

**The Role of 'Property Rights' in Determining  
Economic Values for Environmental Costs and Benefits**

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## **Explanatory note**

The issues dealt with in this report are necessarily technical. Accordingly, the first part of the report is a non-technical summary of the central points arising, akin to a reasonably detailed Executive Summary. What follows are technical chapters which go into more detail on the economic underpinnings of the various arguments. Non-specialist readers will find the Executive Summary alone is probably sufficient for their purposes but they may wish to look at Chapter 3 which draws out various conclusions from the technical chapters. Specialists may find the survey of the technical literature in chapters 1 and 2 of interest, but should also read the non-technical summary.

DWP

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## Non-technical summary

Economic valuation of environmental improvements of damages are central to various decision-making procedures. The most relevant is cost-benefit analysis, which the Environment Agency (EA) uses in various contexts. Ostensibly, economic valuation could also be used in liability contexts to determine the appropriate scale of damages from an environmentally damaging accident, say an oil spill. Valuation is also relevant to setting environmental taxes: the UK aggregates tax and (originally) the landfill tax were both set on the basis of economic valuation studies. Other uses are listed in Bateman et al. (2002).

The conceptual basis for measuring benefits and costs is given by the notion of *willingness to pay* (WTP) and willingness to accept (compensation)(WTA). The idea is that, faced with a good at a given price, any excess of willingness to pay over that price constitutes a net gain, 'consumer surplus' or net benefit to the individual. Faced with a loss, individuals' minimum WTA would be the sum that just compensates them for the loss – they are neither worse off nor better off if they receive the compensation and suffer the loss. In turn, WTP and WTA are firmly linked to individuals' preferences as revealed in the market place. Of relevance to the Environment Agency, and other public bodies, however, is the WTP and WTA notions in what is often, though not always, a *non-market* context. Economists have developed techniques for eliciting WTP and WTA in such contexts.

Until recently, it was not thought to be very important as to which concept was used for valuation purposes. In the context of an improvement one could think of a WTP to secure the improvement and a WTA compensation to forego the improvement. Economic theory suggested that these would not differ much. In the context of environmental damage, it appeared equally valid to ask what individuals would accept by way of compensation to tolerate the damage and what they would be willing to pay to prevent the damage from happening again. As the use of stated preference techniques grew – techniques using questionnaires to elicit WTP and WTA, akin to market research) – so it gradually became clear that the theoretical prediction of  $WTA \sim WTP$  was not true. In such circumstances, it began to matter which measure should be adopted. Even if WTA exceeded WTP by, say, 50%, cost-benefit analyses could be changed in terms of their results. As it happens, recent reviews of the WTA, WTP disparity have shown that the differences can be substantial: WTA/WTP ratios might be anything from 2-20 (see Chapter 2). Moreover, the higher ratios have been found for goods that come close to being 'public goods': goods that when supplied to one group of people are supplied to others because of their collective nature. Clean air and water are examples. As such, the high WTA/WTP ratios affect goods that are within the regulatory overview of the Environment Agency. The WTA-WTP disparity matters. Rather than using WTP measures, as has been fairly standard in cost-benefit analysis, use of WTA could substantially shift the balance of policy in favour of more environmental improvement than would currently be dictated by 'conventional' cost-benefit approaches.

The focus then shifts to explanations for the observed disparity. Several, sometimes complementary, explanations have been advanced. The main ones are shown in the table below. Two contexts are distinguished. The first is where WTP and WTA are

Explanation	Context	
	WTA > WTP for quantity gains (or losses)	WTA for a quantity loss > WTP for a quantity gain
Income effect	WTA-WTP must be small since they differ only by an income effect.	
Income and substitution effect	WTA-WTP could be large if good in question has low substitutability which may be true of public goods	
Questionnaire design	Possible biases in questionnaires may result in more exaggeration of WTA than WTP	
Reference dependency: endowment effect alone		Individuals value £1 of loss substantially more than £1 of gain: 'loss aversion'. Hence WTA > WTP
Mixed substitution and endowment effects		Possibility that endowment and substitution effects co-exist, making WTA-WTP potentially large.
Uncertainty about preferences, and effects of learning	If sellers (WTA) unsure of their preferences they may overstate WTA. If buyers (WTP) unsure they may understate WTP. WTA-WTP widens.	

each used to value a gain (an environmental improvement, say) and each is used to value a loss. The second context is where a gain is compared to a loss relative to some 'reference point' which is usually taken to be the prevailing pattern of property rights, usually seen as the status quo. In this second context, there is some evidence that there exists an 'endowment effect' such that WTA for a loss greatly exceeds WTP for a gain of equivalent 'physical' size. Explanations for WTA being (significantly) greater than WTP then vary. Some suggest that the observed disparities are simply mistakes arising from the failure of questionnaire-approaches to elicit true values. Others suggest that WTA – WTP can be large simply because the goods in question have low substitutability. Others suggest that the endowment effect is present in most contexts.

The empirical testing of these explanations is in its infancy. Accordingly, it is not possible to say which explanations hold the most water. Yet, if, say, the argument that the disparities are artefacts is correct, this matters for valuation and hence for policy. It would not be correct to use 'untrue' valuations. If the argument about substitutes is correct, policy might have to give higher priority to low substitution assets than to those with more substitutes – a view that would accord with many people's intuition that the closer something is to being unique the higher its value.

Choosing the 'right' valuation technique depends on what 'property rights' are ascribed to the status quo and the post-policy context. It is perfectly possible for there to be no defined, or hazily defined, property rights to the status quo and to the post-policy situation. The theory – though it is disputed – suggests that anyone with a right to the status quo should have any damages they suffer, relative to that position, valued using WTA. While this situation is widely acknowledged, it is often the case that WTA is not used to value damages. For improvements the situation is somewhat more complex. If an environmental improvement involves some legal target, it seems logical to argue that people are effectively being given property rights to the improvements. If so, their WTP to secure those improvements would appear not to be the relevant magnitude. Rather it is their WTA compensation to forego the improvement. But, again, WTP is almost universally used to value those gains. In contexts where there is no 'right' to the improvement but a right to the status quo, WTP emerges as the correct measure.

