theoretical framework (see, for example, Kerschbamer and Kirschsteiger, 2000).

[4] In experimental double-auction markets buyers and sellers are free to declare a price quote for one unit of the fictitious commodity within certain time constraints. Each exchange covers a single unit of commodity and is realized when one of the parties accepts the price quote proposed by the other party. In posted-offer markets the seller publishes the prices of goods possibly limiting the amount for sale and the buyer decides to buy this good on the basis of a comparison between the prices published by different sellers.
[5] Particularly, the change in market institution has a greater impact on tax incidence than a change in the assignment of the liability.

Interestingly, the latter study argues that statutory incidence may play a role in situations where social norms affect the final outcome: for instance the statutory incidence might create a sort of "moral commitment" to pay the tax. Indeed, implementing an ultimatum game *à la* Guth et al. (1982) in which the tax is levied on the proposer in one treatment and on the responder in the other treatment, Kerschbamer and Kirschsteiger (2000) report evidence that the market side on which the tax is levied exhibits a greater tax burden. Riedl and Tyran (2005) experimentally test tax LSE in a gift-exchange labor market and find that "a change in tax regimes does not significantly affect relevant market outcomes like the distribution of incomes between workers and firms, even in the short run".

Gamage and Shanske (2011) argued that in theory, offsetting tax burden can also alleviates most conflicts between the efficient revenue-raising advantages of reducing market salience and concerns related to distribution, but they are uncertain of the extent to which the needed offsetting tax rate-adjustments will be politically feasible in practice.

With the aim of extending the previous literature, we conduct a laboratory experiment that sheds light on the experimental relevance of tax salience and tax incidence. In particular, we aim at answering two questions: is market performance affected by the salience of the tax? Is the incidence of a tax independent of which side of the market it is levied on (Liability Side Equivalence Principle, LES)? We address these questions by designing a laboratory experiment with within-subject variations, in which subjects trade a fictitious good in a double-auction market as pioneered by Smith (1962). The choice of this trading institution is due to the evidence that countless experiments have shown that these markets exhibit a rapid price convergence to the competitive equilibrium price as well as efficient allocations (see, for example, Smith, 1976; Smith and Williams, 1983; Smith *et al.*, 1982). For this reason, double auction markets have also been widely used as a benchmark for testing the performance of other institutions (see, for example, Ketcham *et al.*, 1984). We compare ST (Salient Tax) with NST (Non-Salient Tax) tasks to answer our first research question and then tax-on-buyer with tax-on-seller tasks to answer our second research question. Our contribution innovates the previous literature in two main points. First we focus on the impact of tax salience and incidence in terms of market allocational and informational efficiency; second we provide experimental evidence of what has been so far investigated through the use of field experiments and theoretical models. In this perspective, laboratory experiments are particularly well suited to the purpose at hand. Indeed, they are performed in a controlled environment in which it is possible to control for all the factors that are supposed to be relevant as well as to avoid many econometric problems of observational data analysis. This way one can be assured that resulting experimental data cannot be useless or misleading in testing theory assumptions. As a further point, the major empirical challenge for economists is going beyond correlation analysis to provide insights on causation. While economics has been served well by using precise models and econometric techniques for answering causal questions on taxation using variations in naturally occurring data, the expanding use of controlled laboratory experimentation is an important recent development – pushed by the behavioural economics revolution – to provide insights on causation.

The next sections describe our experimental design in detail (section 2), and discuss our findings (section 3). Section 4 concludes.

2. Experimental design

2.1. An overview

We conduct a laboratory experiment in which subjects trade one unit of a fictitious good in a double-auction market. The experiment[6] was programmed and conducted with the software z-Tree (Fishbacher, 2007). The experimental design consists of nine tasks (see Table 1):

Table 1: Summary of Experimental Tasks

1. A task in which subjects face an induced stationary demand and supply schedule[7] with no tax imposition (NT);
2. A task with subjects facing a demand schedule with reserve prices that are implicitly reduced by the amount of a 4 ECU excise tax on buyers (STB4);
3. A task with subjects facing a supply schedule with cost values that are implicitly incremented by the amount of a 4 ECU excise tax on sellers (STS4);
4. A task with subjects facing a demand schedule with reserve prices that are implicitly reduced by the amount of an 8 ECU excise tax on buyers (STB8);
5. A task with subjects facing a supply schedule with cost values that are implicitly incremented by the amount of an 8 ECU excise tax on sellers (STS8);
6. A task in which subjects face the no tax task schedules with the explicit imposition of a 4 ECU excise tax on buyers (NSTB4);
7. A task in which subjects face the no tax task schedules with the explicit imposition of a 4 ECU excise tax on sellers (NSTS4);
8. A task in which subjects face the no tax task schedules with the explicit imposition of an 8 ECU excise tax on buyers (NSTB8);
9. A task in which subjects face the no tax task schedules with the explicit imposition of an 8 ECU excise tax on sellers (NSTS8).

