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Do Price-Tags Influence Consumers' Willingness to Pay?

On External Validity of Using Auctions for Measuring Value[1]

Forthcoming in Experimental Economics

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Abstract

This paper considers the external validity of the growing set of literature that uses laboratory auctions to reveal consumers' willingness to pay for consumer goods, when the concerned goods are sold in retailing shops through posted price procedures. Here, the quality of the parallel between the field and the lab crucially depends on whether being informed of the actual field price influences a consumer's willingness to pay for a good or not. We show that the elasticity of the WTP revision according to the field price estimation error is significant, positive, and can be roughly approximate to one quarter of the error. We then discuss the normative implications of these results for future experiments aimed at eliciting private valuations through auctions.

Key words: Experimental Economics; Willingness to pay; Auction; Posted Price; Value Elicitation; Consumer Behavior.

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1. INTRODUCTION

Since the seminal paper of Hoffman et al. (1993), auction selling procedures in laboratories have appeared as an appealing and challenging method for eliciting consumer preferences in applied studies. These new experimental methods tend to complement or even to substitute traditional surveys and questionnaires used for decades in marketing studies. They have been employed extensively for various purposes in applied economics (for a detailed survey, see Lusk and Shogren, 2007). Domains of application include product marketing (demand-led conception, packaging, pricing, etc.) and public regulation (labelling control, innovation acceptability, etc.). Numerous applications are found in the food industry, due to the complexity of the products, their attributes and labelling. Previous studies have covered desirable characteristics – e.g. food safety (e.g. Buzby et al., 1998, Hayes et al., 1995) and animal welfare (Lusk and Norwood, 2008) –, less desirable ones – e.g. GMOs (Lusk et al., 2001, Noussair et al., 2004), hormones (Fox, 1995) and insecticides (Roosen et al., 1998) and, lastly, intrinsic or extrinsic characteristics – from countless studies on taste to fair-trade (Rousu and Corrigan, 2008) –. The products or characteristic concerned might be available on the actual field consumer market (Wertenbroch and Skiera, 2002) or not (List, 2003).

The large success of these experimental methods in applied research stems primarily from the fact that participants have real incentives for revealing the true value that they attribute to a product, contrary to hypothetical survey settings (among others, see Cummings et al., 1995; List and Shogren, 1998, and Neill et al., 1994). Another advantage of using experimental methods is that their results are expressed in money units, more useful for most users than hedonic marks or mere product ranking. In order to support this experimental method as a valuable tool in market research, the reliability of its estimates must be assessed, especially when they produce out-of-the-lab predictions.

Preferences measured in the laboratory are defined in monetary terms by *values*, a value being the maximum amount that each bidder (buyer) is willing to pay. Value is built by the buyer-consumer, and therefore known by her. Conversely, this value is ignored by the seller (here the experimentalist). The use of incentive-compatible auctions (Vickrey, 1961) or equivalent selling procedures such as BDM (Becker et al., 1964) for eliciting WTP (*i.e.* bid=WTP) has been validated scientifically in the best literature, both theoretically (Vickrey, 1961) and empirically, thanks to the 'induced-value' methodology introduced by Vernon Smith (1976). Reassured by these results based on *redemption values* of lab products, we can now legitimately use these procedures to elicit *homegrown values* for real life products, with the hypothesis: bid=WTP=home-grown value[2]. Subsequent literature specifies precise technical conditions in the lab for this hypothesis to be sustainable: proper incentives, adequate learning procedures and explanations (List and Shogren, 1998), private information (to avoid affiliation, Corrigan and Rousu, 2006), *n* products for sale depending on the number of participants with Vickrey, etc.[3] In the present article we assume that this hypothesis holds, i.e. that bid=WTP, and focus on the content of this WTP.

[2] Note that the expression 'homegrown value' qualifies the product, and not any behavior or preference.
[3] Nevertheless, theoretically equivalent procedures had been shown to have different degrees of efficiency in reveling redemption values in the lab. For instance, Noussair et al. (2004b) even observe significant differences between *WTP* in BDM procedures and *WTP* in Vickrey auctions.

In this article we question the parallel between a revealed 'in-the-lab' WTP and an ignored 'out-of-the-lab' WTP. Although Brookshire et al. (1987) could not find any significant difference between the 'real world' and the lab for privately consumed commodities, various hindrances were identified as limiting the quality of the parallel between the lab and the field, *i.e.* the external validity of the method. In particular, we concentrate here on one (important) dimension of this problem: the price effect. In the field, at least in developed countries, most consumer goods are sold with *posted price procedures*. In the laboratory, we use auctions or BDM procedures. The external validity of such laboratory experiments may be limited, for two related reasons. First, the in- and out-of-the-lab selling procedures involve different decision processes ('take it or leave it' in the field, and 'make a bid' in the lab). By comparing posted prices and bilateral bargaining market institutions, Cason et al. (2003) show that the choice of the selling procedure influences outcomes. Second, there is another difference: the presence (in the field) or absence (in the lab) of a visible *Field Price* (FP) when taking a buying decision. The fact of the buyer knowing or ignoring the FP will pose a problem of parallelism if (and only if) WTP is dependent on the FP. In this case, the WTP in the lab (WTP_{lab}) may differ from WTP in the field (WTP_{field}), and a bias may be introduced by the lab procedure[4]. Note that if WTP depends on the field price, two distinct issues come up. One is parallelism. The other, of a much more general purpose, is the issue of the stability of WTP_{field} as it may depend on field price. If it does, various field prices (due to price discrimination, promotion, taxes or subsidies), may lead to various WTP_{field}. In developing countries, where prices are often defined with bilateral negotiation, the issue is even bigger. In this paper we concentrate on the question of parallelism, but we see that we cannot answer this question properly without keeping an eye on the issue of WTP in the field.

The question of the (in)dependence of WTP from FP has already been addressed in the literature. Cherry et al. (2004) show with induced value that outsides options shave bids. Harrison et al. (2004) revisit the data of Hoffman et al. (1993) by estimating a random effects Tobit model with lower and upper limits. They reach the conclusion that ignoring the censoring of elicited values due to extra-laboratory prices can significantly alter the results. Using a choice experiment, Carlsson et al. (2007) show that preferences are affected by the inclusion of a price. Recently, Drichoutis et al. (2008) used the procedure of Harrison et al. (2007) to show that subjects provided with reference price information bid on average €0.21 more for a sandwich than those who are not. To explain such results, Harrison et al. (2004) stress the importance of belief and knowledge of both price-tags and of the product characteristics. But the aforementioned experimental procedures do not include means to measure such beliefs.

We propose a new protocol including three new variables in a well-controlled 'within' procedure. For each 128 subjects and for each of the 8 products for sale, we elicit the *field price estimation* (FP_{estim}), parallel with the WTP (WTP_{stand}). We then deliver – in a highly credible way – the actual FP of the product, and then re-measure WTP given this price (WTP_{FP}). With such a protocol we are in a controlled environment for the first time, able to observe the actual impact of the price on WTP, knowing the actual information given to the subject when he discovers the field price, i.e. the distance between initial belief and the actual price. This 'before-after' procedure, using only auctions, appears to be most accurate one for our purpose. Posted-price vs. auction would come up against the poor information revealed by posted-price procedures in the lab. This is precisely why we opt for auctions! Of course, the potential influence, on WTP, of being informed of the FP depends on how much the

[4] In their experiment, Issanchou et al. (2008) present the participant of a choice experiment at a baker with several price sets for different kinds of breads. WTP obtained are then compared to WTP elicited in the lab through BDM. While such protocols afford much insight on the effect that the selling procedure itself may have on WTP, the use of fictitious prices eliminates the effect of the price information on WTP.

consumer actually *learns* from the FP disclosure. A subject who accurately approximated a FP would not change much when she disclosed that she was right (neglecting risk aversion). In our protocol, we are able to observe (a) WTP with and without the FP information and (b) what the bidder actually learns from the FP disclosure (the magnitude of her over- or underestimation).

The ideal condition of validity would be independence and then the stability of the WTP, whether FP is known or not, and under- or overestimated or not. If, on the contrary, the WTP for a good is largely influenced by FP disclosure, the use of auction procedures in the lab would appear to exclude an important field variable. Theoretically, we propose to confront our results with four alternative hypotheses: H_1. *Stable WTP* (WTP is *independent* from price). H_2. *Price capped WTP* (WTP is stable up to a cap given by the price and transaction costs). H_3. *Arbitrage WTP* (WTP is determined by 'out-of-the-lab' reselling and buying prices). H_4. *Price signalled WTP* (WTP is influenced by the price, used as a signal for quality). Unlike strictly controlled laboratory redemption-value products, we know, since Adam Smith[5], that home-grown values for not purely financial products have a double face value: use value and exchange value. This double face of value may exist in and out of the lab. In his reference textbook on auction theory, Krishna (2010) distinguishes between cases when the value of the auctioned good is derived from its sole consumption or use, and situations where the value of the auctioned good is based on how much it will fetch in the resale market. In the first context, values are heterogeneous among subjects and are independent on others' behaviours. Bids then reflect strictly *private values*. In the second set of situations, values are homogeneous among subjects and bids reflect *common values* or *interdependent values* (see Krishna, 2010, for developments). A typical case of value ambivalence might be a vintage *bottle of wine* that the owner may either drink or resell (e.g. on E-Bay). Questioning your own WTP for such a bottle, you would consider both alternatives. H_1 and H_3 stand for these two extreme situations. In H_1, a subject may regard a good only for her personal or private consumption, namely for its *use value*. This would be for example if the buyer were forced to drink the bottle of wine, in or out of the lab. A current assumption in economics textbooks is that individuals have well-defined preferences. In this case, the elicited preferences for individual attributes should be independent of the price, revealed or not. FP has no effect on WTP. However, FP may still be useful and influence the subject's WTP for private valuation, as it may be used as a signal of the quality of the good (H_4). Here, we may posit that the more ignorant the subject is concerning the quality of the good, and simultaneously the more confident she is about the efficiency of the market and the similitude of her taste compared to other buyers' tastes, the more her WTP is likely to be influenced by the FP disclosure.[6] However, in such situations the laboratory reveals private values. In H_3, the subject regards a good for sale in the lab only as an *exchange value*. For such a subject, the FP therefore entirely determines the value[7]. FP defines the common value and covers up private values. H_2 corresponds to an intermediate situation. Subjects may regard the good auctioned as private value but would never bid more in the laboratory than the price they know or suppose they could buy the

[5] "The word value, it is to be observed, has two different meanings, and sometimes expresses the utility of some particular object, and sometimes the power of purchasing other goods which the possession of that object conveys. The one may be called 'value in use;' the other, 'value in exchange.' The things which have the greatest value in use have frequently little or no value in exchange; and on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water: but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it." (*Wealth of Nations* Book 1, chapter IV). In *Capital I,* K. Marx, following A. Smith, develops the analysis of the relation between exchange value and use value.

[6] A step further in the same direction would be to agree that, for certain consumers at least, the FP could be a valuable attribute as such. For such consumers, adjusting their WTP to the FP may be regarded as automatic.

[7] WTP=FP when one overlooks transaction costs, risk aversion and commitment costs (see Zhao and Kling, 2004, for a definition of commitment costs)

same product for in the field (here ignoring transaction costs). A subject will therefore not buy a good in the laboratory at a price superior to the objective or subjective field price. Harrison et al. (2004) refer to this as *field-price censoring*. In this case, the laboratory only partially reveals private values.

Our results show that H_1 and H_3 are rejected. We also show that H_2 alone does not exhaust the data. H_4 appears as a good candidate for explaining the residue. In our discussion, we support the idea that the lab reveals WTP close to field WTP, but that in and out of the lab WTPs are under posted price influence. We then conclude that, in experimental design aimed at measuring WTP for marketed products, FP might be introduced every time it is available and not a treatment variable. We also propose a systematic exploration of FP estimation when no actual field price is available, and/or pricing is at stake. Of course, one may reasonably accept the fact that, for a typical consumer, an offered good in the lab has both an exchange value and a use value, and therefore that these two lines of reasoning apply at the same time, more or less depending on the type of good supplied.

Section (2) of this paper now presents our experimental design in more detail, with the subjects and indicators that will serve our analysis. Sections 3 and 4 then present the hypothesis and the results. After a brief discussion in Section 5, Section 6 concludes.

2. EXPERIMENTAL DESIGN

Our experimental design is based on three main principles:

(i) *WTPs are elicited through auctions.* Although consumers scarcely purchase goods through auctions, such procedures remain the most relevant for measuring individual WTP in labs. In the lab posted-price sales are realistic but provide poor results, as consumers choose only yes or no for a given good at a given price. Therefore, the researcher may multiply the number of sales by implementing several artificial prices. By doing so, buyers lose the information conveyed by an actual field price.

(ii) *The effect of FP on WTPs is examined by observing bids before and after the introduction of price tags.* The second idea is that the main difference between posted-price sales and auctions is the knowledge of the price tag. Whereas price tags may operate as a benchmark in posted-price sales, buyers may be unaware of them in auctions. To be successful, one must be credible when providing the price tags.

(iii) *Beliefs relative to out-of-the-lab price tags are examined.* The third idea is that the observation of the WTP revisions is not enough. These beliefs may have an impact on the WTP revision when the price tag is introduced. In other words, consumers may react differently to the price introduction, whether they under- or overestimate it. The price disclosure may come as a bad or a good surprise and thus impact preferences in positively or negatively. The magnitude of this impact could moreover be expected to be correlated with the distance (positive or negative) between the field price and field price estimation.

A. Procedure and variables

Table 1 below describes the sequence of the experiment.

---TABLE 1 HERE---

Each stage 1, 3 and 5 consists of 8 simultaneous 4th price Vickrey auctions. 8 different products are being sold simultaneously on these auctions. In each auction at each stage, 3 items of the same product are being sold to the 3 highest bidders. The price is defined by the 4th highest bid. During each of these stages 1, 3 and 5, the task of each subject is to place 8 bids for the 8 different products for sale (detailed below).

Not every auction ends up with an effective sale. In order to avoid endowment and substitution effects, each subject knows that he/she will not end up purchasing more than two items[8]. Bids are anonymous and computerized[9]. No information on bids and prices was given to the subjects during the experiment.

Before Stage 1, subjects participated in two practice auctions. One melon[10] and 3 soda cans were sold respectively at the 2nd and 4th bid in a Vickrey auction. At the end of each learning auction, the researchers discussed the winner(s) and the auction price with the audience. The winners then had to pay for the product they had won. This learning stage ensured a sound understanding of the sale procedure and of the non-hypothetical nature of the situation.