Finally, what constitutes 'rights' is not easy to determine. Reference to the law is the obvious solution, but this is not always clear on the context arising from a planned improvement. Suppose an environmental goal is set but not achieved. If individuals had rights to the environmental context associated with the goal, should they now be compensated for a failure to achieve the goal? In many contexts that is how compensation works (e.g. railway service failures), but it is not clear that the law would uphold such a case in the context of a failure to secure a clean air target, or a climate change goal. There may also be considerable ambiguity in other contexts – e.g. agricultural pollution. Do subsidies confer a right on taxpayers to demand a given level of environmental quality from farmers? Or can farmers argue that they hold the property rights to their land and that, beyond direct compliance with regulations, they have no obligation to taxpayers to do more than this.

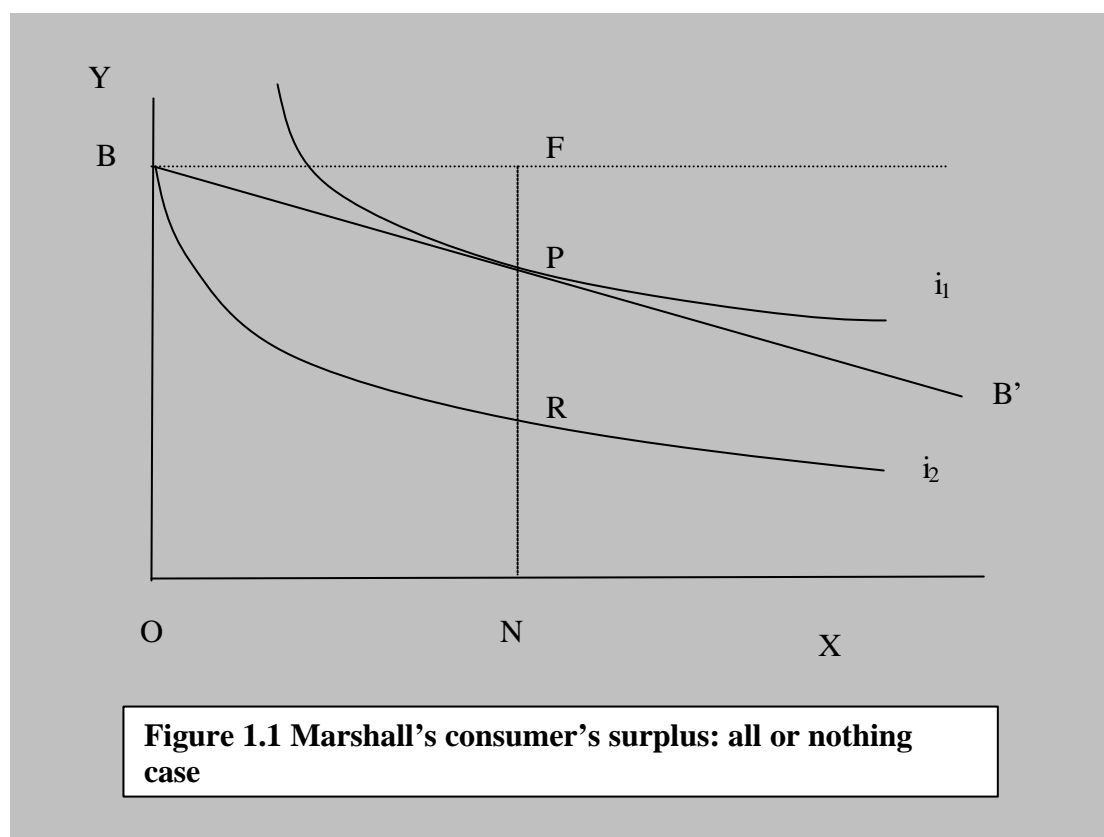
Overall, if, for reasons of difficulty of elicitation, WTA measures cannot be found, regulators and policy makers should be aware that there is an argument for supposing that WTP measure of gain and loss might seriously understate true values.

## 1 Technical report: Measures of consumer's surplus

The WTP vs WTA debate centres on the concept of consumer's surplus. There are several notions of consumer's surplus and it is important to understand these in order fully to appreciate the WTP/WTA debate.

### Marshall's concept of consumer's surplus I

The concept of consumer's surplus due to Alfred Marshall (1920) is illustrated in Figure 1.1, for an 'all or nothing' context in which a good X is made available. What is being compared is the situation with the good and the situation without it.  $i_0$  and  $i_1$  are indifference curves. X is the commodity in question and Y is 'all other goods' or income. The price of all other goods is set equal to unity. The budget line is given by BB' and the slope of BB' is the *absolute price* of X. The slope of BB' is an absolute price not a relative price (the ratio FP/BF) because the price of Y is set equal to one. The consumer goes to point P because this gets him on to the highest possible indifference curve given the budget BB'. So, the consumer consumes ON of X at a price FP. But the *maximum willingness to pay* (WTP) of the consumer is in fact FR because, if he paid this and got ON of X, he would be at point R which is on the same indifference curve as point B, the initial position where he does not consume any of X. In other words, *Marshall's definition of consumer's surplus is the difference between the maximum WTP and the actual price paid.*



## Marshall's concept of consumer's surplus II

The Marshallian notion of consumer's surplus can be extended to a situation when the price of X changes. While this is the case most usually illustrated in expositions of consumer's surplus it turns out not to be the one that is most relevant to environmental contexts. They tend to involve policies or projects that alter the *quantity* of an environmental good. However, it is useful to go through the process of analysing the effects of a price change first.

Figure 1.2 extends 1.1 to the situation where the price of X changes. This also enables us to illustrate Marshall's notion of consumer's surplus in the context of the familiar (Marshallian) demand curve, the one we find in virtually all expositions of the interaction of supply and demand. The top half of the diagram shows the indifference map but this time the budget line swivels out as the price of X falls (for any amount of Y more X can now be purchased). The consumer's equilibrium shifts from A to B, increasing the quantity of X that is purchased. If the price change can be represented as the move from  $P_1$  to  $P_2$  in the lower half of the diagram, then plotting  $P_1, X_1$  and  $P_2, X_2$  traces out the demand curve, the heavy line in the lower half of the diagram. The measure of benefit (welfare change) suggested by Marshall is then the area under the demand curve between  $P_1$  and  $P_2$ .

