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Effects of study design characteristics on the WTA–WTP disparity: A meta analytical framework ☆

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Abstract

We investigate the effects of certain factors related to study design and elicitation techniques on the WTA–WTP disparity. These factors are: explicit statement of the price, iterative bidding, within/between-subjects nature of the design, and out-of-pocket payments. We adopt a meta analytic approach to generalize from prior studies. This enables us to examine our hypotheses as well as other factors discussed in the literature. Our findings suggest that iterative bidding and within-subjects designs decrease the WTA–WTP disparity, whereas out-of-pocket payments increases the disparity – compared to tax reductions and other indirect payments. The effect of explicitly stating the price of the good to the respondents seems to be insignificant.

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1. Introduction

Standard economic theory assumes that the amount an individual is willing-to-pay (WTP) to obtain a good is approximately equal to the amount she is willing-to-accept (WTA) to relinquish the same good (Willig, 1976). However, empirical research offers substantial evidence of a disparity between individuals' selling and buying prices. In the last three decades, numerous studies have reported that the WTA value is often considerably larger than the WTP value for the same good. For instance, in one of the first studies that use both WTA and WTP measures, Hammack and Brown (1974) reported that waterfowl hunters were willing to spend $247 to be able to continue hunting, but they required an average compensation of $1044 to sell their hunting rights.

A line of research argues that there is no single value associated with a good; individuals' valuations depend on the context (e.g. Kahneman, Ritov, & Schkade, 1999). For instance, stated amounts may differ if the valuation question is framed as a *gain* or *loss* (Irwin, 1994). Furthermore, different context variables (or components, dimensions) may be more/less important for a buyer or seller (e.g. Birnbaum & Stegner, 1979). As such, the disparity between the WTA and WTP valuations would also be context-dependent. Some of these context variables are related to the study design and elicitation techniques. In this study we investigate the effects of certain design and methodological factors on the WTA–WTP disparity. Rather than designing a new experiment, we adopt a meta analysis procedure to test our hypotheses. Meta analysis differs from other kinds of systematic reviews with respect to the methodology it employs: It provides a statistical integration of experimental results across independent studies. A well-conducted meta-analysis allows for a thorough analysis of the heterogeneity between different studies and for an examination of each explanatory variable's significance while controlling for the other variables.

Economists tend to argue that WTA–WTP disparity is due to strategic misrepresentation which is linked to experimental design factors and elicitation techniques (see Brookshire, Coursey, & Radosevich, 1988, for a discussion). This does not imply that these factors affect only the degree to which valuations are revealed truthfully; they may also influence the valuations themselves. All the same, it is important to understand the effects of such factors on the WTA–WTP disparity. In this paper we examine the effects of certain design factors that have not received enough attention in prior research, namely: (i) explicit statement of the price, (ii) iterative bidding, (iii) within/between-subjects nature of the design, and (iv) out-of-pocket payments. Effects of these factors on valuation have significant implications. For example, if iterative bidding decreases the WTA–WTP disparity, it implies that single open-ended questions may lead to overstating the minimum WTA and / or understating the maximum WTP.

As discussed in detail below, the WTA–WTP disparity depends on a number of variables. In order to examine the effects of the four design factors stated above, one should control all the other factors that presumably affect the WTA–WTP disparity – or examine the effects for different levels of the other factors for that matter.

For instance, one may test the effect of iterative bidding when the design is incentive compatible versus not. Rather than adopting this approach, we use a meta analytical framework. Meta analysis is used for integration and generalization of relationships; new relationships can be examined together with the ones examined previously (Miller & Pollock, 1994). The key here is to code or obtain the data pertaining to the new hypotheses from prior studies. In our case, all the four variables that we examine can be readily obtained from the design and methodology expositions of the prior studies. Meta analytic approach has the added advantage that it inherently reflects the replication of the previous results.

The paper proceeds as follows. In the next section we present a background for the WTA–WTP disparity and our hypotheses. This includes a brief discussion of context variables that potentially affect the WTA–WTP disparity. Then we introduce the methodology, and provide the results of the meta analysis. The paper ends with a discussion and some suggestions for further research. We emphasize at this point that our purpose is to examine how the WTA–WTP disparity varies due to certain variables, rather than what actually causes it, or whether the process of valuation changes accordingly.

2. Background and hypotheses

Several research streams on the valuation of goods have contributed to the WTA–WTP disparity literature. Early theoretical investigation of the WTA–WTP disparity can be traced back in the economics literature. Henderson (1941) examined alternative specifications of consumer's surplus and compensating variation, which are closely related to the WTP and WTA measures. To the best of our knowledge, the first empirical study that reports the WTA and WTP values is Coombs, Bezembinder, and Goode (1967). They elicited the buying and selling prices for different lottery tickets in a hypothetical setting, and found that the average selling price was more than twice the buying price. Knetsch and Sinden (1984) was the first study that adopted a real exchange mechanism, and they reported a WTA/WTP ratio of 4 for lottery tickets.

Previous studies that examine the WTA–WTP disparity typically focus on one explanation or factor. Extensive examination of factors that contribute to the disparity is rather sparse. In one of these studies, Hoffman and Spitzer (1993) put together a number of explanations for the WTA–WTP disparity: income effect, psychological reasons (Prospect Theory and endowment effect, the need to "close" transactions, preference uncertainty, and regret avoidance), misrepresentation, and incorrect framing of questions. In a survey of previous empirical research, Brown and Gregory (1999) group the possible reasons into two main categories: economic factors (income effects and substitution, transaction costs, implied value of the good, profit motives) and psychological factors (endowment effect, legitimacy, ambiguity and moral responsibility). In a recent review, Horowitz and McConnell (2002) find that the WTA–WTP disparity is a robust effect. Their main finding is that as the good in question moves away from an "ordinary private good", the disparity increases. They

also report some counterintuitive findings such as incentive compatible designs leading to higher WTA–WTP disparities.