The Stage 1 auction repeated the usual standard procedure used in experiments aimed at revealing WTP for real products. We call this first measure the *standard willingness to pay* (WTP_{stand}). During Stage 2, the participants were asked to estimate the field price (FP_{estim}). For each of the 8 products, they were encouraged to take this task seriously: the subject with the best estimation received €3. The second and the third best estimators received respectively €1 and €0.5. Stage 3 was technical. It was designed to check the stability of individual preferences for a product. In practical terms, it was a strict repetition of Stage 1. Without any additional information, subjects could reconsider their Stage 1 bids after guessing the *FP* (we call the bids collected at Stage 3 the WTP reconsidered or WTP_{recon}). In Stage 4, the actual field prices (*FP*) of the 8 products were disclosed to the subjects. In order to make this information on *FP* as credible as possible, we presented photographs of the products *in situ*, *i.e.* on shelves with clearly visible price tags. The place and date where the 8 products where originally bought by the researcher were also specified. Finally, in Stage 5, subjects made a last series of 8 bids for the 8 products, being informed of the *FP*. We call the data collected at this stage WTP revision knowing *FP*, or WTP_{FP}. At the end of the experiment, one subject was asked to randomly select the auction stage (1, 3 or 5) that would be made effective for the purchases.

B. Indicators

It is useful to define a series of indicators based on our collected data.

1. *WTP revision induced by the FP disclosure.* $\boldsymbol{\Delta WTP_{revis}} = WTP_{FP} - WTP_{stand}$ ()

ΔWTP_{revis} measures the extent to which a subject revises her WTP for a given product once the researcher has disclosed the actual field price of the product in shops. It is the difference between a subject's bid at Stage 5 and the same subject's bid at Stage 1 for the same product. Note that a similar

[8] When subjects bought more than two products, a draw determined which two products they actually purchased.
[9] Pen and paper were available for those participants (especially the older ones) who were not at ease with computers. Once their bid was made, a researcher assisted them in recording it on the computer.
[10] The melon auction also allowed subjects to become familiar with proposals of prices per kg.

indicator is ΔWTP_{recon}. It measures the extent to which a subject revises her WTP for a given product once she has thought about the field price in order to propose estimation at Stage 2. Recall that no additional information is given between Stages 2 and 3.

2. *Estimation error of the FP.* $\boldsymbol{\Delta FP_{estim}} = FP - FP_{estim}$

ΔFP_{estim} measures a subject's error in the estimation of the field price of a given product. Practically, ΔFP_{estim} is the difference between the estimation made by a subject at Stage 2 and the actual price given by the researcher (for the same product) at Stage 4. Note that, with this notation, $\Delta FP_{estim}>0$ means an underestimation of the actual field-price and $\Delta FP_{estim}<0$ means an overestimation of the actual field-price.

3. *Elasticity of the WTP revision according to the estimation error.* $\boldsymbol{Elast} = \Delta WTP_{revis} / \Delta FP_{estim}$

Elast is the ratio of the two previous indicators. It measures the elasticity of a subject's revision of her WTP, induced by the FP disclosure and based on her error of estimation of the FP for the same product[11]. This ratio constitutes the crucial indicator for the purpose of this paper.

4. *Minimum Subjective Surplus.* $\boldsymbol{SS} = FP_{estim} - WTP_{stand}$

SS measures the difference between WTP_{stand} and FP_{estim} for a given product by a given subject. If the product is considered for its exchange value, if we neglect both transaction costs and risk aversion, and if we posit that the subject behaves rationally in the auction, then *SS* might be equal to zero, as the subject might bid the exact value of the product.

5. *Minimum Objective Surplus.* $\boldsymbol{OS} = FP - WTP_{rev/FP}$

OS is the objective version of *SS*, *i.e.* it is the same indicator, considering the objective actual *FP* instead of its estimation by the subject. If we consider the product for its exchange value, we anticipate $OS<SS$ when the subject is risk averse (which is the standard hypothesis for subjects in the lab), as the *FP* is obvious when disclosed and not subject to error as FP_{estim} is. When the product is considered (only) for its use value, the *FP* disclosure should not have any impact on the WTP if the subject is fully informed of the characteristics of the product. In other words, a ΔWTP_{revis} different from zero would mean, when considering a product for its use value, that the subject considered the price as a sign of the product's quality. In such a case, $OS<SS$ is not obvious.

Finally, it is useful to note that the difference between *OS* and *SS* is directly related to the error of estimation of the field price and the elasticity of the *WTP* revision according to the estimation error. For instance, an underestimation of FP associated with an elasticity inferior to one generates $OS > SS$.

C. Subjects and products

The experiments took place in the GAEL experimental economics laboratory at the INP of Grenoble. There were 8 sessions, each with 14 to 16 participants for a total of 124 subjects. The recruitment was

[11] Following an extensive debate, we opt for an indicator of absolute elasticity and not for an indicator of relative elasticity ($\frac{\Delta WTP_{rev} / WTP_{stand}}{\Delta FP_{estim} / FP_{estim}}$). The absolute measure has the advantage of not excluding subjects with $WTP_{stand}=0$ and is coherent with our measure of *OS*–*SS* (Point 6).

conducted in Grenoble and its suburbs by professionals in telemarketing and under the supervision of the GAEL laboratory. The sample was constructed to be representative: 53 males and 71 females aged from 16 to 83 (with an average age of 45). The subjects were remunerated a fixed amount of €20. According to their experimental decisions, subjects could earn additional money in Stage 2 and buy a maximum of 2 products during the auction stages. The amount paid for the product(s) was then deducted from the experimental gain.

The products on sale are listed in Table 2. We chose these products with great care as we knew that the impact of the price-tag knowledge could vary not only in magnitude but also in sign (according to a subject's over- or underestimation of the *FP*). The authors considered that the product choice of previous studies (Brookshire et al., 1987, Drichoutis et al., 2008, etc.) had been a weakness. In this experiment the products were therefore chosen mainly for their heterogeneity and their relatively low market value. These items differed in several respects: some were common consumer goods and therefore had a well-known market price (bread, crisps, bananas); some were relatively new or rare (smoothies, hyssop jelly, cotton bags); finally, some had specific characteristics (fair-trade, organic, and nutritional). We expected some products to be widely overestimated (bag) or underestimated (jelly). This heterogeneity is important as we did not want our experimental observations to be specific to a certain type of product.

Overall, the experiment that reported here has several advantages compared with previous studies on the same topic, as it includes: i) the elicitation of the field price estimation by the subjects: the examination of the subjects' belief as to the field price is essential when examining its effect on WTP; ii) a within procedure: WTP without the field price information and WTP with the field price are elicited with the same subjects, which prevents variance due to sampling; iii) a relevant set of products: robust results need products with heterogeneous characteristics as price information may have a different impact on different products; and finally iv) non-student subjects: participants are real consumers used to shopping.

3. HYPOTHESIS

We propose to test the following four hypotheses. We first consider a frictionless market and then reflect on the possible effects of friction.

H_1. Stable and independent (from the Field Price) WTP

Private valuation (PV), known by the bidder, is accurately revealed by WTP in the lab. This is true whether the bidder knows or the actual FP or not.

The bidder knows what value he attaches to the object by the time the bidding starts. (The bidder implicitly ignores others' values, though knowledge of others' valuation would not affect how much the object was worth for him, the bidder). This hypothesis is plausible when the value of the object to a bidder is derived from its consumption or use alone, i.e. from how much utility he would derive from possessing it. The WTP is not influenced by the outside *FP*. The disclosure of the latter therefore has no impact and $WTP_{stand} = WTP_{FP}$. Thus,

$$\text{Elast} = 0 \qquad (1)$$

H_2. Price Cap WTP

Private valuation is accurately revealed by WTP in the lab if (and only if) PV stands below the posted price (actual or estimated).

The laboratory is not impervious to the outside world and even though the bidder values the object for its use value, she also considers the opportunity cost of buying it in the laboratory compared to buying it later in the field. She will not pay more than the field price (Harrison et al. (2004) refer to this as *field-price censoring*). We thus have $WTP_{stand} = min\{\text{PV}, FP_{estim}\}$ and $WTP_{FP} = min\{\text{PV}, FP\}$. Four cases emerge:

$\text{PV} \leq FP_{estim}, FP$	$FP_{estim}, FP \leq \text{PV}$	$FP_{estim} \leq \text{PV} \leq FP$	$FP \leq \text{PV} \leq FP_{estim}$
$Elast = 0$	$Elast = 1$	$0 < Elast < 1$	$0 < Elast < 1$

(2)

H_3. Arbitrage WTP

WTP does not reveal private valuation because it is hidden by common values when the interdependence stems from resale considerations.

If a bidder assigns value on the basis of how much the object would fetch in the resale market, then the private valuation vanishes behind *interdependent values* (Krishna, 2010). If the outside-the-lab market for the object is pure and without transaction costs, then the situation may be described as one of *pure common value*, because even if the value is ignored by bidders by the time of the auction, it is the same for all bidders. Therefore, each bidder offers the field price or what she thinks the field price is. Consequently,

$$Elast = 1 \qquad (3)$$

H_4. Price signal and unstable WTP

Private valuation is revealed but, as it is only estimated by the bidder, price revelation may be used as a signal for quality expertise and lead to a revision of the valuation.

The Field Price signals quality. When bidders make an error in the estimation of *FP*, they revise their PV towards the *FP*. In the case of underestimation (respectively overestimation), bidders have underestimated (overestimated) the quality of the good and increase (decrease) their PV. We have $WTP = PV = f(FP)$ with $f' \geq 0$. Thus,

$$0 \leq Elast \qquad (4)$$

In a more realistic setting, the purchase in the laboratory, compared to the purchase outside the laboratory, generates hidden costs[12]. We have identified the following:

Transaction Costs – Buying within the laboratory may generate transaction costs. They may be either positive or negative. For instance, it may save the buyer a trip to the closest shop (gain of time and money) if she was in any case going to buy the good auctioned sooner or later. On the other hand, the

[12] The same costs may exist for the purchase of goods within a particular shop compared to the other shops.

bidder may not feel disposed to purchase at the precise moment of the experiment (*e.g.* she may not be willing to be loaded with goods as she has planned to go to the movies).

Risk Premium and Commitment Costs – The ignorance of FP may decrease bids. First, risk-adverse bidders may seek a risk premium when they are uncertain about the FP. Such bidders may want to avoid bidding above *FP* and lower their bids accordingly. Second, bidders may seek compensation for the renunciation of future learning opportunities as buying within the laboratory prevents the buyer from delaying her purchase decision until more information is gathered (about the market context). Zhao and Kling (2001) refer to this as commitment costs.

Market frictions have no impact on the prediction of H_1 and H_4 *per se* as we have assumed that bidders are not looking for substitutes out of the lab (*i.e.* no opportunity costs). Once we allow links between the lab and the field, frictions complicate the predictions. In H_2 for instance, transaction cost may shift the price cap either upwards or backwards (depending on its sign). Therefore, it turns out to be adventurous to determine it without additional assumptions, whether the private values are above or below the price cap. In the perspective of arbitrage (H_3), bidders may strive to ensure a bigger surplus when there are uncertainties about *FP*: risk-adverse bidders are willing to make sure that their bids lie comfortably below *FP* and bidders may seek compensation for the commitment. Both effects generate $SS > OS$.

4. RESULTS

A. Overview

Figure 1 displays an overview of our results. Each graph is dedicated to one of the eight products. The two columns at the rear represent (left) the average field price estimation (FP_{esti}) and (right) the actual field price (*FP*). The columns in the front represent the average *WTP* before (left) and after (right) the announcement of the field price (respectively WTP_{stand} and WTP_{FP}). Therefore, on each of these figures, the gap between the two rear columns measures the mean estimation error of the *FP* ($\Delta estimFP$), and the gap between the two front columns measures the mean revision of the willingness to pay ($\Delta revisWTP$). Finally, subjective surplus *SS* (respectively the objective surplus) can be viewed by looking at the difference between the two left columns (or the two right columns).

INSERT FIGURE 1

INSERT TABLE 2

Table 2 sums up the means of our different indicators per product by differentiating situations where bidders underestimate, overestimate or accurately estimate *FP*.

We also check the impact of the 'Price is Right' procedure on the *WTP*s. As there is no additional external information given to subjects between Stage 1 and Stage 3, no economics standard hypothesis would support a change in WTP at this stage. However, the issue of price might have a psychological effect on a subject and modify his or her WTP. Therefore, apart from the documented effect on WTP of a mere repetition of an auction, a difference between WTP_{stand} and WTP_{recon} might be due to a saliency effect of the field price issue. WTP_{recon} is on average slightly superior to WTP_{stand} (€1.17 vs

€1.12) although the hyssop jelly is the only product that has a significant difference between WTP_{Stand} and WTP_{recon} (Wicoxon matched-pair test, p=0.0112; all the other products have p>0.05).

B. *Values and Prices*

Subjects do not properly estimate the field prices

OBSERVATION 1: $\Delta estimFP \neq 0$. Subjects do not properly estimate the field prices. The direction (whether subjects underestimate or overestimate the field price) and the extent of the estimation errors depend on the nature of the product.

When applying a t-test to the 8 products, one cannot reject the null hypothesis that $\Delta estimFP$ is different from zero. Nevertheless, the rejection of this hypothesis only means that the subjects' errors on the 8 products are centred on zero. In fact, only 3% of the individual estimations were strictly correct and 17% were correct within a 10% range. Looking at them product by product, overestimations do not compensate for underestimations (or inversely). While prices for both bananas and organic bags are underestimated on average, prices for smoothies, jellies, crisps and both types of baguette bread are overestimated[13]. The magnitude of errors is also related to the nature of the product. New or unfamiliar products like smoothies, hyssop jelly or organic bags exhibit larger estimation errors (respectively -41.8%, -30.5% and +116.7%) than more commonly-used products like baguette bread (-0.6%), 'balanced' baguettes (-9.9%) and packets of crisps (-16.6%). Results for both types of banana are more surprising (+60.8% for the 'normal' bananas and +22.3% for the fair-trade bananas).

Subjects want a surplus

OBSERVATION 2: SS>0 and OS>0. Subjects do not confuse values and prices. On the basis of their FP estimation or FP knowledge, they are looking for a good deal in the lab.

For every product of our set, WTP_{stand} is significantly lower than FP_{estim} (Wilcoxon signed rank test, p=0.0000). On average, subjects are willing to pay €0.79 less than their field price estimation. At the individual level, 77% of the decisions display lower WTP_{stand} than FP_{estim} and 9.3% exhibit the same amount. We find similar results once the actual field price is announced: WTP_{FP} is significantly lower than the FP (p=0.0000), with an average difference of €0.84. The proportion of $WTP_{FP}>FP$ is significantly lower than the proportion of $WTP_{stand}>FP_{estim}$ (Fisher Exact, p=0.0189). Without price information, bidders are willing to pay less than what they think the price is. Once the field price is known, subjects are still willing to pay less than the price. Subjects are (objective or subjective) surplus seekers: they are not willing to pay as much for a product in the lab as they would have to pay outside the lab. These results support the Field Price Censoring of Harrison et al. (2004). This effect is strengthened by FP disclosure[14].

Elasticity is on average positive and inferior to one

[13] Differences between the estimation means and the relevant field prices are significant at the 5% level for the fair-trade bananas and at the 1% level for all the other products according to a t-test.

[14] Harrison et al. (2004), using the data of Hoffman et al. (1993), observe that $WTP_{stand}<FP$. This is not always true here, even on average. Subjects may bid above the actual FP (the frequency of $WTP_{stand}>FP$ reaches 52.4% for bananas). The position of WTP_{stand} relative to FP is dependent on the error of estimation their bidders have made. For instance, Hoffman et al. (1993)'s participants may have underestimated the field price of steaks whereas our participants have overestimated the field price of bananas.