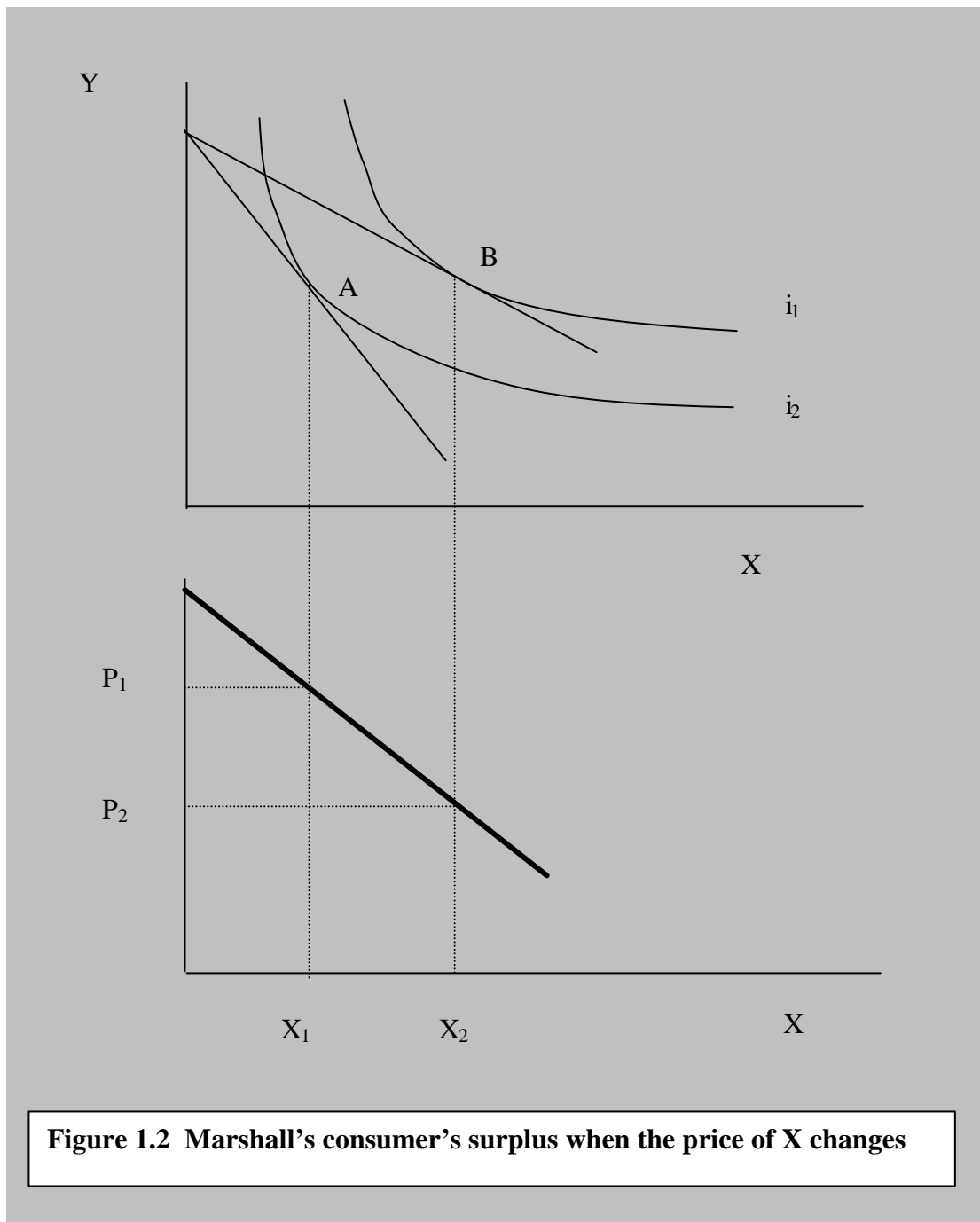
## Hicks's four consumer's surpluses when the price of X changes

Hicks (1943) showed that the Marshallian measure of consumer's surplus is not in fact a true measure of the benefit of a price change. The essential reason for this is that the Marshallian measure holds *income* constant, whereas for a true measure of welfare change it is *welfare* (utility) that needs to be held constant. The issue then is what the reference point is for holding welfare constant. This will become clear as the separate measures are described. Hicks produced four measures of welfare change, two of which hold welfare constant at the pre-change level, and two of which hold welfare constant at the post-change level. But there are two contexts for each measure: one in which prices decrease and one in which they increase. Hence, for the context of a price change, no less than eight notions of surplus emerge.

### Compensating variation (CV)

Consider a price *decrease*. The individual is better off with the price decrease than without it. CV is then the maximum sum that could be taken away from the individual such that he is indifferent between the post-change (new) situation and the pre-change (original) situation. The reference point is the *original* level of welfare.

Consider a price *increase*. The individual is worse off with the price increase than without it. CV is then the compensation required by the individual to make him indifferent between the new and old situations. The reference point is again the *original* level of welfare



**Figure 1.2 Marshall's consumer's surplus when the price of X changes**

*The CV measures relate to a context in which the change in question takes place. In this case they relate to the situation in which the price falls. CV in the context of a price fall thus measures the individual's *maximum willingness to pay* rather than relinquish the price reduction. In the context of a price rise, CV is the *minimum amount the individual is willing to accept* by way of compensation to tolerate the higher price. Note that the implicit assumption about property rights with CV is that the individual is entitled to the pre- change situation.*

### Equivalent variation (EV)

Consider a price *decrease*. The individual is better off with the price decrease than without it. EV measures the sum of money that would have to be given to the individual in the original situation to make him as well off as he would be in the new situation. The reference point is the level of welfare in the *new* situation.

Consider a price *increase*. EV is now the individual's willingness to pay to avoid the price increase, i.e. to avoid the decrease in welfare that would arise in the post-change situation. The reference point is the level of welfare in the *new* situation.

The EV measures relate to a context in which *the price change does not take place*. EV for a price fall is the *minimum willingness to accept* to forego the price fall. EV for a price rise is the *maximum willingness to pay* to avoid the price rise. *Note that the implicit assumption about property rights with EV is that the individual is entitled to the post change situation.*

### Compensating surplus (CS)

The compensating surplus, CS, and equivalent surplus (ES) measures relate to contexts in which the individual is constrained to consume either the new quantity of X (CS) or the old quantity of X (ES).

CS is then defined as the sum that would make the individual indifferent between the original situation and a situation in which he is constrained to buy the quantity of X that results from the price change. If the context is a price *decrease*, then CS is a measure of the *willingness to pay* to secure that decrease. If the context is one of a price *increase*, then CS is a measure of the *willingness to accept* compensation for the price increase.