Another stream of research suggests that particulars of the context affect the valuation of goods (e.g., Kahneman et al., 1999; Knetsch & Gregory, 2002). A contextual variable may serve as a cue, and/or may influence the salience of another contextual variable (Peters, Slovic, & Gregory, 2003). In particular, different context variables may be more/less important for a buyer or seller. For instance, buyers may weigh unfavorable evidence more than sellers (Birnbaum & Stegner, 1979); hedonic, as opposed to utilitarian, features may be more salient in forfeiture than acquisition (Dhar & Wertenbroch, 2000); sellers may focus more on the loss of benefits of the goods, and the associated negative affect may influence the salience of other cues (Peters et al., 2003) and so on.

Context may affect the stated valuation in two ways. First, it may affect the degree of strategic misrepresentation of the valuation. Economists tend to argue that strategic motives and misrepresentation is a result of design and elicitation techniques. Individuals may intentionally overstate the WTA and understate the WTP because of bargaining habits or profit motives (Knez, Smith, & Williams, 1985). According to this argument, once the incentives for truthful revelation of valuations are provided, the disparity should disappear. Second, context changes (constructs) the valuation itself. For instance, individuals may have different WTP values when the payment is framed as a tax increase versus an out-of-pocket payment, which is an elicitation design issue. WTA–WTP disparity can also be related to certain characteristics of the good (e.g., availability of substitutes).

Below we discuss the context variables affecting the WTA–WTP disparity. This includes our hypotheses and other variables examined in the literature. Hence, our contribution is twofold: We provide a thorough analysis of some design factors which have not been studied explicitly before. In addition, we add to prior evidence, which is mixed in some cases, on some factors already examined in the literature. We group the context variables in terms of their effects: (i) rational–economic effects, (ii) strategic misrepresentation, (iii) emotional effects, (iv) mental reference/framing effects. Some variables may pertain to multiple effects. We will discuss the variables from multiple angles when applicable. We understand context as a general term including features or components of the stimulus. Variables below are regarded as context variables because they can be manipulated experimentally (even though experimental manipulation of some may require creativity). [2]

2.1. Rational–economic effects

The first set of contextual variables is related to the rational or economic factors that explain the WTA–WTP disparity.

[2] Because we adopt a meta analysis framework, our interest is limited to factors that are observable (or identifiable) from prior studies. For instance, Dhar and Wertenbroch (2000) report that the WTA–WTP disparity is higher for hedonic than for utilitarian goods. Hedonic versus utilitarian distinction is typically pre-tested on the subjects. Since it is a subjective judgment, it is difficult to judge when it is not reported.

2.1.1. Availability of substitutes

Standard utility theory claims that buyers' and sellers' asymmetric valuations can be explained by the income effect. Income effect means that obtaining a good versus giving it away would take individuals to different final wealth points. Willig (1976) and Randall and Stoll (1980) derived upper and lower bounds for the WTA–WTP disparity as a function of price elasticities, consumer surplus, and income levels. Hanemann (1991) analytically shows that the income effect is more pronounced when substitutes are not available, and the WTA and WTP values should converge if the good at hand has a very close substitute. Therefore, we expect the WTA–WTP disparity to be higher when there is no readily available substitute for the good.

Adamowicz, Bhardwaj, and Macnab (1993) report two experiments, one of which supports Hanemann's substitution effect. In their first experiment they found that for a one-time only movie feature, which is also available on tape, VCR ownership (means to the substitute) had no effect on the WTA–WTP difference. In their second experiment, the difference between WTA and WTP for a hockey game ticket was 30% smaller in the substitute condition (the game would also be broadcast live), compared to the no-substitute condition (no broadcast).

2.1.2. Market availability

Another factor that may affect the WTA–WTP disparity is whether the good is readily available or traded in the market. [3] Consumers have some degree of price (specified market value) awareness for market goods. Non-market goods, on the other hand, can be characterized by a wider range of consumer valuations, and these valuations may be ambiguous. Kolstad and Guzman (1999) claim that ambiguity about the value of a good and the cost of gathering information cause an individual to overstate her WTA value and understate the WTP value. When there is a range of possible values for a non-market good, it makes sense for buyers to assign a value towards the lower end of the range, and for sellers to assign a value towards the higher end, which will increase the WTA–WTP disparity (Brown & Gregory, 1999). The WTA–WTP disparity should be higher for non-market goods.

2.1.3. Learning/experience

WTA–WTP discrepancy is also observed for items like pens or candy bars (e.g., Kahneman, Knetsch, & Thaler, 1990; Knetsch, 1989) which are traded in the market. Coursey, Hovis, and Schulze (1987) argue that experimental designs that do not allow for experience or learning may lead to the WTA–WTP disparity. Individuals are generally not familiar with valuation tasks, especially with the WTA valuation. If they have an opportunity to evaluate the consequences of their valuation decisions over a series of trials, they may "discover" their preferences (Plott, 1996), or learn that revealing true preferences is the dominant strategy (in incentive

[3] Note that good substitutes exist for most market goods, but not for all. For instance, a regular mug is an imperfect substitute for a college mug.

compatible designs). Therefore, experience may affect both the valuation itself, and the extent of strategic misrepresentation.

Empirical evidence regarding the effect of learning on the WTA–WTP disparity is mixed. Shogren, Shin, Hayes, and Kliebenstein (1994) obtained almost equal WTA and WTP values after a series of trials. Using a similar mechanism, on the other hand, Kahneman et al. (1990) observed no significant decrease in the disparity due to repetition. Nonetheless, we expect a smaller WTA–WTP disparity if values are elicited after the respondents gain experience. [4]

2.1.4. Explicit price information

In some empirical studies respondents are provided with the price of the good at hand. Although respondents may already have an idea about the prices, explicit price information narrows the ambiguity about the good's market value. When price information is not provided, individual valuations can cover a wider range. If individuals are uninformed or uncertain about the price, it makes economic sense to report low WTA values and high WTP values (Zhao & Kling, 2001). There is also a psychological effect of price knowledge. Various experimental studies on anchoring effect have shown that individuals tend to be biased towards any given value, even when it is arbitrary (see Kahneman et al., 1999, for a review on anchoring effects in valuation). An explicitly stated price may have an anchoring or priming effect serving as a signal of fair value. Individuals will consider WTA and WTP values as deviations from this anchor; hence the disparity will be lower. Explicit price information presumably affects the valuation itself, but it is also possible that individuals may adjust their valuations strategically high or low. The above discussion leads us to the following:

Hypothesis 1. The WTA–WTP disparity will be lower when subjects are provided with the price of the good.