OBSERVATION 3: $0 < Elast < 1$. On average, subjects revise their willingness to pay with the same sign of their estimation error. This means that the average WTP decreases (increases) with the FP disclosure when FP has generally been overestimated (underestimated). The magnitude of the WTP revision is smaller than the magnitude of the estimation error. Surprisingly, the elasticity does not happen to be larger when the FP is overestimated.

The great majority of subjects revise their willingness to pay in the same direction as their error of estimation: $\Delta revisWTP>0$ when $\Delta estimFP>0$ and $\Delta revisWTP<0$ when $\Delta estimFP<0$. At the individual level, 53.7% of the *WTPs* are revised either downward when the field price is overestimated or upward when the field price is underestimated. Nonetheless, *WTPs* are revised in the opposite direction for 20.8% of the revision decisions (Fisher exact p=0.0000). It is worth mentioning that for one quarter of the decisions, WTP_{stand} is equal to WTP_{FP}. The magnitude of WTP revisions is lower than the magnitude of error estimations: $\Delta revisWTP<\Delta estimFP$. Among the cases of underestimations, WTPs increase in average by €0.21 when the estimations of the FP were in average €0.84 below the correct estimation. As for the cases of overestimations, WTPs decrease in average by €0.33 when the estimations of the FP were €1.31 above the actual FP. As may be expected, the average WTP revision is null among the subjects with accurate estimations of the FP.

OBSERVATION 4: $\Delta revisWTP$ is monotonic with $\Delta estimFP$, and $\Delta revisWTP$ seems to be roughly linear to $\Delta estimFP$. In other words, the larger the error estimation, the greater the revision of the willingness to pay will be.

In Figure 2 we categorize decisions in deciles according to the error estimations. The first decile contains the decisions with the largest overestimations and the 10th decile contains the decisions with the largest underestimations. One can clearly see that $\Delta revisWTP$ increase monotonically: the larger the overestimation (underestimation), the larger the decrease (increase) of the *WTP* will be. Furthermore, the elasticity is relatively stable over the deciles – apart from the 4th one[15] – with the mean values (0.27, 0.12, 0.37, 0.30, 0.23, 0.26, 0.23, 0.26, 0.24). The median test cannot reject the null hypothesis that the *Elasts* of these deciles are identical ($\chi^2(8)=10.0959$, p=0.258)[16,17]. Similarly, when the field-price is overestimated, *Elast* is not significantly different from when *FP* is underestimated (Wilcoxon-Mann-Whitney, p=0.4808).

--- FIGURE 2 HERE---

A constant elasticity would mean a linear relationship between $\Delta revisWTP$ and $\Delta estimFP$. That is what we may look for in Table 2. The coefficient a, (i.e. *Elast*), is equal to 0.26 and is highly significant. The intercept is null. The scatter plot of the regression is displayed in Figure 3.

--- FIGURE 3 HERE ---

--- TABLE 3 HERE ---

OBSERVATION 5: Individually, the subjective surplus (*SS*) is not systematically larger or equal to the objective surplus (*OS*).

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[15] In the 4th decile, *Elast* = -2.58. This is essentially due to the very small denominator of *Elast* as this decile comprises all the estimation errors that are equal or very close to zero. This makes the elasticity highly volatile as even small changes in *WTP*s have a big impact on its value.

[16] If we include *Elast* of the 4th decile, the median test cannot reject the null hypothesis at the 5% level: $\chi^2(9)=14.8606$, p=0.095.

[17] The Wilcoxon-Mann-Whitney two-sample test corroborates the median test. We applied the 45 tests (including *Elast* of the fourth decile) and did not find any significant result at the 5% level.

We saw above in Section 1 (indicator 6) that $OS - SS = \Delta estimFP\ (1 - Elast)$. This means that $OS > SS$ when $\Delta estimFP>0$ (underestimation of the actual field-price) and $OS < SS$ when $\Delta estimFP<0$ (overestimation of the *FP*). This is largely confirmed by the data: for example, only 25.6% of the decisions have $SS > OS$ when *FP* is overestimated and only 11.3% have $SS < OS$ when *FP* is underestimated (*i.e.* $Elast>1$). The rationale is simple. With $0 < Elast < 1$, *WTP*'s adjustments do not entirely match the estimation errors. Consequently, surplus increases from Stage 1 (*SS*) to Stage 3 (*OS*) when $\Delta estimFP$ is positive and decreases when $\Delta estimFP$ is negative.

C. *Assessment of our four hypotheses*

H_1 Stable and independent WTP – FP has no impact on bids in only one quarter of all cases (see the first row of Table 4). Unsurprisingly, bidders are sensitive to the price disclosure. The idealistic situation where the laboratory is able to elicit private valuation independently from the field (H_1) is clearly not verified.

--- TABLE 4 HERE ---

H_2 Price Cap WTP – Although frictions confuse the clear predictions of Section 3, one can still state than bidders with high *PV* (small surplus) should be more elastic than bidders with low *PV* (large surplus). Table 5 shows medians of *Elast* depending on whether *SS* and *OS* are below or above 0.25[18]. Elasticity is significantly higher for bidders with $SS\leq0.25$ than for bidders with $SS>0.25$ (medians of 0.25 *vs.* 0.00, $p=0.0228$ with a Wilcoxon ranksum test). That is, bidders who are bidding up to what they perceive to be the field price change their bid when they realize that their field price expectations were wrong. They do so to a greater extent than bidders who bid below their expectation of *FP*. Similarly, elasticity is significantly higher for bidders with $OS\leq0.25$ than for bidders with $OS>0.25$ (0.33 *vs.* 0.00, $p=0.0001$): bidders with high *PV* are paying more attention to the opportunity to buy outside the lab. We also find significant difference when one combines low *SS* and *OS* compared to high *SS* and *OS*: 0.50 *vs.* 0.00, $p=0.0000$). If aggregate results validate H_2, the large dispersion in individual data (Table 4) calls for caution.

--- TABLE 5 HERE ---

H_3 Arbitrage WTP – Bidders do not systematically offer the field price or what they perceive to be the field price ($Elast\neq1$). Even when we take into account risk aversion and commitment costs, we do not find that *SS* is systematically larger than the objective surplus *OS*. Bidders do not seek higher surpluses in riskier situations (uncertainty about the true value of *FP*) or in situations with higher commitment costs. This would have been the case if subjects had considered the products only for their exchange value, with both doubts about their valuation of the *FP* and risk aversion. This is clearly not the case and we may therefore conclude that subjects consider the products offered in the lab at least partially for their use value.

H_4 Price Signal and unstable WTP – The field price acts here as a quality signal and therefore performs as an attractor to the *PV* ($Elast>0$). That would be the case in 53.7% of the experimental situations. One can imagine that the price has different degrees of influence, depending on the individual, and that there are individuals for whom prices of some products do not signal quality (25.5%). However, H_4 can hardly explain the 20.8% of situations where $Elast<0$. Furthermore, it is

[18] The threshold of 0.25 has been chosen arbitrarily in order to obtain samples that are comparable in size. Conclusions remain robust with a threshold of 0.

intuitive to assume that the price signal will signal more when the product is unknown than when it is common. This is not verified by our data as we cannot reject the null hypothesis of no difference of *Elast* between the hyssop jelly and the baguette (p=0.5934, Wilcoxon ranksum test).

5. DISCUSSION AND NORMATIVE IMPLICATIONS FOR THE LAB

Our results clearly show that FP influences WTP. First, bidders revise their bid when they learn about FP and, second, the extent of the revision depends on the distance between FP and what bidders expected it to be. (We show that the elasticity of the *WTP* revision according to the estimation error is significant and positive, and can be roughly approximate to one quarter of the error). The impact of FP on WTP affects the interpretation of the data when the experiment aims at eliciting private valuations. FP should not impact PV if bidders value a good only for their private consumption (H_1). Conversely, FP generates a common value if bidders carry out an arbitrage operation on the goods auctioned (H_3). While PVs are perfectly elicited in the lab in H_1, bids elicit common value only in H_3. Neither of the hypotheses have been verified in our data and the truth may well lie between these two extreme situations: PV is either unstable (H_4) or partially veiled behind the common value (H_2). Clear discrimination between the two proposals comes across market frictions: the extent of commitment costs and transaction costs blurs the actual position of PV relative to FP. The individual identification of these costs would help to validate H_2. If not, H_4 would be an alternative.

What are the normative implications of our results in terms of protocol design?

The easiest way to confine subjects to their private value (then H_1 or H_4), by limiting reference to common value (and then excluding H_2 and H_3), is to design a protocol where they are informed that, if they buy a product, it will be compulsory for them to consume it. This is strictly controlled when the protocol includes an 'in the lab' immediate and compulsory consumption of all products bought during a session. Unfortunately, while it is easy to implement such a procedure for some food products – a sandwich or a coffee –, it is obviously impossible to do so for many others. Note two other limits of such a design. First, having to consume it immediately in the lab may dramatically alter the use value of a product, even if its consumption is technically possible. One would greatly value a beer consumed at home in the evening after the session, but attach very little value to the same beer drunk quickly in the lab before leaving a session. Second, the price posted outside may act as such: "I can have the same beer within 10 minutes if I buy it at the market price from the corner shop". Immediate consumption is a (relatively) efficient way to control and avoid the elicitation of common value rather than private value in the lab.

When, for any reason, products cannot be consumed immediately in the lab, common value elicitation cannot be eliminated. As we have seen, a major source of poor control of common value lies outside the lab transaction costs. Therefore, if one cannot eliminate them, a proper design will try to control these costs. A good way to do so is to introduce an announced "field price posted market" in the lab at the end of sessions. To control and objectify the price cap in H_2, the protocol should simply guarantee that products bought during the auctions will be bought back on request by the experimentalist at the end of the session. When additionally the posted price is given to the subjects, then the price cap is totally under control: rational bids cannot exceed this single, obvious and common knowledge cap. If ignored, then a belief exploration of the subjective posted price is required, but control is then loosened by risk aversion.

In addition of the previously described end-of-session 'buy back posted market at field price', the experimentalist may implement a 'selling posted market at (the same) field price'. With such a design, we guarantee and control H_3 (arbitrage) without transaction costs, and without possible arbitration, as it needs price discrimination. In such a context, any product in the lab, whatever it is, is transformed into a (certain) financial product, therefore with no common value. If the field price is given to the subjects, all rational bids should be at this field price. (Note that this design is Vernon Smith redemption value equivalent.)

What sort of protocol would stress H_1 against H_2? We justify H_4 on the basis of the field price used by subjects as a signal of quality. Therefore, the more information is given to subjects about products, the less the signal is necessary. Suppose we sell Bordeaux wine in the lab on the sole basis of blind testing. A non-expert consumer would learn a lot about the quality of a wine if given its field price (that may currently vary from 5€ to 500€) even if he or she focused only on the private value. This price might significantly influence a reasonable consumer's WTP. If less information is supplied concerning the attributes of products delivered in the lab than those (believed) to be available in the field, uncontrolled commitment costs are rational and must be taken into account in interpreting the results. A particular attribute, generally neglected in the literature but that might have a significant effect because it obviously links field price and WTP, is production costs. We know that WTP for fruit and vegetables is often low because a significant proportion of consumers believe that the cost is null (or just equal to the picking costs). On the contrary, one may over-evaluate the cost of a night in a 5-star hotel because of the extreme luxury in the lobby, without taking into account the fact that this cost is divided by the 800 rooms of the palace, rented 365 days a year. With a (believed) competitive market, field prices strictly reflect cost and might influence WTP, especially for a single purchase (the consumer will then adjust his or her demand in relation to the quantities).

6. CONCLUSION

We show in this paper that field prices influence willingness to pay in the lab. We have good reasons to believe that field prices also influence willingness to pay in the field. Therefore, experiments aimed at measuring WTP in the lab should pay particular attention to this price variable for the sake of parallelism and realism.

Experimental economics builds its scientific reputation on its excellent ability to control economic environments and to isolate and therefore measure variables. Our first result is that field prices do indeed influence WTP in the lab, whether they are revealed or not (in the latter case the influence is through beliefs). We analyze the reasons for such an influence with two types of reason. The first type of reason results from common value considerations. A subject who has the opportunity to buy a good in the lab may question the price at which he can buy (or resell) the same product in the field. He may also question the amount of the transaction costs that such a deal would generate. We propose new designs: (i) to control (eliminate) the induced transaction costs, and (ii) to control (reveal) the field price. These new designs will help to separate subjects' private and common valuations. The second type of reason for linking WTP and field price results from private value considerations. Here price is taken as a quality (or cost) signal. This is rational when markets are competitive, individual preferences are close to average ones, and product attributes are partially ignored. In such a context, field prices may be rationally taken as a privately valuable attribute. We propose to take this rationale into account in the design of experiments. First, we increase control and parallelism by delivering the

field price to the subjects before auctioning a product. Second, when it is neither possible nor desirable to reveal field prices, the control is increased if subjects' field price beliefs are collected in parallel with their WTP.