Particularly, in ST tasks it is assumed that showing a price or a cost value ,which includes the excise tax, makes it more perceptible and therefore more salient. However, in NST tasks, values do not include tax, and consumers face a cognitive cost of computing the actual price or cost in the presence of a lower tax salience. Setting two different sizes of the excise tax (4 and 8 ECU) allows us to determine whether a higher tax may lead to different effects on traders' behaviour *ceteris paribus*. In this way, we can be assured that ST tasks will have the same parameterizations of NST tasks and will be comparable from a theoretical standpoint. In fact, the translation of supply and demand schedules due to explicit tax imposition in NST tasks will lead to equivalence with ST task schedules. Clearly, the ST tasks can accurately represent situations in which the "in-front-of-the-shelf" consumer is shown the tax-inclusive price. Conversely, NST tasks represent situations in which the consumer is shown the tax-exclusive price. In this case, as frequently happens, the tax will be added (and hence it will become more salient) only at the checkout.

[6] Figure 1A in the appendix depicts a screenshot of the experimental market place for a seller in the task with no tax imposition.
[7] All tasks in each session refer to supply and demand schedules of no tax task although they are suitably modified in ST tasks to ensure theoretical equivalence conditions with NST tasks.

The experiment was conducted in the "Lee" Laboratory for economic research at the University "Jaume I" of Castellón (Spain). Participants were 138 undergraduate students, particularly freshmen. We ran six sessions over some regular days in September 2014. Each session consisted of the nine tasks reported above and lasted about 100 minutes; tasks order was randomised across sessions. The subjects' role (buyer or seller) as well as costs and values were randomly assigned at the beginning of each task and were the same throughout the entire task, but they differed across tasks. At first, subjects were given a hard copy of the instructions. Subjects were allowed to ask questions either publically or privately to clarify any doubts. Trading activities were performed by adopting Experimental Currency Units (ECU) as the currency during the experiment. At the end of each session, subjects were paid their cumulative earnings according to the conversion rate of 10 ECU=1€.

2.2 Session description

In each session buyers and sellers trade the good in a double-auction market that is opened for 90 seconds in each trading period. The trading screen of all participants always displays the lower "ask" and the higher "bid". One contract is closed whenever a seller accepts the outstanding "bid" or a buyer accepts the outstanding "ask". Traders are sited in a manner that their privacy is protected, also they are not allowed to communicate with each other. This procedure is identical for all tasks. Each session includes 9 tasks. In each tasks both buyers and sellers have 1 unit of a fictitious good to trade. All subjects first trade in 2 practice periods and then in 7 relevant periods in a given task. We induce different demand and supply curves in each market. The demand and supply schedule remain fixed across periods in a given tasks, but they differ among tasks to gauge tax salience impact. In the NT tasks, subjects trade with the stationary demand and supply schedule in the absence of tax as shown in Figure 1.

The predicted equilibrium occurs where the curves intersect the quantity equal to 11, and the price between 44 and 46 (we assume 45 as the equilibrium price for surplus calculus). As mentioned above, in the four ST tasks, the amount of the excise tax has been deducted from values or added to costs, depending on the legal responsibility to pay. In the STB4 task the demand schedule is shifted by 4 ECU compared to the previous setting. This means that the tax is imposed on the buyer and values have been adjusted for the respective tax amount. In this case the equilibrium occurs with a quantity equal to 10 and a price equal to 43 ECU (see Figure 1A in the appendix). In terms of incidence, the STS4 task is theoretically equivalent to the previous (see Figure 1B in the appendix). The supply schedule is shifted by 4 ECU because sellers pay the tax. The equilibrium occurs with a quantity equal to 10 and a price equal to 47 ECU. The introduction of an 8 ECU excise tax determines an equilibrium quantity equal to 9 for both STB8 and STS8 tasks and an equilibrium price equal to 41 ECU and 49 ECU respectively. The supply and demand schedules related to these tasks are shown in Figures 1C and 1D respectively.