2.2. Strategic misrepresentation

The second set of variables is related to the individuals' strategic motives. Variables that would affect the extent of strategic motives and value misrepresentation essentially pertain to the study design. The issue here is the truthful revelation of WTA and WTP valuations.

2.2.1. Preference revealing and real exchange mechanisms

It is possible to design an experimental mechanism so that participants are provided with incentives to reveal their "true" valuations. For instance, in a Vickrey

[4] In this study, we define learning as the experience in the valuation of the same good under the same conditions. Although the number of trials that counts as experience could be subjective, we consider respondents as experienced if data are obtained after four or more trials. This is generally consistent with the existing literature.

auction (where the highest bidder wins the final prize and pays the second highest bid), bidding the "true" valuation is the optimal strategy (Vickrey, 1961; see Harless, 1989 for an example). Another incentive-compatible mechanism is market clearance. Kahneman et al. (1990) used this experimental design where the WTA and WTP prices determined the demand and supply in a simulated market.

We distinguish between the preference revealing and realization of exchange characteristics of incentive-compatible designs. A preference revealing mechanism is presumed to induce the revelation of true valuations. Realization of the exchange means that the transaction actually takes place between a buyer and a seller. A widely used experimental approach is to actually carry out the transaction for a subset of respondents in order to elicit true preferences. It is possible to employ a preference revealing mechanism, such as a Vickrey auction, but not to carry out the exchange. On the other hand, realization of the exchange is presumed to be a preference revealing mechanism itself. [5]

As pointed out earlier, it is argued that individuals would overstate the WTA and understate the WTP if incentives for truthful revelation are not provided. However evidence does not support this argument. In a recent quantitative review, Horowitz and McConnell (2002) found that realization of the exchange has no effect on the WTA–WTP disparity, and preference revealing mechanisms (they use the term "incentive-compatible") in fact increase the disparity. Neill, Cummings, Ganderton, Harrison, and McGuckin (1994) compared the WTP values from three different designs: a contingent valuation method (CVM), a hypothetical Vickrey auction, and a real exchange Vickrey auction. They found that the average WTP values from CVM and hypothetical Vickrey auction are similar and they are both significantly higher than the WTP of the real exchange auction group. In the light of these results, we do not have a prior expectation about the effects of preference revealing designs and realization of the exchange.

2.2.2. Iterative bidding

Individuals' valuations can be obtained through open-ended questions like "how much are you willing to pay?" or alternatively by using multichotomous answer formats or payment cards where respondents make a choice from a list of figures. Some of these choice tasks involve asking the respondents follow-up questions on whether they would pay (accept) a revised amount, which is higher (lower) than the initial responses. The purpose of this sequential elicitation process is to elicit the "maximum" WTP and the "minimum" WTA via an iterative process. [6] The underlying

[5] Realization of the exchange in a mechanism which is not preference revealing (e.g., first-price auction) is a possibility; to our knowledge there is no application in the WTA–WTP research.

[6] The effect of using a multichotomous format as opposed to an open-ended question is not clear. Cameron and James (1987) argue that open-ended questions yield more strategic responses from respondents, whereas questions requiring yes/no answers generate behavior closer to the actual market experience. In order to obtain average valuations from a single yes/no question, researchers vary the amount stated across respondents, and estimate the value based on certain assumptions. As will be discussed later, we do not include valuations based on yes/no questions in our analysis.

assumption is that respondents intentionally misrepresent their valuations when asked the first time. Whether or not an iterative process narrows the gap between the WTA and WTP values is not examined before. To the extent that respondents change their valuations, we expect:

Hypothesis 2. The WTA–WTP disparity will be lower when the empirical procedure involves iterative bidding.

2.2.3. Within versus between-subjects designs

One way to obtain the WTA and WTP figures is to ask both measures to the same group of respondents: a within-subjects design. Alternatively, one may employ a between-subjects design and ask a group of respondents their WTA values and another group their WTP values. When an individual provides multiple measures in a study, she may try to be consistent between the two responses (Camerer, 1995). Therefore, a within-subjects measurement would probably prime respondents to provide selling prices higher than buying prices but these prices should not be markedly different. However, it is not clear whether respondents in this case provide the "true" valuations. It is possible that they may report a lower WTA, for instance, than the actual WTA for the sake of consistency – a form of demand effect.

Hypothesis 3. The WTA–WTP disparity will be lower in a within-subjects design.

2.3. Emotional effects

WTA–WTP gap may also widen when there is an emotionally difficult trade-off. Peters et al. (2003) argue that the WTA–WTP disparity may be highest for goods towards which we have the strongest feelings. They provide evidence that WTA and WTP valuations are constructed by a process guided in part by affect. We consider three factors that relate to emotional effects.

2.3.1. Perceived illegitimacy

We understand perceived illegitimacy as a sense of moral and ethical responsibility (i.e. conscience, altruism). If selling or giving up a good is perceived as an illegitimate transaction, WTA–WTP disparity is expected to increase, mainly due to higher WTA values. When the decision involves a moral dimension or potentially undesirable consequences, individuals typically favor inaction over action (Brown & Gregory, 1999). It is generally unacceptable, for instance, to sell a picture of loved ones. A higher WTA is a reflection of the premium they demand to offset the negative feeling. Hence, the WTA–WTP disparity should be higher when the exchange is perceived as an illegitimate transaction.