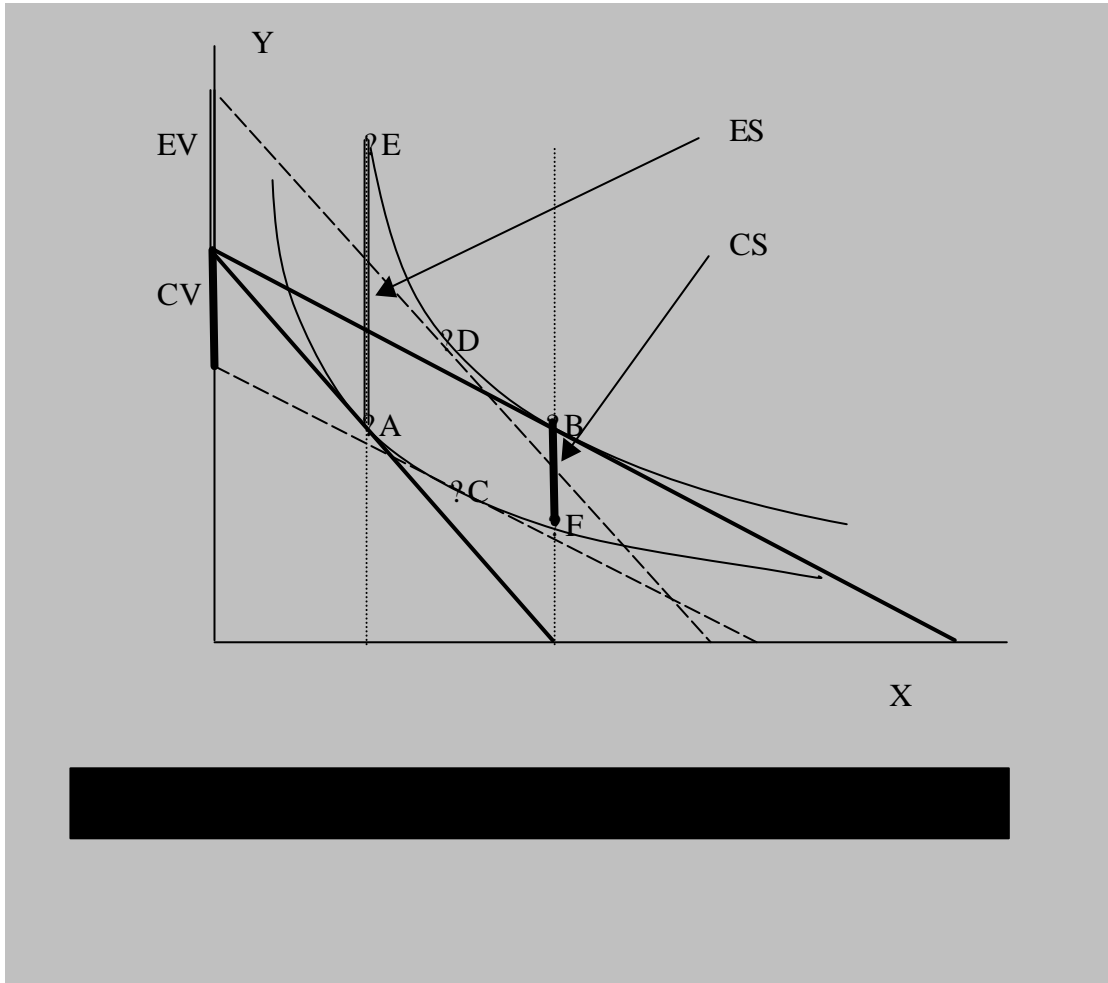
### Equivalent surplus (ES)

ES is similarly quantity-constrained and is defined as the sum that would make the individual indifferent between the new situation (with the price change) and the old situation if the individual is constrained to buy the quantity of X in the original situation. If the context is a price *decrease*, then ES is a measure of the *willingness to accept* compensation to forego the benefit of the price decrease. If the context is one of a price *increase*, then ES is a measure of the *willingness to pay* to avoid the increase.

The concepts can be shown diagrammatically, as in Figure 1.3. Figure 1.3 shows the situation for a price fall. The following relationships hold for equivalent price changes:

- $CV \text{ price fall} = -EV \text{ price rise}$
- $EV \text{ price fall} = -CV \text{ price rise}$
- $EV = CV$  if the income elasticity of demand for X is zero.
- $EV > CV$  for a price decrease if the income elasticity of demand is positive

- $EV < CV$  for a price increase if the income elasticity of demand is positive.



- The higher the income elasticity of demand for X, the greater the disparity between CV and EV

### Consumer's surplus for quantity changes

While the four measures (five, including the Marshallian measure) were developed by Hicks for price changes, they also apply to *quantity* changes. The relevant quantity-based measures were first developed by Mäler (1971, 1974). As noted, quantity change tends to be more relevant for environmental policy and investments which generally change quantities rather than the prices of environmental goods. The relevant measures of surplus are therefore more likely to be the measures of *compensating and equivalent surplus* since these constrain the individual to certain quantities of the goods (Randall and Stoll, 1980).