Figure 1: Demand and Supply schedule in NT tasks (Session1)

In contrast, NST tasks always resort to the no-tax demand and supply schedules. We know from theory that the imposition of an excise tax will shift schedules to the exact tax amount, as subjects must necessarily consider taxes in their personal assessment. In particular, if the tax is imposed on the buyer, the maximum that he is willing to pay will be equal to the sum of the good's price and the tax. Likewise, if the tax is imposed on the seller, the tax will be considered as an additional cost to those already incurred in the production and/or sale activities. This implies, for example, that if the buyer is aware of the application of an excise tax, then he should rationally consider paying the tax in the maximum assigned value, resulting in a downward shift of its demand curve. On the other hand, in the presence of perfect rationality, the seller will consider the tax as an additional cost that will raise its supply curve. This way, ST and NST tasks are theoretically equivalent and allow a proper assessment of the effects of greater or lesser tax salience. More precisely, the STB4 task is equivalent to the NSTB4 task; the STS4 task is equivalent to the NSTS4 task; the STB8 task is equivalent to the NSTB8 task and the STS8 task is equivalent to the NSTS8 task. In the appendix, we list all theoretical and experimental values of price, quantity, total surplus, as well as buyers' and sellers' surplus in reference to the first session setting (see Table 2-13).

3. Analysis and Results

In the light of our experimental design, a panel data model is employed to exploit both the cross-sectional and the time series dimension of our data. In particular, our experiment deals with a perfectly balanced panel, which involves 138 subjects (cross-sectional units), each observed over 63 trading periods[8] (time units). The analysis is based on the following panel regression equation:

$$y_{i,t} = \mu + \beta \cdot TaxType_{i,t} + \alpha_i + \varepsilon_{i,t}$$

where y is a generic placeholder for the dependent variable[9] we take into account, μ stands for the intercept term, α is the individual effect which is assumed to be time invariant within each cross-sectional unit and ε is the residual error component which is assumed to be independent and identically distributed over individuals and time. *TaxType* is a categorical variable which captures the effect of the different tax specifications. In particular, *TaxType* takes on value 1 if subjects are performing the first task (No Tax framework), value 2 if subjects are going through the second task (Salience Tax on Buyer 4 ECU) and so on up to value 9 if subjects are performing the ninth task (Non Salient Tax on Seller 8 ECU). *TaxType* equal to 1 (No Tax) is chosen as a reference (omitted) category of our model. This implies that, in a first step, the effect of each tax specification is measured with reference to the omitted category, i.e. to the no tax case. Secondly, to bring light on the effect of salience, we perform pairwise comparisons across the ninth levels of our categorical variable.

To start with, the main effects of each tax specification are estimated through Pooled OLS, Fixed Effects and Random Effects models. Time after time, the Breusch – Pagan Lagrange Multiplier (LM) test is performed to assess whether a Random Effects model outperforms a Pooled OLS model, the F-Test is employed to choose between a Fixed Effects and a Pooled OLS model and, finally, the Hausman test is used to choose between Random and Fixed Effects models.

As a second step, the predictions from the selected model have been using to compute the average predictive margins for each level of the categorical variable (*TaxType*). Differently speaking, a margin for a given level of the categorical variable corresponds to the predicted average of the dependent variable, treating all observations as if they belonged to that level. Then, contrasts[10] of margins have been

[8] Each of the nine task is is played over 7 periods
[9] Since the allocational efficiency is expressed in percentage points, when it is accounted as a dependent variable, the natural logarithm of the left hand side is taken into account, i.e. a log-linear model is studied
[10] A contrast refers to the difference between a pair of margins

computed and pairwise comparisons across levels have been carried out to evaluate the effect of each tax design in terms of salience, incidence and tax sixe. Reference for the use of margins and contrasts can be found in Searle (1971, 1997).

3.1. Allocational Efficiency

Theoretically speaking, the equivalence relationship of the salient (ST) and non-salient (NST) tax specifications implies that buyers and sellers should equally share profits from the trading activity. Clearly, our experimental design requires a different calculation of the surplus for different tasks. Since in ST tasks subjects face tax-inclusive values, the surplus is equal to $S_b = v - p$ for buyers and $S_s = p - c$ for sellers, where S_b and S_s are buyers and sellers' surplus, respectively; v denotes the private reservation values, p is the unit price and c is the marginal cost. Differently, in NST tasks, subjects deal with tax-exclusive values and have to face the cognitive cost to discount the tax size in their reservation and cost values. In the latter cases, buyers' surplus is computed as $S_b = v - (p + \tau)$ and sellers' surplus as $S_s = p - (c + \tau)$, where τ denotes the unit tax.