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Tables and figures

Table 1: The experimental design: stages, procedures and variables

Stage	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Used Procedure	Vickrey Auction 4th Price	'The Price is Right' Prize-winning	Vickrey Auction 4th Price	Credible information given to the subjects	Vickrey Auction 4th Price
Variable observed or revealed (stage 4)	WTP_{stand} **Standard WTP**	FP_{estim} **Estimation of the field price**	WTP_{recon} **Reconsidered WTP**	**FP Actual field price disclosure**	WTP_{FP} **WTP revision knowing FP**

Table 2: Summary Statistics

		n	FP_{estim}	FP	WTP_{stand}	WTP_{FP}	ΔFP_{estim}	ΔWTP_{revis}
All	Smoothie	124	1.57 €	2.70 €	1.04 €	1.33 €	+1.13 €	+0.29 €
	Banana	124	1.59 €	0.99 €	1.03 €	0.71 €	-0.60 €	-0.31 €
	Fair-Trade Banana	124	2.24 €	1.99 €	1.46 €	1.31 €	-0.25 €	-0.15 €
	Hyssop Jelly	124	3.75 €	5.40 €	2.21 €	2.75 €	+1.65 €	+0.54 €
	Baguette	124	0.90 €	1.00 €	0.77 €	0.80 €	+0.10 €	+0.03 €
	Organic Bag	124	3.25 €	1.50 €	1.27 €	0.90 €	-1.75 €	-0.37 €
	Crisps	124	1.08 €	1.29 €	0.59 €	0.68 €	+0.21 €	+0.09 €
	Balanced Baguette	124	0.86 €	0.95 €	0.58 €	0.61 €	+0.09 €	+0.03 €
	All Products	992	1.90 €	1.98 €	1.12 €	1.14 €	+0.07 €	+0.02 €
Overestimation	Smoothie	10	3.24 €	2.70 €	1.84 €	1.97 €	-0.54 €	+ 0.13 €
	Banana	96	1.82 €	0.99 €	1.15 €	0.74 €	-0.83 €	-0.40 €
	Fair-Trade Banana	58	3.12 €	1.99 €	2.00 €	1.49 €	-1.13 €	-0.51 €
	Hyssop Jelly	16	7.10 €	5.40 €	4.02 €	4.27 €	-1.70 €	+0.25 €
	Baguette	22	1.27 €	1.00 €	1.16 €	1.08 €	-0.27 €	-0.08 €
	Organic Bag	82	4.44 €	1.50 €	1.57 €	1.00 €	-2.94 €	-0.57 €
	Crisps	28	1.87 €	1.29 €	0.78 €	0.76 €	-0.58 €	-0.02 €

	Balanced Baguette	30	1.18 €	0.95 €	0.82 €	0.79 €	-0.23 €	-0.04 €
	All Products	342	2.87 €	1.56 €	1.49 €	1.16 €	-1.31 €	-0.33 €
Good Estimation	Smoothie	1	2.70 €	2.70 €	1.07 €	1.05 €	0.00 €	-0.02 €
	Banana	5	0.99 €	0.99 €	0.60 €	0.56 €	0.00 €	-0.04 €
	Fair-Trade Banana	0	-	-	-	-	-	-
	Hyssop Jelly	2	5.40 €	5.40 €	4.73 €	4.95 €	0.00 €	+0.23 €
	Baguette	7	1.00 €	1.00 €	1.01 €	0.83 €	0.00 €	-0.19 €
	Organic Bag	8	1.50 €	1.50 €	0.50 €	0.64 €	0.00 €	+0.14 €
	Crisps	1	1.29 €	1.29 €	0.00 €	0.00 €	0.00 €	0.00 €
	Balanced Baguette	6	0.95 €	0.95 €	0.57 €	0.54 €	0.00 €	-0.03 €
	All Products	30	1.48 €	1.48 €	0.93 €	0.93 €	0.00 €	-0.01 €
Underestimation	Smoothie	113	1.41 €	2.70 €	0.97 €	1.27 €	+1.29 €	+0.31 €
	Banana	23	0.76 €	0.99 €	0.62 €	0.63 €	+0.23 €	+0.01 €
	Fair-Trade Banana	66	1.46 €	1.99 €	0.99 €	1.16 €	+0.53 €	+0.17 €
	Hyssop Jelly	106	3.21 €	5.40 €	1.89 €	2.49 €	+2.19 €	+0.59 €
	Baguette	95	0.81 €	1.00 €	0.67 €	0.74 €	+0.19 €	+0.07 €
	Organic Bag	34	0.80 €	1.50 €	0.72 €	0.72 €	+0.70 €	0.00 €
	Crisps	95	0.84 €	1.29 €	0.55 €	0.67 €	+0.45 €	+0.12 €
	Balanced Baguette	88	0.74 €	0.95 €	0.50 €	0.55 €	+0.21 €	+0.06 €
	All Products	620	1.39 €	2.23 €	0.92 €	1.14 €	+0.84 €	+0.21 €

Table 3: Linear approximation to Estimation Errors

ΔrevisWTP	Coefficient	Standard Error	t	p > |t|
ΔestimFP	0.2639***	0.0180	14.69	0.000
$(\Delta estimFP)^2$	-0.0063	0.0043	-1.47	0.142
$(\Delta estimFP)^3$	-0.0002	0.0002	-1.11	0.266
Intercept	0.0258	0.0266	0.97	0.332
R^2	0.1959			

Table 4: Frequency of situations according the value of *Elast*

Frequency	*Elast* < 0	*Elast* = 0	0 < *Elast* < 1	*Elast* = 1	*Elast* > 1
Overall	**200 (20.8%)**	**245 (25.5%)**	**340 (35.3%)**	**20 (2.1%)**	**157 (16.3%)**
SS≤0.25	109 (25%)	66 (15%)	166 (38%)	17 (4%)	83 (19%)
SS>0.25	91 (17%)	179 (34%)	174 (33%)	3 (1%)	74 (14%)
OS≤0.25	80 (23%)	50 (14%)	130 (37%)	17 (5%)	78 (22%)
OS>0.25	120 (20%)	195 (32%)	210 (35%)	3 (0%)	79 (13%)
SS≤0.25 & *OS*>0.25	67 (34%)	26 (13%)	78 (40%)	0 (0%)	26 (13%)
SS>0.25 & *OS*≤0.25	38 (34%)	10 (9%)	42 (38%)	0 (0%)	21 (19%)
SS,*OS*≤0.25	42 (17%)	40 (16%)	88 (36%)	17 (7%)	57 (23%)
SS,*OS*>0.25	53 (41%)	169 (41%)	132 (32%)	3 (1%)	53 (13%)

Table 5: Median of *Elast* according the value of *SS* and *OS*

Median of *Elast* (number of observations)	*OS*≤0.25	*OS*>0.25	All *OS*
SS≤0.25	0.50 (244)	0.09 (197)	0.25 (441)
SS>0.25	0.16 (111)	0.00 (410)	0.00 (521)
All *SS*	0.33 (355)	0.00 (607)	0.11 (962)

Figure 1: Means of WTP_{stand}, FP_{estim}, WTP_{FP} and FP by products.

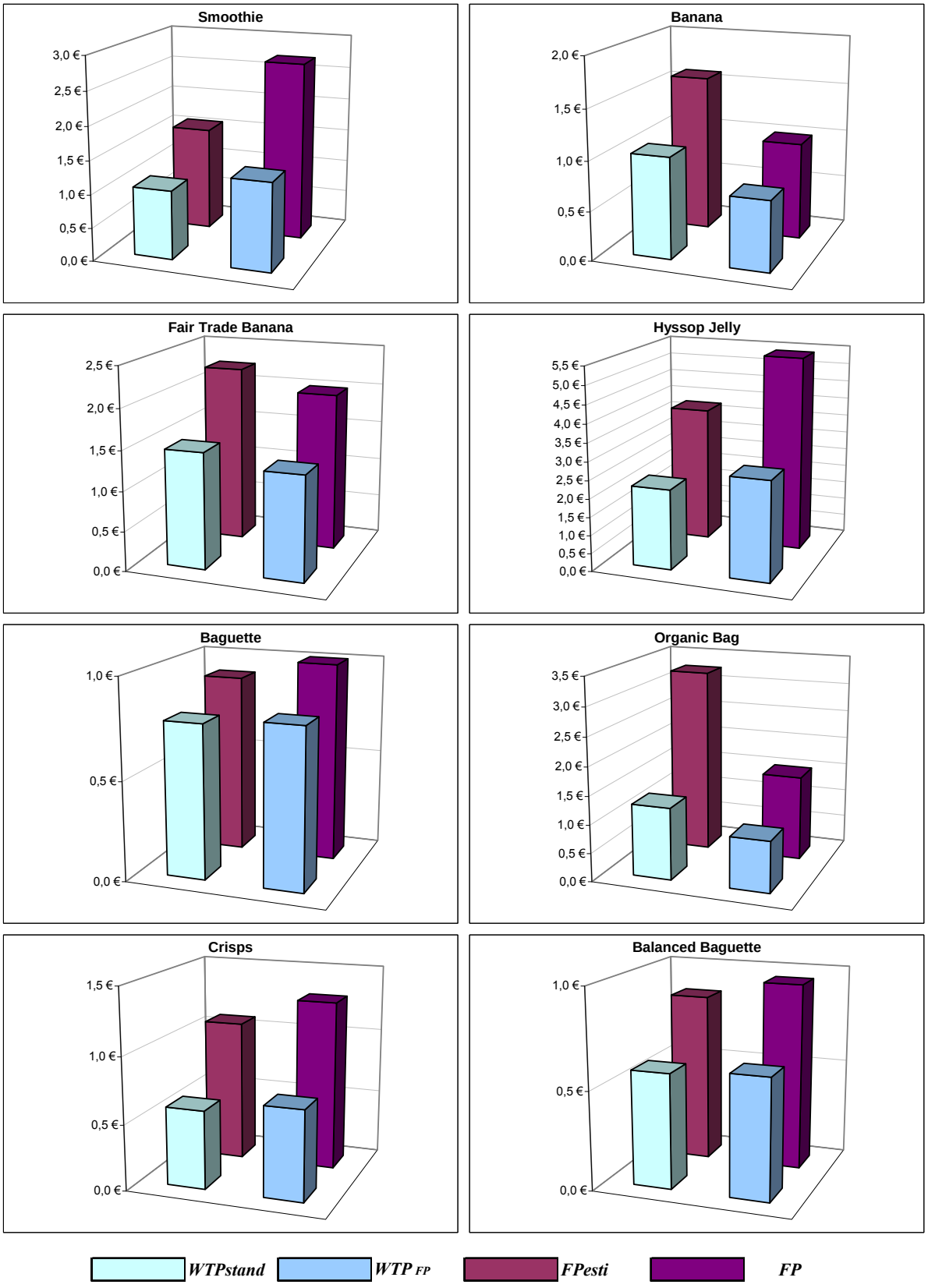


Figure 2: Means of *ΔestimFP*, *ΔrevisWTP* and *Elast* per deciles.

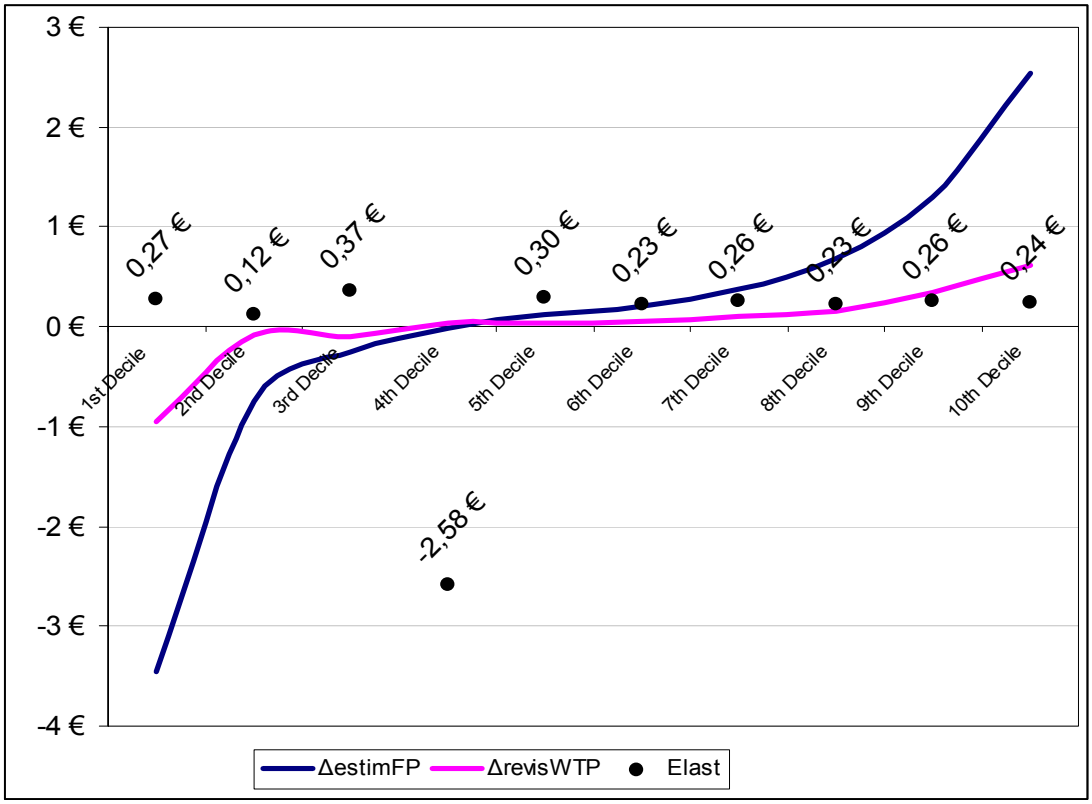
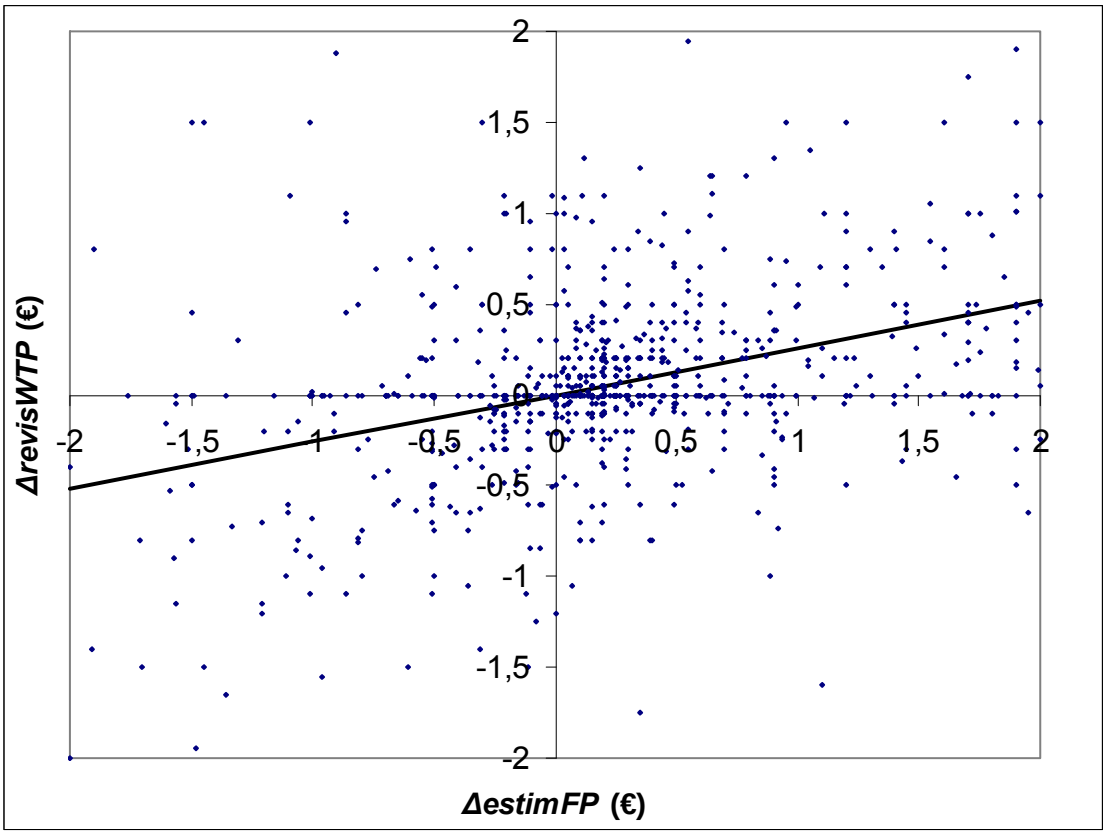


Figure 3: Scatter plot of *ΔrevisWTP* according to *ΔestimFP* and linear regression.


2
1,5
1
0,5
0
-0,5
-1
-1,5
-2
-2
-1,5
-1
-0,5
0
0,5
1
1,5
2
ΔrevisWTP (€)
ΔestimFP (€)

Do Price-Tags Influence Consumers' Willingness to Pay?