Boyce, Brown, McClelland, Peterson, and Schulze (1992) provide empirical support for an increase in WTA–WTP discrepancy when the transaction involves a sense of moral responsibility. Using pine trees as the experimental object, they told one

group of subjects that the trees would be killed if the respondents failed to purchase the tree (WTP) or if they sold it to the experimenter (WTA). A higher WTA/WTP ratio is reported in this "moral responsibility" condition, compared to the "no-kill" condition. Their argument is that if one owns the tree, she has the responsibility. If not, the owner has the responsibility. The property rights shift responsibility to the owner so the buying price does not increase as much as the selling price. [7]

2.3.2. Environmental

Our second factor related to emotional effects is whether the good is environmental or not. Environmental goods involve a sense of moral responsibility but they are not necessarily non-market goods. For example, pine trees can be bought in the market. Irwin (1994) reports that the relative preference for an environmental good as compared to a market good is higher in the selling mode (WTA) than in the buying mode (WTP). Similarly, WTA for environmental goods is higher than the WTA for market goods, even though the WTP values do not differ that much. We expect to see a higher WTA–WTP disparity for environmental goods.

2.3.3. Health related

The third emotion based factor is whether the good is health related or not. One's health and safety is presumably the least substitutable "good." WTA–WTP disparity should increase if the transaction has an effect on health. Unlike other non-substitutable goods, health has a direct and pervasive effect on individual's life. Brown and Gregory (1999) argue that one's health and general safety also involves ethical and legitimacy dimensions. Brief examination of the results of Chapman and Johnson (1995) indicates that the WTA–WTP disparity is generally higher for health related items than for commodity items. Hence, the WTA–WTP disparity should be higher for health-related transactions.

2.4. Mental reference/framing effects

Our last group of context variables is related to the changes in the reference of evaluation, in weighing of features and consequences, or in the evaluation process depending on the particulars of the economic transactions. The discussion below is primarily based on the behavioral decision theory literature.

2.4.1. Ownership

WTA–WTP disparity implies that sellers have a higher valuation than buyers: ownership of a good increases its value. One explanation for the disparity is the endowment effect, which is a manifestation of the loss aversion property of the Prospect Theory (Kahneman & Tversky, 1979; Thaler, 1980). According to the Prospect Theory, a loss would yield a larger (in magnitude) discomfort than the value of a

[7] It is conceivable that this argument may also apply to non-environmental goods. For example, one would not want to sell the pictures of her family.

commensurate gain. WTA reflects the loss value of the good, whereas WTP is a measure of the value from gaining the good (Kahneman et al., 1990). Therefore, when an individual is asked to give up a good she owns, she will demand a high WTA to compensate for the feeling of loss associated. [8] An alternative view is that what matters is the "viewpoint", not the ownership per se. Birnbaum and Stegner (1979) report that respondents assuming the role of an advisor to the buyer focus on lower price estimates when purchasing a car, whereas advisors to sellers focus on higher estimates – leading to the WTA–WTP disparity. If buyers weigh unfavorable evidence (or dimensions) more than sellers, endowment effect is not really necessary to explain the WTA–WTP disparity (Birnbaum, Coffey, Mellers, & Weiss, 1992).

Our interest in this paper is not testing these alternative views, but accounting for the effects of ownership rights and ownership experience compared to a purely hypothetical ownership. [9] In some experimental studies, respondents value goods that are actually distributed (e.g. coffee mugs in Kahneman et al., 1990), or goods that they already have or consume (e.g. waterfowl hunting in Hammack & Brown, 1974). In other cases they are given the ownership rights but not the physical ownership or experience (e.g., Anderson, Vadnjal, & Uhlin, 2000). Kahneman et al. (1990) note that the physical possession of the good produces a stronger endowment effect than the chance of receiving the good, or a property right to it. We expect both ownership rights and ownership experience to increase the WTA–WTP disparity, compared to purely hypothetical ownership, but we do not have a conjecture regarding the relative effects these two variables. [10]

2.4.2. Framing of questions

Prospect Theory and mental accounting argue that valuation depends on the framing of the question. WTA is typically elicited by asking respondents the compensation they would seek to give up the good, assuming that they already possess it. Similarly, WTP is obtained by asking respondents the amount they would pay to obtain a good or improvement. However, both WTA and WTP values can be framed as a loss or gain. For example, one might elicit the WTP in one of the following ways: (i) respondents are told to assume that they do not possess the good, and they are asked how much they are willing to pay to acquire it; (ii) they are told that they possess the good, but they have to pay not to lose it. The former is a gain frame whereas the latter is a loss frame. Similarly the following constitute the gain and loss frames for the WTA measure: (i) respondents are asked how much they would accept not to trade up or have an improvement in the good; (ii) they are asked to state the WTA to give up the good or trade down. Loss aversion property of Pros-

[8] It is also possible to argue that in real settings, owners are likely to have more information about the good and therefore, value it higher (Casey, 1995). However, this argument seems to be less relevant for empirical studies where WTA and WTP questions are asked to randomly drawn respondents.

[9] This is not inconsistent with Birnbaum and Stegner (1979) and Birnbaum et al. (1992) who argue that there is a continuum of viewpoints.

[10] Note that realization of exchange implies ownership rights, but not vice versa.

pect Theory suggests that loss framing increases the stated value. Therefore, the WTA–WTP disparity should be lower if selling (WTA) is framed as a gain, and it should be higher if buying (WTP) is framed as a gain (see McClelland & Schulze, 1991). We do not have a conjecture regarding the sizes of these two effects. [11]

2.4.3. Payment mechanism

Prospect Theory (Kahneman & Tversky, 1979) and mental accounting (Thaler, 1985) argue that valuation depends on the format or the framing of the transaction. One implication of mental accounting that may affect the WTA–WTP disparity is the payment mechanism. Thaler (1985) argues that individuals have different mental accounts for payments depending on where the money comes from and where it goes. For instance, a windfall earning is spent differently than earned money. Similarly, out-of-pocket costs create more disutility than opportunity costs (Thaler, 1980). We argue that the payment mechanism affects the WTA–WTP disparity. Consider a case where the payments are reductions (WTA) or increases (WTP) in tax payments. In this case, WTA and WTP will be "integrated" (see Thaler, 1985) to the tax (loss) account. On the other hand, payments in and out-of-pocket will be "segregated". Because the value function is less convex for losses away from the origin (reference point), a reduction or an increase in the taxes (loss) will result in changes of similar magnitude in the utility. On the other hand, out-of-pocket costs and in-pocket gains will lead to disparate utility changes. Therefore, we expect the disparity to be higher if the payments are in and out-of-pocket as opposed to tax increases/reductions, or other instruments of payment.