Market allocational efficiency is calculated as follows:

$$e = \frac{\sum_{i \in traders} pr_i}{s_s + s_b} \times 100$$

This index, introduced by Gode and Sunder (1997), is defined as the ratio between the total actual profit and the theoretical profit. While the former is the sum of profits made by each trader - where pr_i stands for the profit of trader i - the latter is the sum of theoretical buyers', s_b, and sellers', s_s, surplus. This index converges 100% whenever subjects extract the maximum potential profit from trading. We decompose this index to compute both buyers and sellers' allocational efficiency. In the former case we only consider profits earned by buyers (in the numerator) and the potential buyers surplus (in the denominator); in the latter case we only account for sellers realized profits (in the numerator) and for the potential sellers surplus (in the denominator). Splitting this index up into buyers and sellers allocational efficiency allows us to investigate the effect of the different tax specifications on both buyers and sellers' allocational efficiency.

Table 2 below shows the regression output of the three models using the natural log of the buyer allocation efficiency as a dependent variable.

Table 2: Regression on Buyer Allocational Efficiency

Figure 2 and Table 3 report the margins on the Random Effect model. The full list of contrasts is available in Table 1B (Appendix B).

Figure 2: Margins on Random Effects Model

As a first result, assuming the No Tax framework (NT) as a reference category, a negative and significant impact on buyers' allocational efficiency is detected whenever the tax is legally levied on buyers. On the opposite, a positive and significant impact on buyers' allocational efficiency is observed when the tax is levied on sellers. Our results show that tax salience matters. Indeed, comparing a Salient Tax of 4 ECU levied on buyers (STB4) with a Non Salient Tax of 4 ECU levied on buyers (NSTB4), we observe that the buyers allocational efficiency is lower in the latter case. Still, comparing a Salient Tax of 8 ECU levied on buyers (STB8) with a Non Salient Tax of 8 ECU levied on buyers (NSTB8), the same achievement is reached. It is interesting to note that, when the tax sixe is 8 ECU, the decrease in the allocational efficiency caused by the introduction of a non-salient tax specification is still more accentuated (with respect to the 4 ECU tax), with a contrast of 0.36 (against a contrast of about 0.07). This result points out that a non-salient tax induces subjects to fall prey into accounting errors, which lower their allocational efficiency. Then, keeping equal the subject category who pays the tax as well as the tax sixe, we find that a non-salient tax structure negatively impacts on allocational efficiency.

Table 3: Margins on Random Effects Model

Table 4 shows the regression output of the three models using the natural log of the seller allocation efficiency as a dependent variable.

Table 4: Regression on Seller Allocational Efficiency

Figure 3 and Table 5 report the margins on the Random Effect model. The full list of contrasts is available in Table 2B (Appendix B). As a main result, with respect to the control (i.e. NT task), a negative and significant effect on seller allocational efficiency is observed when the tax is levied on sellers. On the opposite, a tax levied on buyers produces a positive and significant impact on sellers allocational efficiency. As in the previous case, we find that the subject category (buyer or seller) who is legally taxed experiences a reduction in his own allocational efficiency, at the advantage of the other subject category. Also in this case, we detect evidence of reduction in the allocational efficiency of the taxed subject category depending on salience of the tax. Indeed, comparing a Salient Tax of 4 ECU levied on sellers (STS4) with a Non Salient Tax of 4 ECU levied on sellers (NSTS4), we find that a non-salient tax decreases the allocational efficiency of sellers. Nevertheless, the same achievement is not detected when a salient tax on sellers of 8 ECU (STS8) is compared with a non-salient tax on sellers of 8 ECU (NSTS8).

Figure 3: Margins on Random Effects Model

To test whether the tax incidence equivalence principle holds, we take into consideration the market allocational efficiency and, assuming the no tax condition as a benchmark, we study whether it varies depending on the subject (buyer or seller) who pays the excise tax.

Table 5: Margins on Random Effects Model

Table 6 shows the regression output of the three models using the natural log of the market allocation efficiency as a dependent variable.