On External Validity of Using Auctions for Measuring Value[1]

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Abstract

This paper considers the external validity of the growing set of literature that uses laboratory auctions to reveal consumers' willingness to pay for consumer goods, when the concerned goods are sold in retailing shops through posted price procedures. Here, the quality of the parallel between the field and the lab crucially depends on whether being informed of the actual field price influences a consumer's willingness to pay for a good or not. We show that the elasticity of the WTP revision according to the field price estimation error is significant, positive, and can be roughly approximate to one quarter of the error. We then discuss the normative implications of these results for future experiments aimed at eliciting private valuations through auctions.

Key words: Experimental Economics; Willingness to pay; Auction; Posted Price; Value Elicitation; Consumer Behavior.

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1. INTRODUCTION

Since the seminal paper of Hoffman et al. (1993), auction selling procedures in laboratories have appeared as an appealing and challenging method for eliciting consumer preferences in applied studies. These new experimental methods tend to complement or even to substitute traditional surveys and questionnaires used for decades in marketing studies. They have been employed extensively for various purposes in applied economics (for a detailed survey, see Lusk and Shogren, 2007). Domains of application include product marketing (demand-led conception, packaging, pricing, etc.) and public regulation (labelling control, innovation acceptability, etc.). Numerous applications are found in the food industry, due to the complexity of the products, their attributes and labelling. Previous studies have covered desirable characteristics – e.g. food safety (e.g. Buzby et al., 1998, Hayes et al., 1995) and animal welfare (Lusk and Norwood, 2008) –, less desirable ones – e.g. GMOs (Lusk et al., 2001, Noussair et al., 2004), hormones (Fox, 1995) and insecticides (Roosen et al., 1998) and, lastly, intrinsic or extrinsic characteristics – from countless studies on taste to fair-trade (Rousu and Corrigan, 2008) –. The products or characteristic concerned might be available on the actual field consumer market (Wertenbroch and Skiera, 2002) or not (List, 2003).

The large success of these experimental methods in applied research stems primarily from the fact that participants have real incentives for revealing the true value that they attribute to a product, contrary to hypothetical survey settings (among others, see Cummings et al., 1995; List and Shogren, 1998, and Neill et al., 1994). Another advantage of using experimental methods is that their results are expressed in money units, more useful for most users than hedonic marks or mere product ranking. In order to support this experimental method as a valuable tool in market research, the reliability of its estimates must be assessed, especially when they produce out-of-the-lab predictions.

Preferences measured in the laboratory are defined in monetary terms by *values*, a value being the maximum amount that each bidder (buyer) is willing to pay. Value is built by the buyer-consumer, and therefore known by her. Conversely, this value is ignored by the seller (here the experimentalist). The use of incentive-compatible auctions (Vickrey, 1961) or equivalent selling procedures such as BDM (Becker et al., 1964) for eliciting WTP (*i.e.* bid=WTP) has been validated scientifically in the best literature, both theoretically (Vickrey, 1961) and empirically, thanks to the 'induced-value' methodology introduced by Vernon Smith (1976). Reassured by these results based on *redemption values* of lab products, we can now legitimately use these procedures to elicit *homegrown values* for real life products, with the hypothesis: bid=WTP=home-grown value[2]. Subsequent literature specifies precise technical conditions in the lab for this hypothesis to be sustainable: proper incentives, adequate learning procedures and explanations (List and Shogren, 1998), private information (to avoid affiliation, Corrigan and Rousu, 2006), *n* products for sale depending on the number of participants with Vickrey, etc.[3] In the present article we assume that this hypothesis holds, i.e. that bid=WTP, and focus on the content of this WTP.

[2] Note that the expression 'homegrown value' qualifies the product, and not any behavior or preference.
[3] Nevertheless, theoretically equivalent procedures had been shown to have different degrees of efficiency in reveling redemption values in the lab. For instance, Noussair et al. (2004b) even observe significant differences between *WTP* in BDM procedures and *WTP* in Vickrey auctions.

In this article we question the parallel between a revealed 'in-the-lab' WTP and an ignored 'out-of-the-lab' WTP. Although Brookshire et al. (1987) could not find any significant difference between the 'real world' and the lab for privately consumed commodities, various hindrances were identified as limiting the quality of the parallel between the lab and the field, *i.e.* the external validity of the method. In particular, we concentrate here on one (important) dimension of this problem: the price effect. In the field, at least in developed countries, most consumer goods are sold with *posted price procedures*. In the laboratory, we use auctions or BDM procedures. The external validity of such laboratory experiments may be limited, for two related reasons. First, the in- and out-of-the-lab selling procedures involve different decision processes ('take it or leave it' in the field, and 'make a bid' in the lab). By comparing posted prices and bilateral bargaining market institutions, Cason et al. (2003) show that the choice of the selling procedure influences outcomes. Second, there is another difference: the presence (in the field) or absence (in the lab) of a visible *Field Price* (FP) when taking a buying decision. The fact of the buyer knowing or ignoring the FP will pose a problem of parallelism if (and only if) WTP is dependent on the FP. In this case, the WTP in the lab (WTP_{lab}) may differ from WTP in the field (WTP_{field}), and a bias may be introduced by the lab procedure[4]. Note that if WTP depends on the field price, two distinct issues come up. One is parallelism. The other, of a much more general purpose, is the issue of the stability of WTP_{field} as it may depend on field price. If it does, various field prices (due to price discrimination, promotion, taxes or subsidies), may lead to various WTP_{field}. In developing countries, where prices are often defined with bilateral negotiation, the issue is even bigger. In this paper we concentrate on the question of parallelism, but we see that we cannot answer this question properly without keeping an eye on the issue of WTP in the field.

The question of the (in)dependence of WTP from FP has already been addressed in the literature. Cherry et al. (2004) show with induced value that outsides options shave bids. Harrison et al. (2004) revisit the data of Hoffman et al. (1993) by estimating a random effects Tobit model with lower and upper limits. They reach the conclusion that ignoring the censoring of elicited values due to extra-laboratory prices can significantly alter the results. Using a choice experiment, Carlsson et al. (2007) show that preferences are affected by the inclusion of a price. Recently, Drichoutis et al. (2008) used the procedure of Harrison et al. (2007) to show that subjects provided with reference price information bid on average €0.21 more for a sandwich than those who are not. To explain such results, Harrison et al. (2004) stress the importance of belief and knowledge of both price-tags and of the product characteristics. But the aforementioned experimental procedures do not include means to measure such beliefs.

We propose a new protocol including three new variables in a well-controlled 'within' procedure. For each 128 subjects and for each of the 8 products for sale, we elicit the *field price estimation* (FP_{estim}), parallel with the WTP (WTP_{stand}). We then deliver – in a highly credible way – the actual FP of the product, and then re-measure WTP given this price (WTP_{FP}). With such a protocol we are in a controlled environment for the first time, able to observe the actual impact of the price on WTP, knowing the actual information given to the subject when he discovers the field price, i.e. the distance between initial belief and the actual price. This 'before-after' procedure, using only auctions, appears to be most accurate one for our purpose. Posted-price vs. auction would come up against the poor information revealed by posted-price procedures in the lab. This is precisely why we opt for auctions! Of course, the potential influence, on WTP, of being informed of the FP depends on how much the

[4] In their experiment, Issanchou et al. (2008) present the participant of a choice experiment at a baker with several price sets for different kinds of breads. WTP obtained are then compared to WTP elicited in the lab through BDM. While such protocols afford much insight on the effect that the selling procedure itself may have on WTP, the use of fictitious prices eliminates the effect of the price information on WTP.

consumer actually *learns* from the FP disclosure. A subject who accurately approximated a FP would not change much when she disclosed that she was right (neglecting risk aversion). In our protocol, we are able to observe (a) WTP with and without the FP information and (b) what the bidder actually learns from the FP disclosure (the magnitude of her over- or underestimation).

The ideal condition of validity would be independence and then the stability of the WTP, whether FP is known or not, and under- or overestimated or not. If, on the contrary, the WTP for a good is largely influenced by FP disclosure, the use of auction procedures in the lab would appear to exclude an important field variable. Theoretically, we propose to confront our results with four alternative hypotheses: H_1. *Stable WTP* (WTP is *independent* from price). H_2. *Price capped WTP* (WTP is stable up to a cap given by the price and transaction costs). H_3. *Arbitrage WTP* (WTP is determined by 'out-of-the-lab' reselling and buying prices). H_4. *Price signalled WTP* (WTP is influenced by the price, used as a signal for quality). Unlike strictly controlled laboratory redemption-value products, we know, since Adam Smith[5], that home-grown values for not purely financial products have a double face value: use value and exchange value. This double face of value may exist in and out of the lab. In his reference textbook on auction theory, Krishna (2010) distinguishes between cases when the value of the auctioned good is derived from its sole consumption or use, and situations where the value of the auctioned good is based on how much it will fetch in the resale market. In the first context, values are heterogeneous among subjects and are independent on others' behaviours. Bids then reflect strictly *private values*. In the second set of situations, values are homogeneous among subjects and bids reflect *common values* or *interdependent values* (see Krishna, 2010, for developments). A typical case of value ambivalence might be a vintage *bottle of wine* that the owner may either drink or resell (e.g. on E-Bay). Questioning your own WTP for such a bottle, you would consider both alternatives. H_1 and H_3 stand for these two extreme situations. In H_1, a subject may regard a good only for her personal or private consumption, namely for its *use value*. This would be for example if the buyer were forced to drink the bottle of wine, in or out of the lab. A current assumption in economics textbooks is that individuals have well-defined preferences. In this case, the elicited preferences for individual attributes should be independent of the price, revealed or not. FP has no effect on WTP. However, FP may still be useful and influence the subject's WTP for private valuation, as it may be used as a signal of the quality of the good (H_4). Here, we may posit that the more ignorant the subject is concerning the quality of the good, and simultaneously the more confident she is about the efficiency of the market and the similitude of her taste compared to other buyers' tastes, the more her WTP is likely to be influenced by the FP disclosure.[6] However, in such situations the laboratory reveals private values. In H_3, the subject regards a good for sale in the lab only as an *exchange value*. For such a subject, the FP therefore entirely determines the value[7]. FP defines the common value and covers up private values. H_2 corresponds to an intermediate situation. Subjects may regard the good auctioned as private value but would never bid more in the laboratory than the price they know or suppose they could buy the

[5] "The word value, it is to be observed, has two different meanings, and sometimes expresses the utility of some particular object, and sometimes the power of purchasing other goods which the possession of that object conveys. The one may be called 'value in use;' the other, 'value in exchange.' The things which have the greatest value in use have frequently little or no value in exchange; and on the contrary, those which have the greatest value in exchange have frequently little or no value in use. Nothing is more useful than water: but it will purchase scarce anything; scarce anything can be had in exchange for it. A diamond, on the contrary, has scarce any value in use; but a very great quantity of other goods may frequently be had in exchange for it." (*Wealth of Nations* Book 1, chapter IV). In *Capital I,* K. Marx, following A. Smith, develops the analysis of the relation between exchange value and use value.

[6] A step further in the same direction would be to agree that, for certain consumers at least, the FP could be a valuable attribute as such. For such consumers, adjusting their WTP to the FP may be regarded as automatic.

[7] WTP=FP when one overlooks transaction costs, risk aversion and commitment costs (see Zhao and Kling, 2004, for a definition of commitment costs)

same product for in the field (here ignoring transaction costs). A subject will therefore not buy a good in the laboratory at a price superior to the objective or subjective field price. Harrison et al. (2004) refer to this as *field-price censoring*. In this case, the laboratory only partially reveals private values.

Our results show that H_1 and H_3 are rejected. We also show that H_2 alone does not exhaust the data. H_4 appears as a good candidate for explaining the residue. In our discussion, we support the idea that the lab reveals WTP close to field WTP, but that in and out of the lab WTPs are under posted price influence. We then conclude that, in experimental design aimed at measuring WTP for marketed products, FP might be introduced every time it is available and not a treatment variable. We also propose a systematic exploration of FP estimation when no actual field price is available, and/or pricing is at stake. Of course, one may reasonably accept the fact that, for a typical consumer, an offered good in the lab has both an exchange value and a use value, and therefore that these two lines of reasoning apply at the same time, more or less depending on the type of good supplied.

Section (2) of this paper now presents our experimental design in more detail, with the subjects and indicators that will serve our analysis. Sections 3 and 4 then present the hypothesis and the results. After a brief discussion in Section 5, Section 6 concludes.

2. EXPERIMENTAL DESIGN

Our experimental design is based on three main principles:

(i) *WTPs are elicited through auctions.* Although consumers scarcely purchase goods through auctions, such procedures remain the most relevant for measuring individual WTP in labs. In the lab posted-price sales are realistic but provide poor results, as consumers choose only yes or no for a given good at a given price. Therefore, the researcher may multiply the number of sales by implementing several artificial prices. By doing so, buyers lose the information conveyed by an actual field price.

(ii) *The effect of FP on WTPs is examined by observing bids before and after the introduction of price tags.* The second idea is that the main difference between posted-price sales and auctions is the knowledge of the price tag. Whereas price tags may operate as a benchmark in posted-price sales, buyers may be unaware of them in auctions. To be successful, one must be credible when providing the price tags.

(iii) *Beliefs relative to out-of-the-lab price tags are examined.* The third idea is that the observation of the WTP revisions is not enough. These beliefs may have an impact on the WTP revision when the price tag is introduced. In other words, consumers may react differently to the price introduction, whether they under- or overestimate it. The price disclosure may come as a bad or a good surprise and thus impact preferences in positively or negatively. The magnitude of this impact could moreover be expected to be correlated with the distance (positive or negative) between the field price and field price estimation.

A. Procedure and variables

Table 1 below describes the sequence of the experiment.

---TABLE 1 HERE---

Each stage 1, 3 and 5 consists of 8 simultaneous 4th price Vickrey auctions. 8 different products are being sold simultaneously on these auctions. In each auction at each stage, 3 items of the same product are being sold to the 3 highest bidders. The price is defined by the 4th highest bid. During each of these stages 1, 3 and 5, the task of each subject is to place 8 bids for the 8 different products for sale (detailed below).

Not every auction ends up with an effective sale. In order to avoid endowment and substitution effects, each subject knows that he/she will not end up purchasing more than two items[8]. Bids are anonymous and computerized[9]. No information on bids and prices was given to the subjects during the experiment.

Before Stage 1, subjects participated in two practice auctions. One melon[10] and 3 soda cans were sold respectively at the 2nd and 4th bid in a Vickrey auction. At the end of each learning auction, the researchers discussed the winner(s) and the auction price with the audience. The winners then had to pay for the product they had won. This learning stage ensured a sound understanding of the sale procedure and of the non-hypothetical nature of the situation.