Hypothesis 4. The WTA–WTP disparity will be higher when the payments are in and out-of-pocket.

2.4.4. Risky payoffs

Individuals' valuations may change when the good in hand involves risky payoffs. Birnbaum et al. (1992) argued that if there is uncertainty regarding the utility (payoff) of a transaction, values would depend on the "viewpoint". In a recent study, Shefrin and Caldwell (2001) focus on the valuation of binary lotteries with zero and non-zero outcomes. They develop two hypotheses based on a change-of-process framework (Mellers, Chang, Birnbaum, & Ordonez, 1992). The first hypothesis is that the WTA–WTP disparity should increase as the probability of the non-zero outcome decreases (higher risk). Their second hypothesis is that the disparity should be independent of the absolute value of the non-zero outcome. [12] They found support for the first hypothesis and mixed results for the second one. Similarly, Casey (1995)

[11] Irwin (1994) suggests that WTA – WTP disparity should be greater in the loss–loss frame than in the gain–gain frame; however, her empirical findings do not support this conjecture.

[12] We do not include this hypothesis in our study because the value of the non-zero outcome is related to the price of the good and this figure is not always available. We believe that this hypothesis deserves further testing.

observes a small increase in the WTA/WTP ratio as the probability of the zero outcome increases. Therefore, we expect the WTA–WTP disparity to be higher for risky goods or payoffs. [13]

3. Analysis

3.1. Data

Meta analysis is a structured quantitative review of previous findings. To facilitate the analysis, we searched several databases, and then traced the references of the initial set of studies. Eventually we used 164 data points from 39 studies, which report both the WTA and the WTP measures of valuation (or the WTA/WTP ratio which is sufficient for our analysis). Studies that report only the percentages of respondents who value the good above or below a certain monetary amount are not suitable for our purposes. Furthermore, studies that estimate WTA and WTP values from percentages are also not included in the analysis (e.g., Knetsch & Sinden, 1984). [14]

Studies used in the meta analysis are listed in Table 1. These studies use a variety of goods, such as chocolate bars, elk hunting permits and lotteries. Fig. 1 shows the distribution of the WTA/WTP ratio for the 164 data points. The WTA/WTP ratio exhibits substantial variation, extending from 0.14 to 113. Note that a ratio of 0.14 implies that the selling price is much less than the buying price. There are six other data points with WTA/WTP ratios less than 1, but these figures are closer to 1. The mean of the ratios is 7.1, and the median is 2.9. In addition to the high positive skewness, there are a few data points with substantially high WTA/WTP ratios, going up to 113.

3.1.1. Dependent variable

We use the natural logarithm of the WTA/WTP ratio as the measure of WTA–WTP disparity. We obtain the ratio by dividing the average WTA reported by the respondents by the average reported WTP. Note that this is different than the average of (WTA/WTP) which requires within-subjects measures of WTA and WTP. Only one data point in our set is based on the average of respondents' WTA/WTP ratios (Harless, 1989). He reports that the average of WTA/WTP ratios is larger than the ratio of average WTA/average WTP, but he does not provide the latter measures. In addition, some studies provide only median values for the WTA and WTP

[13] We do not account for different degrees of risk in our analysis; we use a binary variable which represents the existence of risk.

[14] The reason for this exclusion is that these estimations are based on assumptions about the distribution of valuations. Haab and McConnell (1997) show that estimated values depend on the assumed utility function, and even negative WTP estimations can be obtained.

Table 1
Studies used in the meta analysis

Author(s) and year	Good	Number of data points
Adamowicz et al. (1993)	Tickets for Cannes commercials show	1
Anderson et al. (2000)	Eggs, ecological eggs	2
Banford et al. (1979)	Ocean pier, postal service	2
Bishop et al. (1983)	Goose hunting permits	1
Borges and Knetsch (1998)	Scratch-win lottery tickets	1
Bowker and MacDonald (1993)	Odor free air	1
Boyce et al. (1992)	Norfolk island pine	2
Brookshire and Coursey (1987)	Density of park trees	8
Brookshire et al. (1988)	Raspberry juice	5
Brookshire et al. (1990)	Tasting sucrose octa-acetate	10
Brookshire et al. (1980)	Elk hunting permits	3
Carmon and Ariely (2000)	NCAA basketball tickets	1
Casey (1995)	Lottery	2
Chapman and Johnson (1995)	20 various items	20
Coombs et al. (1967)	Lottery	2
Dubourg et al. (1994)	Vehicle safety feature	6
Eisenberger and Weber (1995)	Lottery	8
Franciosi et al. (1996)	Mugs	1
Garbacz and Thayer (1983)	Senior companion program services	2
Gerking et al. (1988)	Job safety	1
Hammack and Brown (1974)	Waterfowl hunting	1
Harless (1989)	Lottery	2
Hartman et al. (1990)	Electric service reliability	9
Hogarth and Kunreuther (1989)	Insurance	4
Kachelmeier and Shehata (1992)	Lottery	1
Kahneman et al. (1990)	Mugs, pens, binoculars, chocolate bars	11
Knetsch (1989)	Candy bars	1
Mantymaa (1999)	Usage of undeveloped land	1
McDaniels (1992)	Auto safety	1
Mellers et al. (1992)	Lottery	2
Morrison (1997)	Chocolate bar, mugs	4
Ortona and Scacciati (1992)	Labor/leisure trade off, faster/slower train	4
Peters et al. (2003)	Lottery tickets	4
Rowe et al. (1980)	Atmospheric visibility	4
Schulze et al. (1986)	Closure of landfill, presence of landfill	2
Shefrin and Caldwell (2001)	Precious/toxic metal in a land	4
Shogren et al. (1994)	Candy bars, mugs, health risk from food pathogens	17
Shogren et al. (2001)	Candy bars, mugs	12
Tanrivermis (1998)	Environmental quality	1
Total		164

Note: Chapman and Johnson (1995) report 56 data points from the same set of respondents under the same experimental conditions. We included 20 items that they used in both the first and the second experiments.