Table 6: Regression on Market Allocational Efficiency

Figure 4 and Table 7 report the margins on the Random Effect model. The full list of contrasts is available in Table 3B (Appendix B). As we can see, the introduction of a tax (in all its specifications) has a negative and significant effect on market allocational efficiency. Interestingly, for any given salience specification and tax size, the impact of the tax on the total allocational efficiency varies depending on the subject category who pays the tax. Indeed, a salient tax of 4 ECU promotes lower allocational efficiency when it is levied on sellers rather than on buyers (see comparison STB4 vs. STS4). The same achievement is detected comparing a salient tax on buyers of 8 ECU (STB8,) with a salient tax of the same size levied on sellers (STS8). Still, a non-salient tax of 4 ECU leads to lower allocational efficiency when it is levied on sellers (see comparison NSTB4 vs. NSTS4). No significant results are achieved with a non-salient tax of 8 ECU.

Figure 4: Margins on Random Effects Model

Table 7: Margins on Random Effects Model

3.2. Informational efficiency

Following Vernon Smith (1962), we measure the accuracy of the price discovery process by computing the root mean square error between each of the n transaction prices (for i=1…n) over a given period and the equilibrium price (p_0) of that period, expressed as a percentage of the equilibrium price. Substantially, the Smith's Alpha captures the standard deviation of actual prices over the theoretical equilibrium value.

$$\alpha = \frac{100}{p_0}\sqrt{\frac{1}{n}\sum_{i=1}^{n}(p_i - p_0)}$$

Then, a lower value of this index is desirable, since it would imply that trading prices exhibit lower deviations from the market equilibrium price.

Table 8 shows the regression output of the three models using the Smith's Alpha as a dependent variable.

Table 8: Regression on Smith's Alpha

Figure 5 and Table 9 report the margins on the Random Effect model. The full list of contrasts is available in Table 4B (Appendix B).

Figure 5: Margins on Random Effects Model

Table 9: Margins on Random Effects Model

In general terms, our results show that any tax specification induces a negative impact on the informational efficiency of the market, compared with the no-tax control treatment. What is particularly interesting in our context is that the salience of the tax does have a significant impact in terms on informational efficiency. More precisely, we find that, for any subject category and tax size, a non-salient tax specification worsens the market informational efficiency with respect to a salient tax specification. Indeed, a non-salient tax on buyer of 4 ECU promotes lower informational efficiency than a salient tax on buyers of 4 ECU (see STB4 vs. NSTB4). Similarly, a non-salient tax of 8 ECU levied on buyers (NSTB8) makes the market informationally less efficient than a salient tax on buyers of 8 ECU (STB8). The same achievements hold when the tax is levied on sellers (see comparisons STS4 vs. NSTS4 and STS8 vs. NSTS8).

4. Conclusion and discussion

In spite of the centrality of standard theoretical predictions in public economics, the recent advances in behavioural economics have emphasized the role of several heuristics and cognitive biases in affecting subjects' decisions and their response with respect to taxation. Tax salience and tax incidence have been two of the most discussed concerns in recent years, probably because of the policy implications they carry. The idea that customers exhibit some sensitivity to the visibility of a tax may lead the government to use the salience as a fiscal tool. Still, whether or not behavioural and institutional factors affect the repartition of the tax burden between buyers and sellers needs to be accounted for because of its implications on the distributional effects of a tax system. In the last decade, these issues have motivated researchers to focus on individual's behavioural responses to taxes. Taking advantage of the use of experimental techniques, our contribution sheds light on the impact of tax salience and tax incidence on market performance. In particular, we evaluate market performance in terms of its allocational and informational efficiency. While the index proposed by Gode and Sunder (1997) is taken into account as a measure for allocational efficiency, Smith's alpha is used to test market informational efficiency. Our results show that, for a given market side (buyer and seller) and tax size, switching from a salient to a non-salient tax specification reduces both market allocational and informational efficiency. Furthermore, we find that, for any size, a different impact on market allocational efficiency is detected depending on which side of the market the tax is levied on. Then, we conclude that both tax salience and tax incidence matter. While our contribution has to be thought as an experimental test of what has been so far investigated through the use of field experiments and theoretical models, much work is needed to shed light on the main drivers responsible for tax misperception. In this sense, several cognitive biases might be at work. For instance, the "availability" bias may lead subject to under-evaluate that kind of information which is not salient. Another possible explanation could instead be related to the "anchoring" bias, which causes people to anchor their evaluations to a starting point and make them fail to properly account for the arrival of new information. Then, customers who are affected by this bias might think that the final price will be very similar to the original one than to any other price. Moreover, framing of prices may affect subjects' decisions (see Tversky and Kahneman, 1986). Last but not least, tax misperception may simply be due to the fact that calculation costs exceed the related benefits. In this perspective, we think that further research is still needed to explore the potential source of tax misperception.