The Stage 1 auction repeated the usual standard procedure used in experiments aimed at revealing WTP for real products. We call this first measure the *standard willingness to pay* (WTP_{stand}). During Stage 2, the participants were asked to estimate the field price (FP_{estim}). For each of the 8 products, they were encouraged to take this task seriously: the subject with the best estimation received €3. The second and the third best estimators received respectively €1 and €0.5. Stage 3 was technical. It was designed to check the stability of individual preferences for a product. In practical terms, it was a strict repetition of Stage 1. Without any additional information, subjects could reconsider their Stage 1 bids after guessing the *FP* (we call the bids collected at Stage 3 the WTP reconsidered or WTP_{recon}). In Stage 4, the actual field prices (*FP*) of the 8 products were disclosed to the subjects. In order to make this information on *FP* as credible as possible, we presented photographs of the products *in situ*, *i.e.* on shelves with clearly visible price tags. The place and date where the 8 products where originally bought by the researcher were also specified. Finally, in Stage 5, subjects made a last series of 8 bids for the 8 products, being informed of the *FP*. We call the data collected at this stage WTP revision knowing *FP*, or WTP_{FP}. At the end of the experiment, one subject was asked to randomly select the auction stage (1, 3 or 5) that would be made effective for the purchases.

B. Indicators

It is useful to define a series of indicators based on our collected data.

1. *WTP revision induced by the FP disclosure.* $\boldsymbol{\Delta WTP_{revis}} = WTP_{FP} - WTP_{stand}$ ()

ΔWTP_{revis} measures the extent to which a subject revises her WTP for a given product once the researcher has disclosed the actual field price of the product in shops. It is the difference between a subject's bid at Stage 5 and the same subject's bid at Stage 1 for the same product. Note that a similar

[8] When subjects bought more than two products, a draw determined which two products they actually purchased.
[9] Pen and paper were available for those participants (especially the older ones) who were not at ease with computers. Once their bid was made, a researcher assisted them in recording it on the computer.
[10] The melon auction also allowed subjects to become familiar with proposals of prices per kg.

indicator is ΔWTP_{recon}. It measures the extent to which a subject revises her WTP for a given product once she has thought about the field price in order to propose estimation at Stage 2. Recall that no additional information is given between Stages 2 and 3.

2. *Estimation error of the FP.* $\boldsymbol{\Delta FP_{estim}} = FP - FP_{estim}$

ΔFP_{estim} measures a subject's error in the estimation of the field price of a given product. Practically, ΔFP_{estim} is the difference between the estimation made by a subject at Stage 2 and the actual price given by the researcher (for the same product) at Stage 4. Note that, with this notation, $\Delta FP_{estim}>0$ means an underestimation of the actual field-price and $\Delta FP_{estim}<0$ means an overestimation of the actual field-price.

3. *Elasticity of the WTP revision according to the estimation error.* $\boldsymbol{Elast} = \Delta WTP_{revis} / \Delta FP_{estim}$

Elast is the ratio of the two previous indicators. It measures the elasticity of a subject's revision of her WTP, induced by the FP disclosure and based on her error of estimation of the FP for the same product[11]. This ratio constitutes the crucial indicator for the purpose of this paper.

4. *Minimum Subjective Surplus.* $\boldsymbol{SS} = FP_{estim} - WTP_{stand}$

SS measures the difference between WTP_{stand} and FP_{estim} for a given product by a given subject. If the product is considered for its exchange value, if we neglect both transaction costs and risk aversion, and if we posit that the subject behaves rationally in the auction, then *SS* might be equal to zero, as the subject might bid the exact value of the product.

5. *Minimum Objective Surplus.* $\boldsymbol{OS} = FP - WTP_{rev/FP}$

OS is the objective version of *SS*, *i.e.* it is the same indicator, considering the objective actual *FP* instead of its estimation by the subject. If we consider the product for its exchange value, we anticipate $OS<SS$ when the subject is risk averse (which is the standard hypothesis for subjects in the lab), as the *FP* is obvious when disclosed and not subject to error as FP_{estim} is. When the product is considered (only) for its use value, the *FP* disclosure should not have any impact on the WTP if the subject is fully informed of the characteristics of the product. In other words, a ΔWTP_{revis} different from zero would mean, when considering a product for its use value, that the subject considered the price as a sign of the product's quality. In such a case, $OS<SS$ is not obvious.

Finally, it is useful to note that the difference between *OS* and *SS* is directly related to the error of estimation of the field price and the elasticity of the *WTP* revision according to the estimation error. For instance, an underestimation of FP associated with an elasticity inferior to one generates $OS > SS$.

C. Subjects and products

The experiments took place in the GAEL experimental economics laboratory at the INP of Grenoble. There were 8 sessions, each with 14 to 16 participants for a total of 124 subjects. The recruitment was

[11] Following an extensive debate, we opt for an indicator of absolute elasticity and not for an indicator of relative elasticity ($\frac{\Delta WTP_{rev} / WTP_{stand}}{\Delta FP_{estim} / FP_{estim}}$). The absolute measure has the advantage of not excluding subjects with $WTP_{stand}=0$ and is coherent with our measure of *OS*–*SS* (Point 6).

conducted in Grenoble and its suburbs by professionals in telemarketing and under the supervision of the GAEL laboratory. The sample was constructed to be representative: 53 males and 71 females aged from 16 to 83 (with an average age of 45). The subjects were remunerated a fixed amount of €20. According to their experimental decisions, subjects could earn additional money in Stage 2 and buy a maximum of 2 products during the auction stages. The amount paid for the product(s) was then deducted from the experimental gain.

The products on sale are listed in Table 2. We chose these products with great care as we knew that the impact of the price-tag knowledge could vary not only in magnitude but also in sign (according to a subject's over- or underestimation of the *FP*). The authors considered that the product choice of previous studies (Brookshire et al., 1987, Drichoutis et al., 2008, etc.) had been a weakness. In this experiment the products were therefore chosen mainly for their heterogeneity and their relatively low market value. These items differed in several respects: some were common consumer goods and therefore had a well-known market price (bread, crisps, bananas); some were relatively new or rare (smoothies, hyssop jelly, cotton bags); finally, some had specific characteristics (fair-trade, organic, and nutritional). We expected some products to be widely overestimated (bag) or underestimated (jelly). This heterogeneity is important as we did not want our experimental observations to be specific to a certain type of product.

Overall, the experiment that reported here has several advantages compared with previous studies on the same topic, as it includes: i) the elicitation of the field price estimation by the subjects: the examination of the subjects' belief as to the field price is essential when examining its effect on WTP; ii) a within procedure: WTP without the field price information and WTP with the field price are elicited with the same subjects, which prevents variance due to sampling; iii) a relevant set of products: robust results need products with heterogeneous characteristics as price information may have a different impact on different products; and finally iv) non-student subjects: participants are real consumers used to shopping.

3. HYPOTHESIS

We propose to test the following four hypotheses. We first consider a frictionless market and then reflect on the possible effects of friction.

H_1. Stable and independent (from the Field Price) WTP

Private valuation (PV), known by the bidder, is accurately revealed by WTP in the lab. This is true whether the bidder knows or the actual FP or not.

The bidder knows what value he attaches to the object by the time the bidding starts. (The bidder implicitly ignores others' values, though knowledge of others' valuation would not affect how much the object was worth for him, the bidder). This hypothesis is plausible when the value of the object to a bidder is derived from its consumption or use alone, i.e. from how much utility he would derive from possessing it. The WTP is not influenced by the outside *FP*. The disclosure of the latter therefore has no impact and $WTP_{stand} = WTP_{FP}$. Thus,

$$\text{Elast} = 0 \qquad (1)$$

H_2. Price Cap WTP

Private valuation is accurately revealed by WTP in the lab if (and only if) PV stands below the posted price (actual or estimated).

The laboratory is not impervious to the outside world and even though the bidder values the object for its use value, she also considers the opportunity cost of buying it in the laboratory compared to buying it later in the field. She will not pay more than the field price (Harrison et al. (2004) refer to this as *field-price censoring*). We thus have $WTP_{stand} = min\{\text{PV}, FP_{estim}\}$ and $WTP_{FP} = min\{\text{PV}, FP\}$. Four cases emerge:

$\text{PV} \leq FP_{estim}, FP$	$FP_{estim}, FP \leq \text{PV}$	$FP_{estim} \leq \text{PV} \leq FP$	$FP \leq \text{PV} \leq FP_{estim}$
$Elast = 0$	$Elast = 1$	$0 < Elast < 1$	$0 < Elast < 1$

(2)

H_3. Arbitrage WTP

WTP does not reveal private valuation because it is hidden by common values when the interdependence stems from resale considerations.

If a bidder assigns value on the basis of how much the object would fetch in the resale market, then the private valuation vanishes behind *interdependent values* (Krishna, 2010). If the outside-the-lab market for the object is pure and without transaction costs, then the situation may be described as one of *pure common value*, because even if the value is ignored by bidders by the time of the auction, it is the same for all bidders. Therefore, each bidder offers the field price or what she thinks the field price is. Consequently,

$$Elast = 1 \qquad (3)$$

H_4. Price signal and unstable WTP

Private valuation is revealed but, as it is only estimated by the bidder, price revelation may be used as a signal for quality expertise and lead to a revision of the valuation.

The Field Price signals quality. When bidders make an error in the estimation of *FP*, they revise their PV towards the *FP*. In the case of underestimation (respectively overestimation), bidders have underestimated (overestimated) the quality of the good and increase (decrease) their PV. We have $WTP = PV = f(FP)$ with $f' \geq 0$. Thus,

$$0 \leq Elast \qquad (4)$$

In a more realistic setting, the purchase in the laboratory, compared to the purchase outside the laboratory, generates hidden costs[12]. We have identified the following:

Transaction Costs – Buying within the laboratory may generate transaction costs. They may be either positive or negative. For instance, it may save the buyer a trip to the closest shop (gain of time and money) if she was in any case going to buy the good auctioned sooner or later. On the other hand, the

[12] The same costs may exist for the purchase of goods within a particular shop compared to the other shops.

bidder may not feel disposed to purchase at the precise moment of the experiment (*e.g.* she may not be willing to be loaded with goods as she has planned to go to the movies).

Risk Premium and Commitment Costs – The ignorance of FP may decrease bids. First, risk-adverse bidders may seek a risk premium when they are uncertain about the FP. Such bidders may want to avoid bidding above *FP* and lower their bids accordingly. Second, bidders may seek compensation for the renunciation of future learning opportunities as buying within the laboratory prevents the buyer from delaying her purchase decision until more information is gathered (about the market context). Zhao and Kling (2001) refer to this as commitment costs.

Market frictions have no impact on the prediction of H_1 and H_4 *per se* as we have assumed that bidders are not looking for substitutes out of the lab (*i.e.* no opportunity costs). Once we allow links between the lab and the field, frictions complicate the predictions. In H_2 for instance, transaction cost may shift the price cap either upwards or backwards (depending on its sign). Therefore, it turns out to be adventurous to determine it without additional assumptions, whether the private values are above or below the price cap. In the perspective of arbitrage (H_3), bidders may strive to ensure a bigger surplus when there are uncertainties about *FP*: risk-adverse bidders are willing to make sure that their bids lie comfortably below *FP* and bidders may seek compensation for the commitment. Both effects generate $SS > OS$.

4. RESULTS

A. Overview

Figure 1 displays an overview of our results. Each graph is dedicated to one of the eight products. The two columns at the rear represent (left) the average field price estimation (FP_{esti}) and (right) the actual field price (*FP*). The columns in the front represent the average *WTP* before (left) and after (right) the announcement of the field price (respectively WTP_{stand} and WTP_{FP}). Therefore, on each of these figures, the gap between the two rear columns measures the mean estimation error of the *FP* ($\Delta estimFP$), and the gap between the two front columns measures the mean revision of the willingness to pay ($\Delta revisWTP$). Finally, subjective surplus *SS* (respectively the objective surplus) can be viewed by looking at the difference between the two left columns (or the two right columns).

INSERT FIGURE 1

INSERT TABLE 2

Table 2 sums up the means of our different indicators per product by differentiating situations where bidders underestimate, overestimate or accurately estimate *FP*.

We also check the impact of the 'Price is Right' procedure on the *WTP*s. As there is no additional external information given to subjects between Stage 1 and Stage 3, no economics standard hypothesis would support a change in WTP at this stage. However, the issue of price might have a psychological effect on a subject and modify his or her WTP. Therefore, apart from the documented effect on WTP of a mere repetition of an auction, a difference between WTP_{stand} and WTP_{recon} might be due to a saliency effect of the field price issue. WTP_{recon} is on average slightly superior to WTP_{stand} (€1.17 vs

€1.12) although the hyssop jelly is the only product that has a significant difference between WTP_{Stand} and WTP_{recon} (Wicoxon matched-pair test, p=0.0112; all the other products have p>0.05).

B. *Values and Prices*

Subjects do not properly estimate the field prices

OBSERVATION 1: $\Delta estimFP \neq 0$. Subjects do not properly estimate the field prices. The direction (whether subjects underestimate or overestimate the field price) and the extent of the estimation errors depend on the nature of the product.

When applying a t-test to the 8 products, one cannot reject the null hypothesis that $\Delta estimFP$ is different from zero. Nevertheless, the rejection of this hypothesis only means that the subjects' errors on the 8 products are centred on zero. In fact, only 3% of the individual estimations were strictly correct and 17% were correct within a 10% range. Looking at them product by product, overestimations do not compensate for underestimations (or inversely). While prices for both bananas and organic bags are underestimated on average, prices for smoothies, jellies, crisps and both types of baguette bread are overestimated[13]. The magnitude of errors is also related to the nature of the product. New or unfamiliar products like smoothies, hyssop jelly or organic bags exhibit larger estimation errors (respectively -41.8%, -30.5% and +116.7%) than more commonly-used products like baguette bread (-0.6%), 'balanced' baguettes (-9.9%) and packets of crisps (-16.6%). Results for both types of banana are more surprising (+60.8% for the 'normal' bananas and +22.3% for the fair-trade bananas).

Subjects want a surplus

OBSERVATION 2: SS>0 and OS>0. Subjects do not confuse values and prices. On the basis of their FP estimation or FP knowledge, they are looking for a good deal in the lab.

For every product of our set, WTP_{stand} is significantly lower than FP_{estim} (Wilcoxon signed rank test, p=0.0000). On average, subjects are willing to pay €0.79 less than their field price estimation. At the individual level, 77% of the decisions display lower WTP_{stand} than FP_{estim} and 9.3% exhibit the same amount. We find similar results once the actual field price is announced: WTP_{FP} is significantly lower than the FP (p=0.0000), with an average difference of €0.84. The proportion of $WTP_{FP}>FP$ is significantly lower than the proportion of $WTP_{stand}>FP_{estim}$ (Fisher Exact, p=0.0189). Without price information, bidders are willing to pay less than what they think the price is. Once the field price is known, subjects are still willing to pay less than the price. Subjects are (objective or subjective) surplus seekers: they are not willing to pay as much for a product in the lab as they would have to pay outside the lab. These results support the Field Price Censoring of Harrison et al. (2004). This effect is strengthened by FP disclosure[14].

Elasticity is on average positive and inferior to one

[13] Differences between the estimation means and the relevant field prices are significant at the 5% level for the fair-trade bananas and at the 1% level for all the other products according to a t-test.