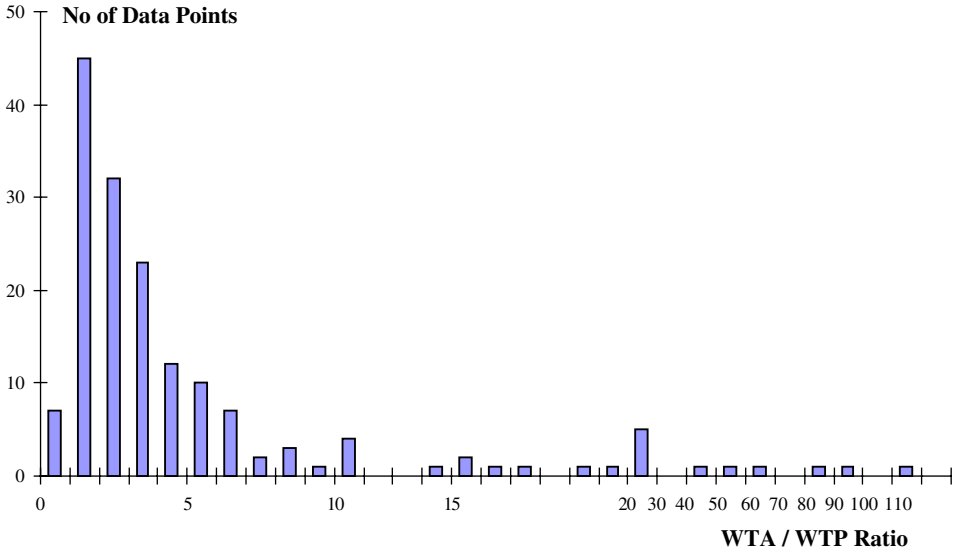

Fig. 1. Histogram of WTA/WTP ratio.

measures. [15] Even though the medians are generally smaller than the means, the ratio of medians is fairly close to the ratio of means. [16]

Using ln(WTA/WTP) as the dependent variable has two benefits. First, using the absolute difference between the WTA and WTP would be inappropriate because this difference depends on the price level of the good. Second, using the natural logarithm avoids the problem of whether to use the WTA/WTP ratio or the WTP/WTA ratio; explained variation and significances of the variables do not change by taking the logarithm of either ratio.

3.1.2. Explanatory variables

For the explanatory variables, we use 17 measures that represent the variables discussed in the previous section. We present these variables in the first column of Table 3, together with the expected direction of the effects. All the explanatory variables are binary. Because some of the explanatory variables represent characteristics of the goods, their classification (hence, each data point) variables could be subjective. Therefore, two judges coded these binary variables independently for all the data points. Initial agreement between the judges' codings was 95%, and all the remaining disagreements were resolved through discussion.

[15] Chapman and Johnson (1995) chose to report the geometric means of the WTA and WTP figures.

[16] We replicated our analysis with a dummy variable representing whether the measure was a median or average; this variable was insignificant and did not affect the coefficients of the other variables.

3.2. Method

We first present the simple correlations of the 17 explanatory variables with the dependent variable ln(WTA/WTP) in the upper panel of Table 2. Simple correlations by definition do not consider the presence of other variables. Therefore, the associations are not as insightful as the regression (our main analysis) results. Nevertheless, about half of the correlations are significant, and for most of the variables, the correlation and the corresponding regression coefficient have the same sign.

The lower panel of Table 2 presents the simple correlations among the explanatory variables; for ease of exposition we present the correlations higher than 0.50 in the table. Looking at these different pairs of variables, it is necessary to distinguish between theoretical and empirical (practical) correlations. For instance, the association between *ownership experience* and *within-subjects design* is not a theoretical one. However, *availability of substitutes* and being a *market good* are conceptually related. Keeping this in mind, we combined four pairs of variables into four new variables (or factors). More specifically, (i) *realization of exchange* and *preference revealing* are combined into *incentive compatible* designs; (ii) *availability of substitutes* and *market good* are combined into *normal good*; (iii) *perceived illegitimacy* and *environmental* are combined into *intrinsic values*; and (iv) *ownership right* and *ownership experience* are combined into *ownership*. [17] When we examine the correlations among the reduced set of 13 variables, there is only one correlation higher than 0.50 which is the correlation between *incentive compatible* and *ownership* ($\rho = 0.53$).

Using this set of 13 explanatory variables and ln(WTA/WTP) as the dependent variable, we conducted an OLS regression analysis. The regression results are presented in Table 3. The coefficient of variation R^2 is 0.44 and the adjusted-R^2 is 0.39. Although the primary concern is the significance of the variables, the resulting explained variation of 0.44 is typical for a meta analysis. Examples of meta analyses include Peter and Churchill (1986) with an R^2 of 0.25, and Assmus, Farley, and Lehmann (1984) with R^2 of 0.59.

3.3. Discussion

Although price stated and risky payoff variables are not statistically significant ($p > 0.10$), all the estimates have the expected signs. Before the discussion of specific variables, the overall picture that emerges from the regression analysis is that all the four effects (rational–economic effects, strategic misrepresentation, emotional effects, and mental reference/framing effects) have a role in the disparity. This implies that the WTA–WTP disparity is not simply due to strategic misrepresentation. We should note here that one should not try to estimate the magnitude of the WTA–WTP disparity for specific cases; for example, when there is iterative bidding and incentive compatibility. The reason is that, for instance, *incentive compatible* designs automatically

[17] We weighted the observations equally (0.5) in combining these pairs of variables. This is consistent with the results of a separate factor analysis where the variables of a given pair have almost equal loadings for the retained factors.