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Table 1: Summary of Experimental Tasks

Task	Task Tag	Task Description
1	NT	No Tax
2	STB4	Salient Tax on Buyer (4 ECU)
3	STS4	Salient Tax on Seller (4 ECU)
4	STB8	Salient Tax on Buyer (8 ECU)
5	STS8	Salient Tax on Seller (8 ECU)
6	NSTB4	Non-salient Tax on Buyer (4 ECU)
7	NSTS4	Non-salient Tax on Seller (4 ECU)
8	NSTB8	Non-salient Tax on Buyer (8 ECU)
9	NSTS8	Non-salient Tax on Seller (8 ECU)

Dependent Variable: Buyer Allocational Efficiency

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
TaxType = 2, STB4	-0.0973***	-0.0973***	-0.0973***
	(0.0132)	(0.0125)	(0.0125)
TaxType = 3, STS4	0.0783***	0.0783***	0.0783***
	(0.0132)	(0.0125)	(0.0125)
TaxType = 4, STB8	-0.169***	-0.169***	-0.169***
	(0.0132)	(0.0125)	(0.0125)
TaxType = 5, STS8	0.0287**	0.0287**	0.0287**
	(0.0132)	(0.0125)	(0.0125)
TaxType = 6, NSTB4	-0.159***	-0.159***	-0.159***
	(0.0132)	(0.0125)	(0.0125)
TaxType = 7, NSTS4	0.117***	0.117***	0.117***
	(0.0132)	(0.0125)	(0.0125)
TaxType = 8, NSTB8	-0.529***	-0.529***	-0.529***
	(0.0132)	(0.0125)	(0.0125)
TaxType = 9, NSTS8	0.0825***	0.0825***	0.0825***
	(0.0132)	(0.0125)	(0.0125)
Constant	4.579***	4.579***	4.579***
	(0.00936)	(0.00881)	(0.0122)
Observations	8,694	8,694	8,694
R-squared	0.298	0.328	
Number of Subject		138	138

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Table 2: Regression on Buyer Allocational Efficiency

Tax Type	Margin	Std. Err.	Unadjusted Groups[11]
NSTB8	4.050	0.012	
STB8	4.410	0.012	A
NSTB4	4.419	0.012	A
STB4	4.481	0.012	
NT	4.579	0.012	
STS8	4.607	0.012	
STS4	4.657	0.012	B
NSTS8	4.661	0.012	B
NSTS4	4.696	0.012	

Table 3: Margins on Random Effects Model

[11] Margins sharing a latter in the group label are not significantly different at the 5% level.

Dependent Variable: Seller Allocational Efficiency

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
TaxType = 2, STB4	0.0486***	0.0486***	0.0486***
	(0.00972)	(0.00882)	(0.00882)
TaxType = 3, STS4	-0.194***	-0.194***	-0.194***
	(0.00972)	(0.00882)	(0.00882)
TaxType = 4, STB8	0.0774***	0.0774***	0.0774***
	(0.00972)	(0.00882)	(0.00882)
TaxType = 5, STS8	-0.328***	-0.328***	-0.328***
	(0.00972)	(0.00882)	(0.00882)
TaxType = 6, NSTB4	0.0627***	0.0627***	0.0627***
	(0.00972)	(0.00882)	(0.00882)
TaxType = 7, NSTS4	-0.310***	-0.310***	-0.310***
	(0.00972)	(0.00882)	(0.00882)
TaxType = 8, NSTB8	0.174***	0.174***	0.174***
	(0.00972)	(0.00882)	(0.00882)
TaxType = 9, NSTS8	-0.312***	-0.312***	-0.312***
	(0.00972)	(0.00882)	(0.00882)
Constant	4.546***	4.546***	4.546***
	(0.00687)	(0.00624)	(0.00988)
Observations	8,694	8,694	8,694
R-squared	0.433	0.485	
Number of Subject		138	138

Standard errors in parentheses
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4: Regression on Seller Allocational Efficiency

Tax Type	**Margin**	**Std. Err.**	**Unadjusted Groups**[12]
STS8	4.218	0.009	A
NSTS8	4.234	0.009	AB
NSTS4	4.235	0.009	B
STS4	4.351	0.009	
NT	4.546	0.009	
STB4	4.594	0.009	C
NSTB4	4.608	0.009	CD
STB8	4.623	0.009	D
NSTB8	4.720	0.009	

Table 5: Margins on Random Effects Model

[12] Margins sharing a latter in the group label are not significantly different at the 5% level.