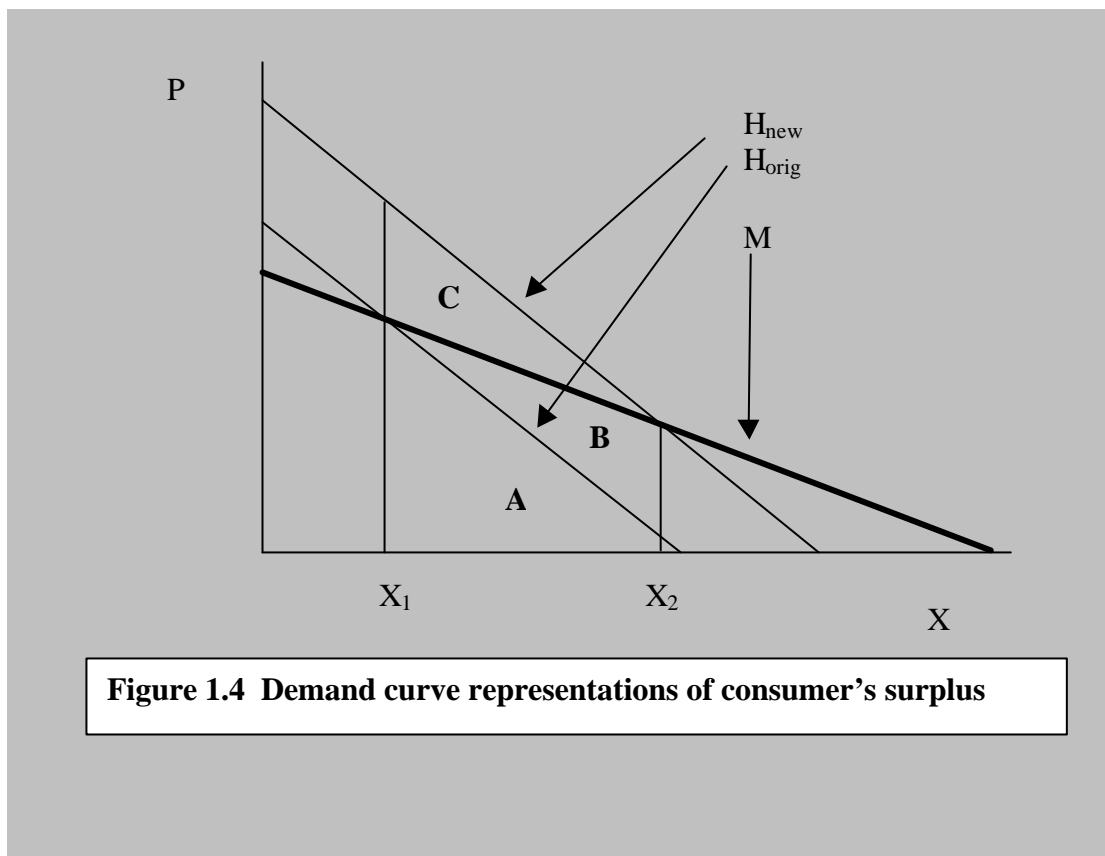
Figure 1.4 translates all the measures so far introduced in terms of demand curves. These demand curves are derived in the same way as Figure A1.2. There are now three demand curves:

$H_{\text{new}}$  is the Hicksian demand curve for the new level of welfare, i.e. where the relevant reference point is the level of welfare that would arise in the situation after a policy change.

$H_{\text{orig}}$  is the Hicksian demand curve for the original level of welfare, i.e. where the relevant reference point is the level of welfare that pertains in the original, pre-change, situation.

M is the Marshallian demand curve.

The strictly correct demand curves are the Hicksian ones, also known as *compensated demand curves*. They are correct because their reference point is a constant level of welfare, whether it is before or after the change in question. The Marshallian demand curve holds income constant, not welfare. *Depending on the magnitude of the difference between these demand curves, which one is chosen could matter for cost-benefit analysis.* There is one situation in which the curves all coincide, and this is



where the marginal utility of income is constant, i.e. the consumer gets the same amount of welfare from an extra unit of income regardless of how much income he has.

Figure 1.4 shows a situation in which the quantity of good X changes from  $X_1$  to  $X_2$ . The relevant measures of consumer's surplus in Figure 1.4 are as follows:

Area A+B = Marshallian surplus (MS)  
 Area A = compensating surplus (CS)  
 Area A+B+C = equivalent surplus (ES)

Note that the following relationships hold for a quantity *increase*:

$$ES > MS > CS$$

And

ES < MS < CS for a quantity decrease.

### Summary of the Hicksian measures and the link to the notions of WTP and WTA

Following Mitchell and Carson (1989), the measures can be summarised as in Table 1.1. The Table also shows the links to willingness to pay and willingness to accept

**Table 1.1 Summary of surplus measures**

	<b>WTP</b>	<b>WTA</b>
<b>Quantity increase</b>	<b>CS</b>	<b>ES</b>
<b>Quantity decrease</b>	<b>ES</b>	<b>CS</b>
<b>Price increase</b>	ES, EV	CS, CV
<b>Price decrease</b>	CS, CV	ES, EV

(WTP, WTA).

Mitchell and Carson suggest that the two CS measures fit most contexts. They argue that the context for policy is usually one where benefits are measured relative to the current state of individuals' welfare. For an improvement in environmental quality, CS is the maximum WTP for that improvement whilst maintaining the pre-policy level of welfare (i.e. the individual is just as well off with the improvement as without it). For any decrease in environmental quality, CS is the minimum compensation the individual is willing to accept to tolerate the reduce quality. In short:

$$CS(q+) = \max WTP$$

$$CS(q-) = \min WTA$$

(where q+ is the quantity increase and q- the quantity decrease).

*The implicit assumption in Mitchell and Carson's recommendation of CS is that individuals have a (property) right to the initial situation. They have no right to the benefit brought about by the policy in question and hence the relevant magnitude is their willingness to pay. But they have a right not to have their existing situation worsened, hence the relevant magnitude in this context is their willingness to accept compensation. But it is feasible to argue that individuals may be deemed to have some right to the 'new' quantity of the environmental good, i.e. the post-policy level. Indeed, this idea is very much at the heart of environmental debates with many*

environmentalists arguing that there are basic ‘rights’ to clean air, etc. As such, it is sensible to retain the notions of ES as well as CS, since ES relates to the context where there is a ‘right’ to the change.

Table 1.2 is an alternative way of presenting the information in Table 1.1 and summarises the all-important connections between the various equivalent and compensating measures, WTP and WTA. For convenience, the CS and ES measures are omitted for price changes, and a minus sign is placed in front of CS and ES for the ‘policy worse’ cases.<sup>1</sup>

$$WTA - WTP = ES - CS$$

**Table 1.2 Summary links between WTP, WTA and equivalent and compensating measures**

<b>PROPERTY RIGHTS:</b>	<b>POLICY MAKES INDIVIDUAL WORSE OFF: PRICE INCREASE or QUANTITY DECREASE</b>	<b>POLICY MAKES INDIVIDUAL BETTER OFF: PRICE DECREASE or QUANTITY INCREASE</b>
<b>RIGHT TO THE STATUS QUO</b>	WTAC TO TOLERATE LOSS CV -CS	WTP TO SECURE GAIN  CV CS
<b>RIGHT TO A NEW SITUATION</b>	WTP TO AVOID LOSS  EV -ES	WTAC TO FOREGO THE BENEFIT EV ES

### **The WTA, WTP disparity: competing explanations**

We are now in a position to investigate the magnitude of any difference between WTA and WTP. We will take it that WTA is observed to be higher than WTP. We then ask if each explanation is consistent with this difference being ‘large’. The competing explanations are best addressed by building up the story chronologically in terms of the development of the various arguments.