Table 2
Simple correlations

Correlations with the dependent variable ln(WTA/WTP)	
1. Availability of substitutes	−0.24***
2. Market good	−0.36***
3. Learning	−0.23***
4. Price stated	0.06
5. Preference revealing mech.	−0.21***
6. Realization of exchange	−0.30***
7. Iterative bidding	0.02
8. Within-subjects design	−0.01
9. Perceived illegitimacy	0.42***
10. Environmental	0.34***
11. Health related	0.41***
12. Ownership right	−0.02
13. Ownership experience	0.11
14. WTA framed as gain	−0.05
15. WTP framed as gain	0.02
16. Out-of-pocket payment	−0.13*
17. Risky payoffs	−0.04

Pairs of explanatory variables with correlations >0.50		Simple correlation
Availability of substitutes	& Market good	0.74***
Within-subjects design	& Ownership experience	−0.60***
Preference revealing mech.	& Realization of exchange	0.87***
Preference revealing mech.	& Ownership right	0.58***
Realization of exchange	& Ownership right	0.64***
Perceived illegitimacy	& Environmental	0.60***
Ownership right	& Ownership experience	0.68***

* $p < 0.10$.
*** $p < 0.01$.

imply *ownership*, or researchers rarely use *iterative bidding* in *incentive compatible* designs. Be it a theoretical association or merely a coincidence, the end result is that some variables are confounded. For instance, incentive compatibility, vis-à-vis ownership, is neither a "main effect" nor an "interaction" but the two effects are interdependent. This does not create a technical problem, but the reader should interpret it accordingly. We cannot simply set incentive compatibility to 1, and ownership to 0 in order to find the expected WTA–WTP disparity in such a case.

That said, let us first focus on our hypotheses regarding the effects of four design factors. We did not find sufficient evidence for the effect of explicitly stating the price of the good to the respondents. Therefore, Hypothesis 1 was not supported. We note that in all the cases where the price is given, except for one case, respondents are students and the goods are items such as coffee mugs and chocolate bars. One exception is a Smith auction for the density of park trees for which the critical cost (value) is provided to the individuals. In the former case, the respondents already have some price knowledge, and stating a figure may not have an additional effect. It is conceivable that what matters is not the statement of the price, but price knowledge. Price

Table 3
Regression analysis results

Dependent variable: ln(WTA/WTP)			
Explanatory variables		Expected direction of the effect	Standardized estimate
Availability of substitutes	Normal good	–	−0.27***
Market good			
Learning	.....	–	−0.26***
H1: Price stated	.....	–	−0.06
Preference revealing mech.	Incentive compatible	?	−0.32***
Realization of exchange			
H2: Iterative bidding	.....	–	−0.20***
H3: Within-subjects design	.....	–	−0.12*
Perceived illegitimacy	Intrinsic values	+	0.34***
Environmental			
Health related	.....	+	0.18**
Ownership right	Ownership	+	0.18**
Ownership experience			
WTA framed as gain	.....	–	−0.23***
WTP framed as gain	.....	+	0.16**
H4: Out-of-pocket payment	.....	+	0.12*
Risky payoffs	.....	+	0.10
Adjusted $R^2 = 0.39$			

Note: All tests are one-sided except for "incentive compatible designs".
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

knowledge is an unobservable measure but it is partly captured by the normal good variable.

Our results indicate that iterative bidding ($p < 0.01$) and within-subjects designs ($p < 0.10$) reduce the WTA–WTP disparity. There is strong evidence supporting Hypothesis 2, but support is weaker for Hypothesis 3. In conjunction with the finding that incentive compatible designs decrease the WTA–WTP disparity ($p < 0.01$), these findings suggest that individuals are not inclined to reveal their true valuations or preferences unless there are incentives to do so. Hence, behavioral researchers' attention to strategic misrepresentation is well grounded. Considering the fact that revealing true preferences in incentive compatible settings is a learned behavior, and learning is a significant factor in our analysis (see below), researchers should also provide sufficient learning mechanisms in empirical settings.

The effect of the payment mechanism on the WTA–WTP disparity is marginally significant ($p < 0.10$). If the payments are into or out-of-pocket, rather than through tax reductions and other indirect payments, we observe a slightly larger WTA–WTP disparity. So, there is evidence supporting Hypothesis 4. Literature offers evidence for the influence of payment mechanism on mental references and framing (Thaler, 1980, 1985); however, the effect of payment mechanism on the WTA–WTP disparity was not examined before.

As for the other context variables, we provide evidence that the WTA–WTP disparity is smaller for normal goods and for the cases when there is learning ($p < 0.01$ for both). Our findings also suggest that the disparity is larger for goods with intrinsic values and for goods that are health-related ($p < 0.01$). In addition, the disparity is larger when individuals actually own the good, compared to hypothetical ownership ($p < 0.05$). Other significant variables are the gain-loss framing for buying and selling transactions. When selling is framed as a gain rather than a loss, individuals demand a lower WTA, and the disparity is smaller ($p < 0.01$). On the other hand, when buying is framed as a gain, the disparity is higher because individuals are willing to pay less ($p < 0.05$). Relative sizes of these effects imply that the disparity will be higher for the loss–loss condition than for the gain–gain framing. This is consistent with Fisher, McClelland, and Schulze (1988) where the WTA/WTP ratio for the loss–loss condition is twice that of the gain–gain case.

There was not enough evidence for the effect of risky goods or payoffs. Risky goods in our data set are either lotteries or health related items – we have a separate variable for the latter. One possible explanation for lotteries is that increasing risk may aggravate the WTA–WTP disparity, but goods like lotteries may have a lower disparity in the first place (see Camerer, 1995, p. 668). Therefore what we are observing may be the result of two opposite effects. One limitation of the current study is that we do not address varying degrees of risk.

3.4. Technical issues

Anscombe's test does not suggest a heteroskedasticity problem in our OLS regression model. However, the tolerance figures for incentive compatibility and ownership are less than desired; both are around 0.33 (equivalently, variance inflation factors are 3.0). This implies some degree of multicollinearity regarding these two variables. As a further step, we combined incentive compatibility and ownership into a new variable, which may suitably be called *real exchanges*. When we use this variable in the OLS regression and leave incentive compatibility and ownership out, all tolerance figures are higher than 0.50, and significance levels of the coefficient estimates do not change – except, out-of-pocket payment, which was marginally significant, becomes insignificant.