Dependent Variable: Market Allocational Efficiency

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
TaxType = 2, STB4	-0.0236***	-0.0236***	-0.0236***
	(0.00527)	(0.00486)	(0.00486)
TaxType = 3, STS4	-0.0417***	-0.0417***	-0.0417***
	(0.00527)	(0.00486)	(0.00486)
TaxType = 4, STB8	-0.0349***	-0.0349***	-0.0349***
	(0.00527)	(0.00486)	(0.00486)
TaxType = 5, STS8	-0.105***	-0.105***	-0.105***
	(0.00527)	(0.00486)	(0.00486)
TaxType = 6, NSTB4	-0.0238***	-0.0238***	-0.0238***
	(0.00527)	(0.00486)	(0.00486)
TaxType = 7, NSTS4	-0.0616***	-0.0616***	-0.0616***
	(0.00527)	(0.00486)	(0.00486)
TaxType = 8, NSTB8	-0.0888***	-0.0888***	-0.0888***
	(0.00527)	(0.00486)	(0.00486)
TaxType = 9, NSTS8	-0.0840***	-0.0840***	-0.0840***
	(0.00527)	(0.00486)	(0.00486)
Constant	4.570***	4.570***	4.570***
	(0.00373)	(0.00344)	(0.00513)
Observations	8,694	8,694	8,694
R-squared	0.076	0.090	
Number of Subject		138	138

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Regression on Market Allocational Efficiency

Tax Type	Margin	Std. Err.	Unadjusted Groups[13]
STS8	4.464	0.005	
NSTB8	4.480	0.005	A
NSTS8	4.485	0.005	A
NSTS4	4.508	0.005	
STS4	4.528	0.005	B
STS8	4.534	0.005	B
NSTB4	4.545	0.005	C
STB4	4.546	0.005	C
NT	4.569	0.005	

Table 7: Margins on Random Effects Model

[13] Margins sharing a latter in the group label are not significantly different at the 5% level.

Dependent Variable: Smith's Alpha

VARIABLES	(1) Pooled OLS	(2) Fixed Effects	(3) Random Effects
TaxType = 2, STB4	0.302	0.302*	0.302*
	(0.248)	(0.161)	(0.161)
TaxType = 3, STS4	1.658***	1.658***	1.658***
	(0.248)	(0.161)	(0.161)
TaxType = 4, STB8	1.694***	1.694***	1.694***
	(0.248)	(0.161)	(0.161)
TaxType = 5, STS8	3.787***	3.787***	3.787***
	(0.248)	(0.161)	(0.161)
TaxType = 6, NSTB4	2.549***	2.549***	2.549***
	(0.248)	(0.161)	(0.161)
TaxType = 7, NSTS4	2.511***	2.511***	2.511***
	(0.248)	(0.161)	(0.161)
TaxType = 8, NSTB8	4.009***	4.009***	4.009***
	(0.248)	(0.161)	(0.161)
TaxType = 9, NSTS8	5.341***	5.341***	5.341***
	(0.248)	(0.161)	(0.161)
Constant	5.230***	5.230***	5.230***
	(0.176)	(0.114)	(0.373)
Observations	8,694	8,694	8,694
R-squared	0.083	0.181	
Number of Subject		138	138

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 8: Regression on Smith's Alpha

Tax Type	Margin	Std. Err.	Unadjusted Groups[14]
NT	5.229	0.372	A
STB4	5.531	0.372	A
STS4	6.888	0.372	B
STB8	6.923	0.372	B
NSTS4	7.741	0.372	C
NSTB4	7.779	0.372	C
STS8	9.016	0.372	D
NSTB8	9.238	0.372	D
NSTS8	10.57	0.372	

Table 9: Margins on Random Effects Model

[14] Margins sharing a latter in the group label are not significantly different at the 5% level.