**It is important to distinguish two different cases:**

- **The case where  $WTA > WTP$  for a given *increase* in the quantity of some environmental good, and, similarly, the case where  $WTA > WTP$  for a *decrease* in the good. Following Hanemann (1999), denote the WTA -**

<sup>1</sup> This requires recalling the minus signs. For the quantity gain  $WTA - WTP$  is obviously  $ES - CS$ . For the quantity loss, however,  $WTA - WTP = -CS - (-)ES = ES - CS$ .

**WTP differences as  $WTA^+ - WTP^+$  and  $WTA^- - WTP^-$  where the superscripts denote an increase in the good (+) or a decrease (-) ;**

- **The case where  $WTA$  for a *decrease* in some environmental good exceeds the  $WTP$  for the same magnitude *increase* of the good, or  $WTA^- - WTP^+$ . This second case is the ‘loss aversion’ case.**

These contexts will be made clear as the argument progresses.

### **$WTA^+ - WTP^+$ Explanation I: the income effect<sup>2</sup>**

The first explanation concerns the income effect and relates to the first context above, i.e.  $WTA > WTP$  for an increase in a good.

Reference to Figure 1.3 shows that EV and CV (for price changes) differ solely because of differences in (real) income levels<sup>3</sup>. Hence, if we take  $WTA - WTP$  (for price changes) to be equal to  $EV - CV$ , the first explanation for  $WTA > WTP$  is simply that the income elasticity of demand (for X) is not zero. If it was zero, we would have  $CV = EV$ . Generally, the bigger the income elasticity of demand for X, the bigger the disparity between  $WTA$  and  $WTP$  (Freeman, 1993, p57). This suggests that the disparity could be small or big. However, in an influential article, Willig (1976) argued that the disparity must be small, so much so that nothing is lost by adopting the Marshallian measure of surplus rather than a measure based on (unobservable) compensated demand curves. Willig showed how to use information on the income elasticity of demand to ‘bound’ the differences between EV and CV for a price change. Any error in using the Marshallian measure of surplus is proportional to the income elasticity of demand and consumer surplus as a fraction of income<sup>4</sup>. For most realistic cases, Willig argued, the errors are small and of a few percentage points only.

If the income effect is a potential candidate for explaining why  $WTA > WTP$  in a *price change* context, does the argument carry over to a *quantity change*? And if it does, is there a similar argument to Willig’s that would set bounds on  $WTA - WTP$ ? Randall and Stoll (1980) showed that there appeared to be an entirely analogous argument for quantity changes and that a similar explanation for  $WTA > WTP$  applied, i.e. the difference is due to an income effect. Randall and Stoll also suggested similar ‘bounds’ to the disparity  $WTA - WTP$ . The implication was that  $WTA$  cannot differ much from  $WTP$  provided  $WTP$  is a small fraction of an individual’s income (which would usually be the case).

### **$WTA^+ - WTP^+$ Explanation II: income and substitution effects**

The second explanation concerns income *and* substitution effects and relates again to the first context above, i.e.  $WTA > WTP$  for an increase in a good.

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<sup>2</sup> And by implication  $WTA^- - WTP^-$  as well. An income effect refers to the effect that a falling price has on the expansion of the purchasing power (real income) of an individual for that good., even though total (money) income is unchanged. A substitution effect refers to the substitution of the good with the falling price for other goods, income being unchanged.

<sup>3</sup> Since both CV and EV are constructed by drawing hypothetical budget lines parallel to the pre-change and post-change budget lines.

<sup>4</sup> A simplified proof can be found in Freeman (1993), pp 61-6.

Contrary to the implication of the Randall-Stoll proof, Hanemann (1991) showed that there were *two* effects in the quantity change context: an income effect, and a substitution effect<sup>5</sup>. The disparity between WTA and WTP depends on the ratio of the two effects, i.e. an income effect divided by a substitution effect. Hanemann argued that the substitution effect is more likely to influence the disparity between WTA and WTP than the income effect because, whereas income effects are ‘bounded’, substitution effects are not. Hence dividing the income effect by a very small number could produce a large disparity between WTP and WTA.

While Hanemann’s formal proof of these outcomes is complex, they fortunately have a fairly simple diagrammatic interpretation (Hanemann, 1999). Figure 1.5 shows CS and ES for a quantity change. The indifference curves are deliberately drawn in such a way that they are parallel. The interpretation of this is that the income elasticity of demand for X is equal to unity. The substitution effect between Y (all other goods, or income) and X is given by the curvature of the indifference curves. In Figure 1.5,  $ES > CS$ , so  $WTA > WTP$ . In Figure 1.6, the indifference curves are still parallel but they are steeper than in 1.5, reflecting the lower ‘elasticity of substitution’ between X and Y, i.e. considerably more Y is needed to substitute for a loss of X the less X is consumed. The gap between ES and CS has now widened, due entirely to a low substitution effect. In Figure 1.7, the spacing of the indifference curves gets wider the less X is consumed, reflecting an income elasticity of demand for X that is greater than unity.

These three diagrams capture the essence of the argument as to why, in Hanemann’s view, WTA can exceed WTP and by potentially substantial amounts. While the income effect alone can produce  $WTA > WTP$ , the substitution effect is more important. *The less likely it is that an environmental asset has substitutes, the more likely it is that  $WTA > WTP$  by significant amounts.*

### **WTA<sup>+</sup>-WTP<sup>+</sup> Explanation III: questionnaire-related arguments**

The evidence that  $WTA > WTP$  in the environmental context comes from contingent valuation questionnaires<sup>6</sup>. Hence it is possible that questionnaire design, or particular value-elicitation techniques, bias the respondents’ answers in such a way that response to WTA questions are further from the ‘true’ WTA than answers to WTP questions are from ‘true’ WTP. Hanemann (1999) suggests that questions that take an *open ended* format (‘what is the maximum you are WTP, what is the minimum you are WTA?’) will elicit ‘satisficing’ answers, i.e. respondents will provide *an* answer that is ‘good enough’, with the result that they will understate maximum WTP and overstate minimum WTA. Certainly, there is some suggestion that respondents make seek to ‘extract all they can’ by way of compensation rather than state the minimum they require, the latter being the correct welfare measure. Others suggest that WTA