[14] Harrison et al. (2004), using the data of Hoffman et al. (1993), observe that $WTP_{stand}<FP$. This is not always true here, even on average. Subjects may bid above the actual FP (the frequency of $WTP_{stand}>FP$ reaches 52.4% for bananas). The position of WTP_{stand} relative to FP is dependent on the error of estimation their bidders have made. For instance, Hoffman et al. (1993)'s participants may have underestimated the field price of steaks whereas our participants have overestimated the field price of bananas.

OBSERVATION 3: $0 < Elast < 1$. On average, subjects revise their willingness to pay with the same sign of their estimation error. This means that the average WTP decreases (increases) with the FP disclosure when FP has generally been overestimated (underestimated). The magnitude of the WTP revision is smaller than the magnitude of the estimation error. Surprisingly, the elasticity does not happen to be larger when the FP is overestimated.

The great majority of subjects revise their willingness to pay in the same direction as their error of estimation: $\Delta revisWTP>0$ when $\Delta estimFP>0$ and $\Delta revisWTP<0$ when $\Delta estimFP<0$. At the individual level, 53.7% of the *WTPs* are revised either downward when the field price is overestimated or upward when the field price is underestimated. Nonetheless, *WTPs* are revised in the opposite direction for 20.8% of the revision decisions (Fisher exact p=0.0000). It is worth mentioning that for one quarter of the decisions, WTP_{stand} is equal to WTP_{FP}. The magnitude of WTP revisions is lower than the magnitude of error estimations: $\Delta revisWTP<\Delta estimFP$. Among the cases of underestimations, WTPs increase in average by €0.21 when the estimations of the FP were in average €0.84 below the correct estimation. As for the cases of overestimations, WTPs decrease in average by €0.33 when the estimations of the FP were €1.31 above the actual FP. As may be expected, the average WTP revision is null among the subjects with accurate estimations of the FP.

OBSERVATION 4: $\Delta revisWTP$ is monotonic with $\Delta estimFP$, and $\Delta revisWTP$ seems to be roughly linear to $\Delta estimFP$. In other words, the larger the error estimation, the greater the revision of the willingness to pay will be.

In Figure 2 we categorize decisions in deciles according to the error estimations. The first decile contains the decisions with the largest overestimations and the 10th decile contains the decisions with the largest underestimations. One can clearly see that $\Delta revisWTP$ increase monotonically: the larger the overestimation (underestimation), the larger the decrease (increase) of the *WTP* will be. Furthermore, the elasticity is relatively stable over the deciles – apart from the 4th one[15] – with the mean values (0.27, 0.12, 0.37, 0.30, 0.23, 0.26, 0.23, 0.26, 0.24). The median test cannot reject the null hypothesis that the *Elasts* of these deciles are identical ($\chi^2(8)=10.0959$, p=0.258)[16,17]. Similarly, when the field-price is overestimated, *Elast* is not significantly different from when *FP* is underestimated (Wilcoxon-Mann-Whitney, p=0.4808).

--- FIGURE 2 HERE---

A constant elasticity would mean a linear relationship between $\Delta revisWTP$ and $\Delta estimFP$. That is what we may look for in Table 2. The coefficient a, (i.e. *Elast*), is equal to 0.26 and is highly significant. The intercept is null. The scatter plot of the regression is displayed in Figure 3.

--- FIGURE 3 HERE ---

--- TABLE 3 HERE ---

OBSERVATION 5: Individually, the subjective surplus (*SS*) is not systematically larger or equal to the objective surplus (*OS*).

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[15] In the 4th decile, *Elast* = -2.58. This is essentially due to the very small denominator of *Elast* as this decile comprises all the estimation errors that are equal or very close to zero. This makes the elasticity highly volatile as even small changes in *WTP*s have a big impact on its value.

[16] If we include *Elast* of the 4th decile, the median test cannot reject the null hypothesis at the 5% level: $\chi^2(9)=14.8606$, p=0.095.

[17] The Wilcoxon-Mann-Whitney two-sample test corroborates the median test. We applied the 45 tests (including *Elast* of the fourth decile) and did not find any significant result at the 5% level.

We saw above in Section 1 (indicator 6) that $OS - SS = \Delta estimFP\ (1 - Elast)$. This means that $OS > SS$ when $\Delta estimFP>0$ (underestimation of the actual field-price) and $OS < SS$ when $\Delta estimFP<0$ (overestimation of the *FP*). This is largely confirmed by the data: for example, only 25.6% of the decisions have $SS > OS$ when *FP* is overestimated and only 11.3% have $SS < OS$ when *FP* is underestimated (*i.e.* $Elast>1$). The rationale is simple. With $0 < Elast < 1$, *WTP*'s adjustments do not entirely match the estimation errors. Consequently, surplus increases from Stage 1 (*SS*) to Stage 3 (*OS*) when $\Delta estimFP$ is positive and decreases when $\Delta estimFP$ is negative.

C. *Assessment of our four hypotheses*

H_1 Stable and independent WTP – FP has no impact on bids in only one quarter of all cases (see the first row of Table 4). Unsurprisingly, bidders are sensitive to the price disclosure. The idealistic situation where the laboratory is able to elicit private valuation independently from the field (H_1) is clearly not verified.

--- TABLE 4 HERE ---

H_2 Price Cap WTP – Although frictions confuse the clear predictions of Section 3, one can still state than bidders with high *PV* (small surplus) should be more elastic than bidders with low *PV* (large surplus). Table 5 shows medians of *Elast* depending on whether *SS* and *OS* are below or above 0.25[18]. Elasticity is significantly higher for bidders with $SS\leq0.25$ than for bidders with $SS>0.25$ (medians of 0.25 *vs.* 0.00, $p=0.0228$ with a Wilcoxon ranksum test). That is, bidders who are bidding up to what they perceive to be the field price change their bid when they realize that their field price expectations were wrong. They do so to a greater extent than bidders who bid below their expectation of *FP*. Similarly, elasticity is significantly higher for bidders with $OS\leq0.25$ than for bidders with $OS>0.25$ (0.33 *vs.* 0.00, $p=0.0001$): bidders with high *PV* are paying more attention to the opportunity to buy outside the lab. We also find significant difference when one combines low *SS* and *OS* compared to high *SS* and *OS*: 0.50 *vs.* 0.00, $p=0.0000$). If aggregate results validate H_2, the large dispersion in individual data (Table 4) calls for caution.

--- TABLE 5 HERE ---

H_3 Arbitrage WTP – Bidders do not systematically offer the field price or what they perceive to be the field price ($Elast\neq1$). Even when we take into account risk aversion and commitment costs, we do not find that *SS* is systematically larger than the objective surplus *OS*. Bidders do not seek higher surpluses in riskier situations (uncertainty about the true value of *FP*) or in situations with higher commitment costs. This would have been the case if subjects had considered the products only for their exchange value, with both doubts about their valuation of the *FP* and risk aversion. This is clearly not the case and we may therefore conclude that subjects consider the products offered in the lab at least partially for their use value.

H_4 Price Signal and unstable WTP – The field price acts here as a quality signal and therefore performs as an attractor to the *PV* ($Elast>0$). That would be the case in 53.7% of the experimental situations. One can imagine that the price has different degrees of influence, depending on the individual, and that there are individuals for whom prices of some products do not signal quality (25.5%). However, H_4 can hardly explain the 20.8% of situations where $Elast<0$. Furthermore, it is

[18] The threshold of 0.25 has been chosen arbitrarily in order to obtain samples that are comparable in size. Conclusions remain robust with a threshold of 0.

intuitive to assume that the price signal will signal more when the product is unknown than when it is common. This is not verified by our data as we cannot reject the null hypothesis of no difference of *Elast* between the hyssop jelly and the baguette (p=0.5934, Wilcoxon ranksum test).

5. DISCUSSION AND NORMATIVE IMPLICATIONS FOR THE LAB

Our results clearly show that FP influences WTP. First, bidders revise their bid when they learn about FP and, second, the extent of the revision depends on the distance between FP and what bidders expected it to be. (We show that the elasticity of the *WTP* revision according to the estimation error is significant and positive, and can be roughly approximate to one quarter of the error). The impact of FP on WTP affects the interpretation of the data when the experiment aims at eliciting private valuations. FP should not impact PV if bidders value a good only for their private consumption (H_1). Conversely, FP generates a common value if bidders carry out an arbitrage operation on the goods auctioned (H_3). While PVs are perfectly elicited in the lab in H_1, bids elicit common value only in H_3. Neither of the hypotheses have been verified in our data and the truth may well lie between these two extreme situations: PV is either unstable (H_4) or partially veiled behind the common value (H_2). Clear discrimination between the two proposals comes across market frictions: the extent of commitment costs and transaction costs blurs the actual position of PV relative to FP. The individual identification of these costs would help to validate H_2. If not, H_4 would be an alternative.

What are the normative implications of our results in terms of protocol design?

The easiest way to confine subjects to their private value (then H_1 or H_4), by limiting reference to common value (and then excluding H_2 and H_3), is to design a protocol where they are informed that, if they buy a product, it will be compulsory for them to consume it. This is strictly controlled when the protocol includes an 'in the lab' immediate and compulsory consumption of all products bought during a session. Unfortunately, while it is easy to implement such a procedure for some food products – a sandwich or a coffee –, it is obviously impossible to do so for many others. Note two other limits of such a design. First, having to consume it immediately in the lab may dramatically alter the use value of a product, even if its consumption is technically possible. One would greatly value a beer consumed at home in the evening after the session, but attach very little value to the same beer drunk quickly in the lab before leaving a session. Second, the price posted outside may act as such: "I can have the same beer within 10 minutes if I buy it at the market price from the corner shop". Immediate consumption is a (relatively) efficient way to control and avoid the elicitation of common value rather than private value in the lab.

When, for any reason, products cannot be consumed immediately in the lab, common value elicitation cannot be eliminated. As we have seen, a major source of poor control of common value lies outside the lab transaction costs. Therefore, if one cannot eliminate them, a proper design will try to control these costs. A good way to do so is to introduce an announced "field price posted market" in the lab at the end of sessions. To control and objectify the price cap in H_2, the protocol should simply guarantee that products bought during the auctions will be bought back on request by the experimentalist at the end of the session. When additionally the posted price is given to the subjects, then the price cap is totally under control: rational bids cannot exceed this single, obvious and common knowledge cap. If ignored, then a belief exploration of the subjective posted price is required, but control is then loosened by risk aversion.

In addition of the previously described end-of-session 'buy back posted market at field price', the experimentalist may implement a 'selling posted market at (the same) field price'. With such a design, we guarantee and control H_3 (arbitrage) without transaction costs, and without possible arbitration, as it needs price discrimination. In such a context, any product in the lab, whatever it is, is transformed into a (certain) financial product, therefore with no common value. If the field price is given to the subjects, all rational bids should be at this field price. (Note that this design is Vernon Smith redemption value equivalent.)

What sort of protocol would stress H_1 against H_2? We justify H_4 on the basis of the field price used by subjects as a signal of quality. Therefore, the more information is given to subjects about products, the less the signal is necessary. Suppose we sell Bordeaux wine in the lab on the sole basis of blind testing. A non-expert consumer would learn a lot about the quality of a wine if given its field price (that may currently vary from 5€ to 500€) even if he or she focused only on the private value. This price might significantly influence a reasonable consumer's WTP. If less information is supplied concerning the attributes of products delivered in the lab than those (believed) to be available in the field, uncontrolled commitment costs are rational and must be taken into account in interpreting the results. A particular attribute, generally neglected in the literature but that might have a significant effect because it obviously links field price and WTP, is production costs. We know that WTP for fruit and vegetables is often low because a significant proportion of consumers believe that the cost is null (or just equal to the picking costs). On the contrary, one may over-evaluate the cost of a night in a 5-star hotel because of the extreme luxury in the lobby, without taking into account the fact that this cost is divided by the 800 rooms of the palace, rented 365 days a year. With a (believed) competitive market, field prices strictly reflect cost and might influence WTP, especially for a single purchase (the consumer will then adjust his or her demand in relation to the quantities).

6. CONCLUSION

We show in this paper that field prices influence willingness to pay in the lab. We have good reasons to believe that field prices also influence willingness to pay in the field. Therefore, experiments aimed at measuring WTP in the lab should pay particular attention to this price variable for the sake of parallelism and realism.

Experimental economics builds its scientific reputation on its excellent ability to control economic environments and to isolate and therefore measure variables. Our first result is that field prices do indeed influence WTP in the lab, whether they are revealed or not (in the latter case the influence is through beliefs). We analyze the reasons for such an influence with two types of reason. The first type of reason results from common value considerations. A subject who has the opportunity to buy a good in the lab may question the price at which he can buy (or resell) the same product in the field. He may also question the amount of the transaction costs that such a deal would generate. We propose new designs: (i) to control (eliminate) the induced transaction costs, and (ii) to control (reveal) the field price. These new designs will help to separate subjects' private and common valuations. The second type of reason for linking WTP and field price results from private value considerations. Here price is taken as a quality (or cost) signal. This is rational when markets are competitive, individual preferences are close to average ones, and product attributes are partially ignored. In such a context, field prices may be rationally taken as a privately valuable attribute. We propose to take this rationale into account in the design of experiments. First, we increase control and parallelism by delivering the

field price to the subjects before auctioning a product. Second, when it is neither possible nor desirable to reveal field prices, the control is increased if subjects' field price beliefs are collected in parallel with their WTP.