There are some issues one needs to consider regarding the meta analysis tool. The first is the (in)dependence of data points. There are two ways that the data points may not be independent: (i) obtaining valuations from the same set of respondents for different goods (multiple treatment studies); and (ii) reporting results from different sets of respondents – same or different goods – in the same article. As a diagnosis for the possible effects of dependence among some data points, we checked the sensitivity of the parameter estimates to the deletion of observations. We deleted each observation in turn, and obtained a different set of coefficients. We replicated this sensitivity analysis by deleting 5 and 10 observations randomly (with replacement) a large number of times. It turns out that in each of these cases, the variances from the jackknife distribution are quite small, and none or a few coefficient estimates change sign in a small percentage of the

time. It seems that the direction of the effects is pretty robust against the dependence of data points.

The second issue is the weight/significance of each data point in the dataset. The significance of each data point is related to the sample size used in the corresponding study. The samples sizes in our data set range from 8 to 2116. This issue can be resolved by employing a weighted least squares estimation where weights are the sample sizes. [18] The results of the WLS regression are found to be similar to the OLS findings.

The third issue is the possibility of a "file drawer" or publication bias. File drawer problem refers to the fact that retrievable studies may not be a random sample of all studies conducted; in particular, studies that are not published may involve lower statistical significance or no effects (Rosenthal, 1991). Due to the nature of this area, previous studies report similar WTA and WTP values, as well as disparate ones. The histogram of the WTA/WTP ratios in Fig. 1 shows that ratios cover a wide range, and there is no indication of a bias against ratios above or below a certain threshold. Hence, we believe that publication bias is not a serious issue in our case. In addition, the sensitivity analysis mentioned above could be considered as a diagnosis for publication bias as well.

4. Conclusions and future research

The results of our meta analysis suggest that the WTA–WTP disparity is not simply a result of misrepresented valuations but it is also a consequence of context variables affecting the buying and selling values. In a sense, all the variables we examine moderate the WTA–WTP disparity. Our contribution is twofold. First, we examined variables that were not explicitly examined before. More specifically, we looked at explicit statement of the price, iterative bidding, within/between-subjects nature of the design, and in and out-of-pocket payments. We provide evidence that these variables, except for the statement of price, affect the WTA–WTP disparity. Second, our current study integrates and generalizes the effects of previously examined context variables. We provide further evidence on two variables, incentive compatibility and learning, for which the prior evidence is mixed. Our findings are of importance to researchers in terms of design and methodology in measuring valuations.

The present analysis is not without limitations. First, all of the explanatory variables are binary. Some of them, such as riskiness and substitutability, could be formulated as continuous variables. Even the definition of "environmental" has shades of gray. For example, are ecologically produced eggs as environmental as air quality? However, even if it is possible to convert some variables to continuous ones, assigning continuous values for these variables would amplify the subjective nature of the

[18] More specifically, weights should be inversely proportional to the error variance of the dependent variable. Since we use ln(WTA/WTP) as the dependent variable, deriving the weights is not straightforward. We employed a simulation and found that sample size is proportional to the inverse of the error variance.

coding process. The second limitation of the current analysis is that it does not focus on the possible interactions between the context variables. Is the effect of learning or experience higher for health-related goods? How does ownership affect WTA and WTP for environmental goods, such as air pollution certificates, which are traded in the market? Such potential interactions can be introduced into the analysis, based on reasoning or theory.

In terms of future directions in this area, there is a wide array of issues that still need to be explored. Based on prior research and the current analysis, the WTA–WTP disparity seems to be, to some extent, good-specific. The reason for this is not clear. For instance, why do we observe a WTA/WTP ratio of 5 for pens but a ratio of 2 for mugs, under similar experimental conditions? One possible explanation is the degree of ambiguity about the price or the value of the good. This conjecture could be tested by examining the relationship between price uncertainty and the WTA–WTP disparity for a given good at an individual level. Our analysis did not find a significant effect of the explicit statement of the price; yet, we believe that more research will be insightful. Another related research opportunity is to examine how WTA–WTP disparity varies for different types of goods, such as search goods, experience goods, and credence goods (Darby & Karni, 1973; Nelson, 1970).

Another issue is whether the context variables have more impact on WTA or WTP, given that they affect not only the disparity but also the valuation process itself. Because WTA and WTP are good-specific, in order to infer the effects of context variables on these two values, one needs to compare them to a benchmark value measure, such as price (for instance, WTA may decrease relative to price when the design is incentive compatible whereas WTP may remain relatively constant). Alternatively, one can separately examine the impact of each variable on WTA and WTP. For instance, iterative bidding probably affects both the WTA and WTP, but intrinsic values such as health, environmental concerns or perceived illegitimacy would probably have more impact on the WTA value.

WTA–WTP disparity may also depend on the respondents' characteristics. Adamowicz et al. (1993) report a higher disparity for males than for females. On the other hand, Loewenstein (1996) found evidence that females exhibit a stronger endowment effect. It may be interesting to examine gender differences for valuation, and the underlying characteristics of the two genders in that regard. Future research can also explore other aspects of ownership, such as the duration of the ownership (Strahilevitz & Loewenstein, 1998 examine the effect of ownership duration on the valuation of objects).

Another related question is what constitutes ownership? For example, owning a ticket for an event may not be the same thing as owning a painting. Carmon and Ariely (2000) report that WTA–WTP disparity does not depend on whether the respondents actually own NCAA basketball tickets or whether they are told to assume that they own them. Tickets may be considered as means to some other good, and both the actual and hypothetical owners may be valuing the expected utility from the basketball game at the same level, leading to a similar WTA–WTP disparity. It may be interesting to examine the conditions under which hypothetical ownership does make a difference.

Finally, future research may provide an insight into the underlying processes regarding context effects. For instance, how do individuals utilize price information for WTA and WTP valuations? Along the same line, examining new context variables may shed light into the valuation process. One possible context variable is the order of WTA and WTP questions in a within-subject design. Carmon and Ariely (2000) report no order effect for valuation of basketball game tickets; nevertheless, replication of this finding would be insightful.

We believe that our systematic quantitative review of previous research on WTA–WTP disparity opens new avenues for research on the value elicitation process. We hope that the set of issues raised in this paper will provide some guidance for further examination of the valuation process and consumer behavior.

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