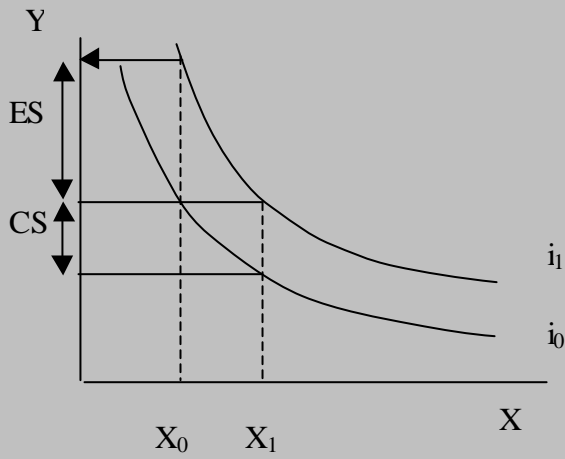
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<sup>5</sup> Randall and Stoll were not incorrect in what they did, but they identified a set of Willig-type restrictions on the WTA-WTP disparity set by the ‘price flexibility of income’, which is the elasticity of the marginal valuation of the good in question with respect to income. This was usually taken to be the same thing as an income elasticity, but Hanemann (1991) showed that it was in fact the ratio of an income elasticity to the elasticity of substitution between the (environmental) good and all other goods in the economy.

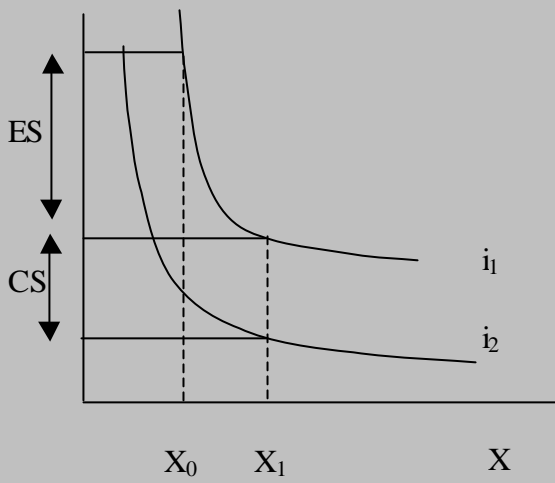
<sup>6</sup> The WTA, WTP disparity is not confined to environmental contexts.

questions are not 'credible' to many respondents, so that their responses may be haphazard. However, even if this is true, it is unclear why this should result in an upwards bias in the average response. Another issue might be the 'one-off' nature of the questionnaire. Coursey et al. (1987) found that *repeating* the survey with the same group of people substantially narrowed the gap between WTA and WTP such that the two converged.

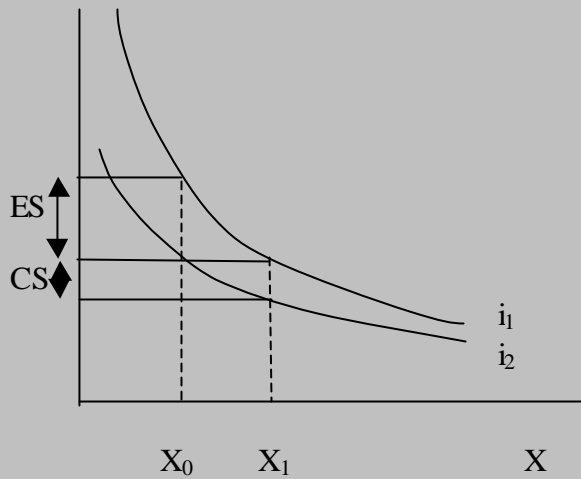
These hypotheses can be tested by looking at samples of contingent valuation studies. Horowitz and McConnell (2002) survey 45 studies. They concluded that:



**Figure 1.5 CS and ES**



**Figure 1.6: X has limited substitutes**



**Figure 1.7: X has income elasticity of demand >1**

- There is no evidence to suggest that particular forms of elicitation produce wider disparities than other forms;
- The use of students as the respondent group did not lead to wider disparities;
- Iteration of the questions with the same group could not be shown to affect the disparity.

Subject to further ‘meta’ studies, the Horowitz-McConnell conclusions would suggest that the  $WTA > WTP$  outcome is not due to questionnaire design.

Diamond (1996) suggests that there is a more fundamental problem with giving credibility to large  $WTA$ - $WTP$  disparities observed in some contingent valuation studies. An individual’s  $WTA$  compensation at income level  $y$  should be the same as the individual’s  $WTP$  at a higher income level  $y+WTA(y)$ . Hence:

$$WTA_y = WTP_{y+WTA(y)}$$

Since  $WTP$  tends to be a small fraction of income and the elasticities of  $WTP$  and  $WTA$  relative to income are not large,  $WTA$  cannot be very different from  $WTP$ <sup>7</sup>. Effectively, this is a restatement of the view that  $WTA$  and  $WTP$  can differ only by an income effect. Moreover, Diamond argues that this remains true despite Hanemann’s (1991) argument that the ‘income effect’ is really an amalgam of an income and substitution effect. Diamond concludes that contingent valuation studies are not, in fact, successful at eliciting either  $WTA$  or  $WTP$ .

#### **$WTA^+$ - $WTP^+$ Explanation IV: Transactions costs**

Randall and Stoll (1980) suggested that transactions and search costs could widen the divide between  $WTA$  and  $WTP$ . For this to be the case,  $WTA$  would have to attract higher costs than  $WTP$  on the  $WTA^+$ - $WTP^+$  context and it is not clear why this should be so. Perhaps the notion of ‘being compensated’ implies some form of uncertainty about the means of compensation and a premium is applied to  $WTA$ . Hanemann (1999) suggests the search costs argument applies ‘even more’ to the loss aversion case (see later), the argument apparently being that search costs are ‘built into’  $WTP$  but not  $WTA$ . Overall, the view that search costs explain  $WTA$ - $WTP$  is unconvincing.