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Tables and figures

Table 1: The experimental design: stages, procedures and variables

Stage	Stage 1	Stage 2	Stage 3	Stage 4	Stage 5
Used Procedure	Vickrey Auction 4th Price	'The Price is Right' Prize-winning	Vickrey Auction 4th Price	Credible information given to the subjects	Vickrey Auction 4th Price
Variable observed or revealed (stage 4)	WTP_{stand} **Standard WTP**	FP_{estim} **Estimation of the field price**	WTP_{recon} **Reconsidered WTP**	**FP Actual field price disclosure**	WTP_{FP} **WTP revision knowing FP**

Table 2: Summary Statistics

		n	FP_{estim}	FP	WTP_{stand}	WTP_{FP}	ΔFP_{estim}	ΔWTP_{revis}
All	Smoothie	124	1.57 €	2.70 €	1.04 €	1.33 €	+1.13 €	+0.29 €
	Banana	124	1.59 €	0.99 €	1.03 €	0.71 €	-0.60 €	-0.31 €
	Fair-Trade Banana	124	2.24 €	1.99 €	1.46 €	1.31 €	-0.25 €	-0.15 €
	Hyssop Jelly	124	3.75 €	5.40 €	2.21 €	2.75 €	+1.65 €	+0.54 €
	Baguette	124	0.90 €	1.00 €	0.77 €	0.80 €	+0.10 €	+0.03 €
	Organic Bag	124	3.25 €	1.50 €	1.27 €	0.90 €	-1.75 €	-0.37 €
	Crisps	124	1.08 €	1.29 €	0.59 €	0.68 €	+0.21 €	+0.09 €
	Balanced Baguette	124	0.86 €	0.95 €	0.58 €	0.61 €	+0.09 €	+0.03 €
	All Products	992	1.90 €	1.98 €	1.12 €	1.14 €	+0.07 €	+0.02 €
Overestimation	Smoothie	10	3.24 €	2.70 €	1.84 €	1.97 €	-0.54 €	+ 0.13 €
	Banana	96	1.82 €	0.99 €	1.15 €	0.74 €	-0.83 €	-0.40 €
	Fair-Trade Banana	58	3.12 €	1.99 €	2.00 €	1.49 €	-1.13 €	-0.51 €
	Hyssop Jelly	16	7.10 €	5.40 €	4.02 €	4.27 €	-1.70 €	+0.25 €
	Baguette	22	1.27 €	1.00 €	1.16 €	1.08 €	-0.27 €	-0.08 €
	Organic Bag	82	4.44 €	1.50 €	1.57 €	1.00 €	-2.94 €	-0.57 €
	Crisps	28	1.87 €	1.29 €	0.78 €	0.76 €	-0.58 €	-0.02 €

	Balanced Baguette	30	1.18 €	0.95 €	0.82 €	0.79 €	-0.23 €	-0.04 €
	All Products	342	2.87 €	1.56 €	1.49 €	1.16 €	-1.31 €	-0.33 €
Good Estimation	Smoothie	1	2.70 €	2.70 €	1.07 €	1.05 €	0.00 €	-0.02 €
	Banana	5	0.99 €	0.99 €	0.60 €	0.56 €	0.00 €	-0.04 €
	Fair-Trade Banana	0	-	-	-	-	-	-
	Hyssop Jelly	2	5.40 €	5.40 €	4.73 €	4.95 €	0.00 €	+0.23 €
	Baguette	7	1.00 €	1.00 €	1.01 €	0.83 €	0.00 €	-0.19 €
	Organic Bag	8	1.50 €	1.50 €	0.50 €	0.64 €	0.00 €	+0.14 €
	Crisps	1	1.29 €	1.29 €	0.00 €	0.00 €	0.00 €	0.00 €
	Balanced Baguette	6	0.95 €	0.95 €	0.57 €	0.54 €	0.00 €	-0.03 €
	All Products	30	1.48 €	1.48 €	0.93 €	0.93 €	0.00 €	-0.01 €
Underestimation	Smoothie	113	1.41 €	2.70 €	0.97 €	1.27 €	+1.29 €	+0.31 €
	Banana	23	0.76 €	0.99 €	0.62 €	0.63 €	+0.23 €	+0.01 €
	Fair-Trade Banana	66	1.46 €	1.99 €	0.99 €	1.16 €	+0.53 €	+0.17 €
	Hyssop Jelly	106	3.21 €	5.40 €	1.89 €	2.49 €	+2.19 €	+0.59 €
	Baguette	95	0.81 €	1.00 €	0.67 €	0.74 €	+0.19 €	+0.07 €
	Organic Bag	34	0.80 €	1.50 €	0.72 €	0.72 €	+0.70 €	0.00 €
	Crisps	95	0.84 €	1.29 €	0.55 €	0.67 €	+0.45 €	+0.12 €
	Balanced Baguette	88	0.74 €	0.95 €	0.50 €	0.55 €	+0.21 €	+0.06 €
	All Products	620	1.39 €	2.23 €	0.92 €	1.14 €	+0.84 €	+0.21 €

Table 3: Linear approximation to Estimation Errors

ΔrevisWTP	Coefficient	Standard Error	t	p > |t|
ΔestimFP	0.2639***	0.0180	14.69	0.000
$(\Delta estimFP)^2$	-0.0063	0.0043	-1.47	0.142
$(\Delta estimFP)^3$	-0.0002	0.0002	-1.11	0.266
Intercept	0.0258	0.0266	0.97	0.332
R^2	0.1959			

Table 4: Frequency of situations according the value of *Elast*

Frequency	*Elast* < 0	*Elast* = 0	0 < *Elast* < 1	*Elast* = 1	*Elast* > 1
Overall	**200 (20.8%)**	**245 (25.5%)**	**340 (35.3%)**	**20 (2.1%)**	**157 (16.3%)**
SS≤0.25	109 (25%)	66 (15%)	166 (38%)	17 (4%)	83 (19%)
SS>0.25	91 (17%)	179 (34%)	174 (33%)	3 (1%)	74 (14%)
OS≤0.25	80 (23%)	50 (14%)	130 (37%)	17 (5%)	78 (22%)
OS>0.25	120 (20%)	195 (32%)	210 (35%)	3 (0%)	79 (13%)
SS≤0.25 & *OS*>0.25	67 (34%)	26 (13%)	78 (40%)	0 (0%)	26 (13%)
SS>0.25 & *OS*≤0.25	38 (34%)	10 (9%)	42 (38%)	0 (0%)	21 (19%)
SS,*OS*≤0.25	42 (17%)	40 (16%)	88 (36%)	17 (7%)	57 (23%)
SS,*OS*>0.25	53 (41%)	169 (41%)	132 (32%)	3 (1%)	53 (13%)

Table 5: Median of *Elast* according the value of *SS* and *OS*

Median of *Elast* (number of observations)	*OS*≤0.25	*OS*>0.25	All *OS*
SS≤0.25	0.50 (244)	0.09 (197)	0.25 (441)
SS>0.25	0.16 (111)	0.00 (410)	0.00 (521)
All *SS*	0.33 (355)	0.00 (607)	0.11 (962)

Figure 1: Means of WTP_{stand}, FP_{estim}, WTP_{FP} and FP by products.

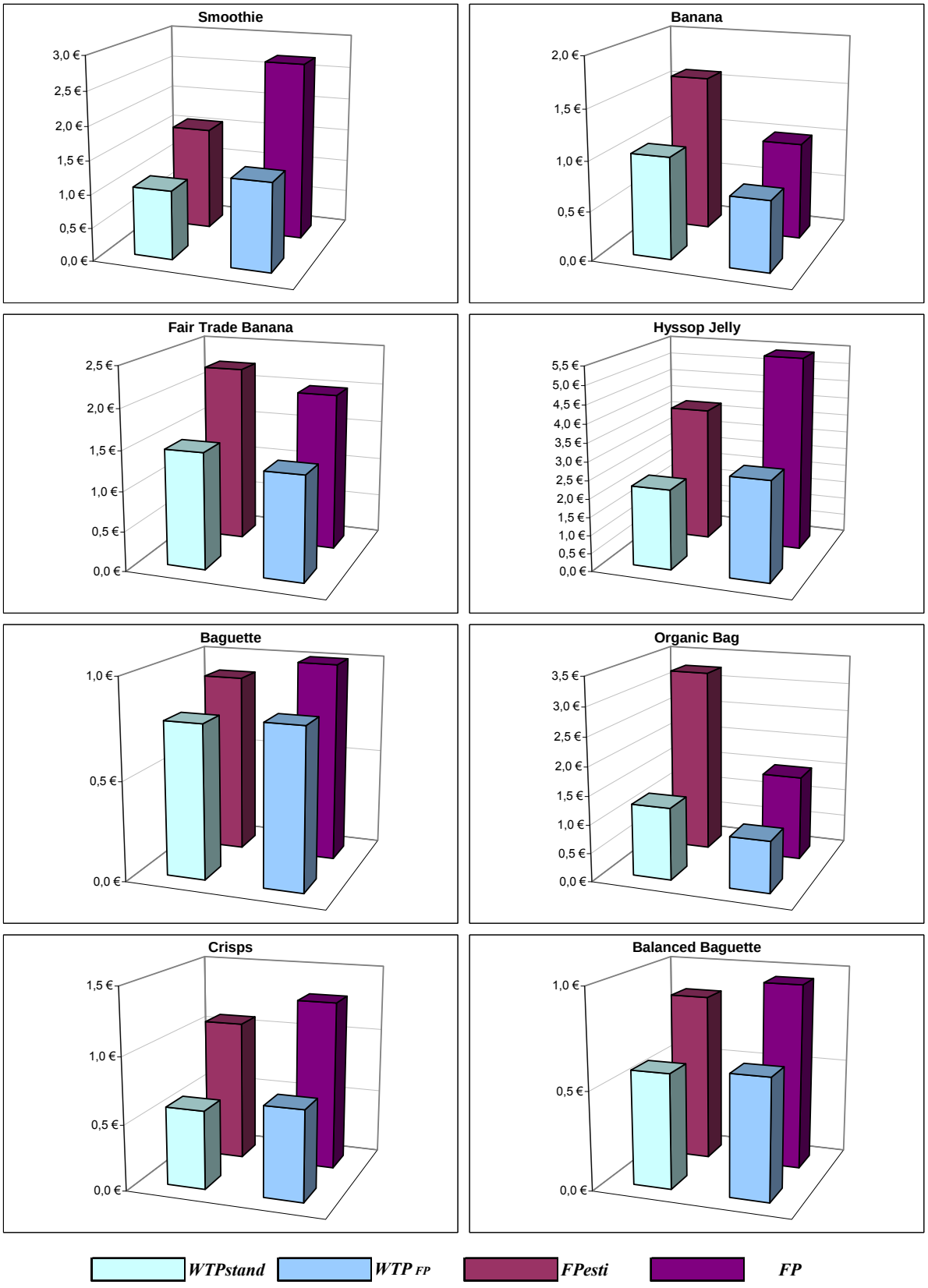


Figure 2: Means of *ΔestimFP*, *ΔrevisWTP* and *Elast* per deciles.

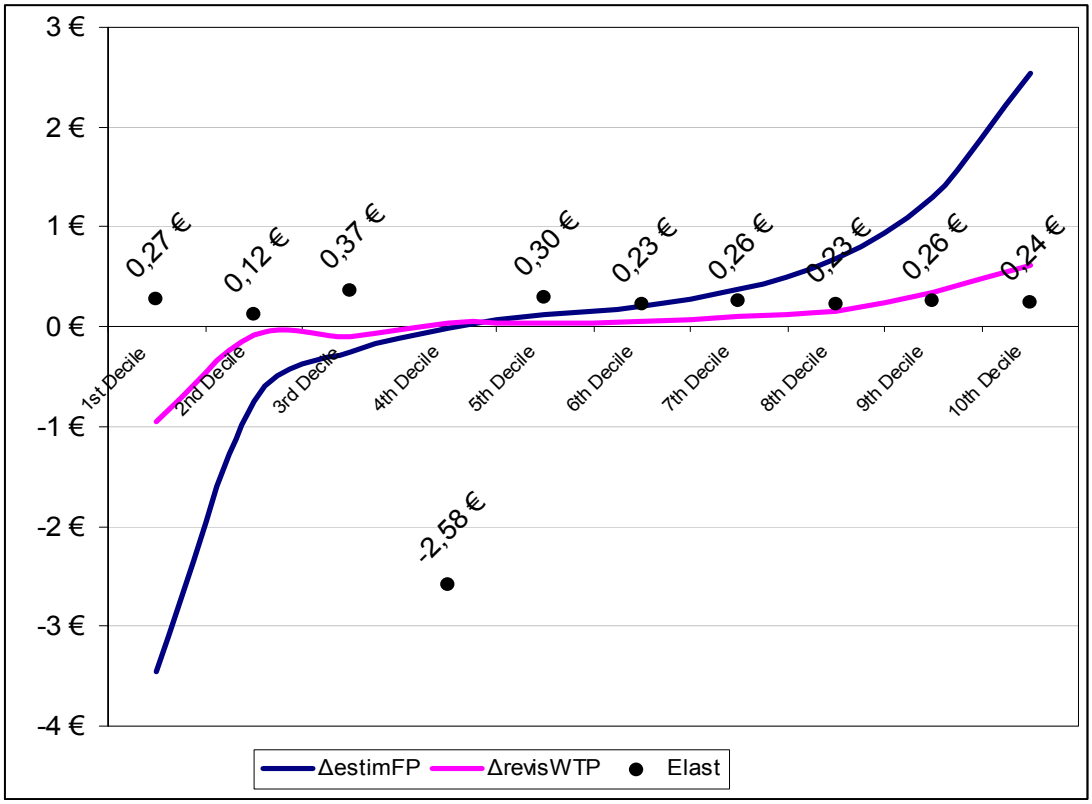
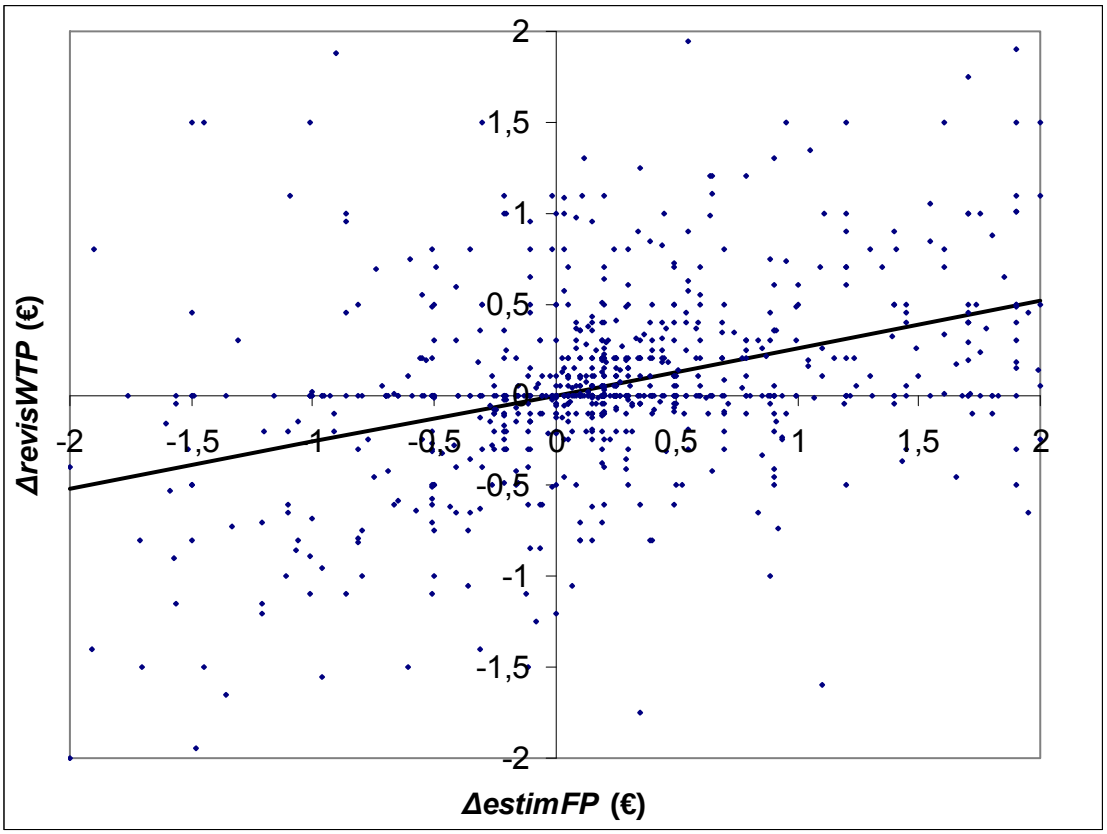


Figure 3: Scatter plot of *ΔrevisWTP* according to *ΔestimFP* and linear regression.


2
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0,5
0
-0,5
-1
-1,5
-2
-2
-1,5
-1
-0,5
0
0,5
1
1,5
2
ΔrevisWTP (€)
ΔestimFP (€)