#### **$WTA^-$ - $WTP^+$ Explanation I: reference dependency**

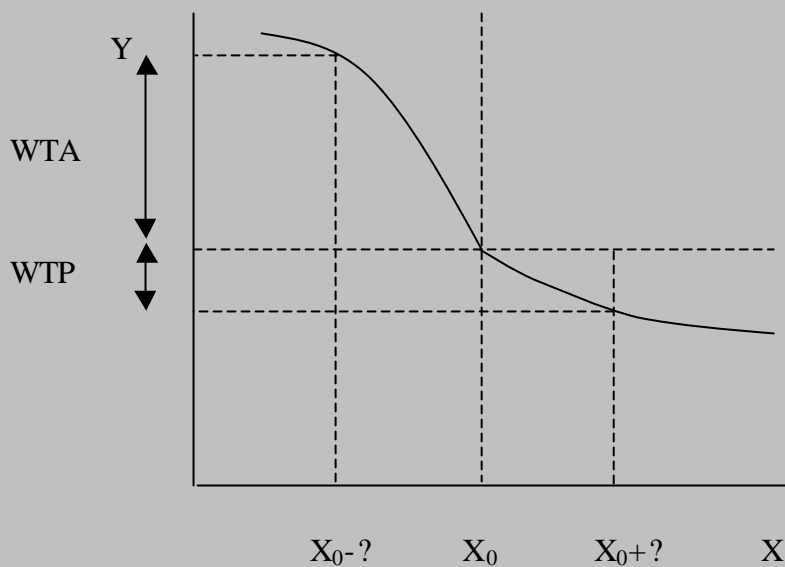
Now consider the context where  $WTP$  for a gain is being compared to  $WTA$  for a loss, the quantity of the gain and loss being equal. This case has produced a substantial literature and has given rise to notions of ‘loss aversion’ and ‘reference dependency’ which, if correct, have major implications for cost-benefit analysis (and demand theory generally). The basic idea behind reference dependency and loss aversion is that losses are weighted far more heavily than gains, where loss and gain are measured equally in terms of quantities. The point of reference for the loss and gain is an endowment point (Thaler, 1980) which is often the bundle of goods, or the amount of a specific good, already owned or possessed, but could be some other

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<sup>7</sup> Swierzbinski (2002) tests this relationship on an early CV study and finds that *estimated WTA* is very close to the mean *WTP* found in the study, but estimated *WTA* using the equation here is considerably less than the calculated *WTA* from the responses to the survey.

point, e.g. an aspiration level. The reference dependency model is owed mainly to Tversky and Kahnemann (1991) and builds on the earlier ‘prospect theory’ work of Kahnemann and Tversky (1979). Another useful early paper is Kahnemann et al. (1990). Many of the seminal works on reference dependency are collected together in Kahnemann and Tversky (2000).

The features of reference-dependency then are that valuations of gains and losses are always *relative* to the reference or endowment point, losses are valued more heavily than gains, and the valuation function exhibits diminishing marginal valuation the further away from the reference point one gets. The effect is to produce an indifference curve as shown in Figure 1.8. The function is ‘kinked’ at the endowment point  $X_0$ . The result is that  $WTA > WTP$ , and depending on the degree of loss aversion, WTA could greatly exceed WTP. The explanation of reference dependency is essentially psychological: advocates of the approach argue that it is an observed feature of many gain/loss contexts, so that theory is essentially being advanced as an explanation of observed behaviour.



**Figure 1.8 A reference-dependent indifference curve**

### **WTA<sup>-</sup>-WTP<sup>+</sup> Explanation II: substitution again.**

Hanemann (1999) argues that the loss aversion, reference dependency argument adds nothing to the substitution effect argument that would explain  $WTA > WTP$ . In Figure 1.9, for example, loss aversion shows up simply because of the curvature of the indifference curve, i.e.  $WTA > WTP$  will be more pronounced the smaller the degree of substitution for X by Y. (Hanemann's view is that reference dependency is nonetheless interesting in a more 'dynamic' context, i.e. one in which one would seek to explain why reference points might actually change).

Whether substitution effects *alone* or an endowment effect *alone* explains  $WTA > WTP$  would now appear to be an empirical issue. Shogren et al. (1994) claimed to show that only the substitution effect is present in contexts where  $WTA > WTP$ , thus rejecting the endowment effect. Their argument was essentially as follows:

WTP and WTA are likely to converge for marketed goods with close substitutes (high elasticity of substitution);

The empirical evidence was consistent with this proposition;

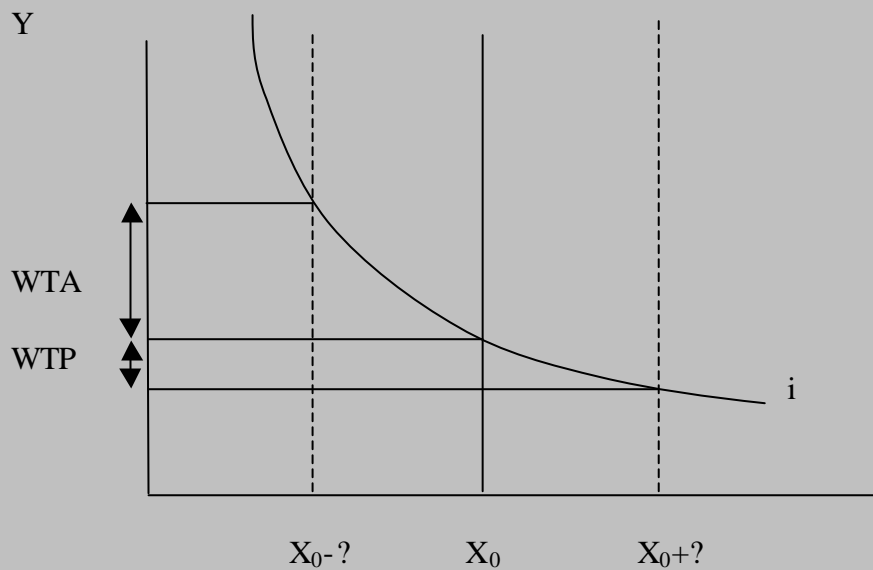
WTA was found to be greater than WTP for goods with low substitutability. If there is an endowment effect, it should show up as  $WTA > WTP$  regardless of the degree of substitutability.

But as close substitutes showed WTA and WTP to be similar, there could be no endowment effect.

Adamowicz et al. (1993) designed an experiment concerning tickets to a hockey game. Part of the sample was informed that the game would be broadcast and part that it would not. The former thus believed there was a substitute and the latter that there was no substitute on offer. Respondents were given WTP questions (how much WTP to purchase a ticket) and how much WTA compensation to sell the ticket. The ratio of WTA to WTP fell from 1.9 in the no-substitute case, to 1.7 in the substitute case, which offers some evidence for the effects of substitution for a familiar, everyday private good.

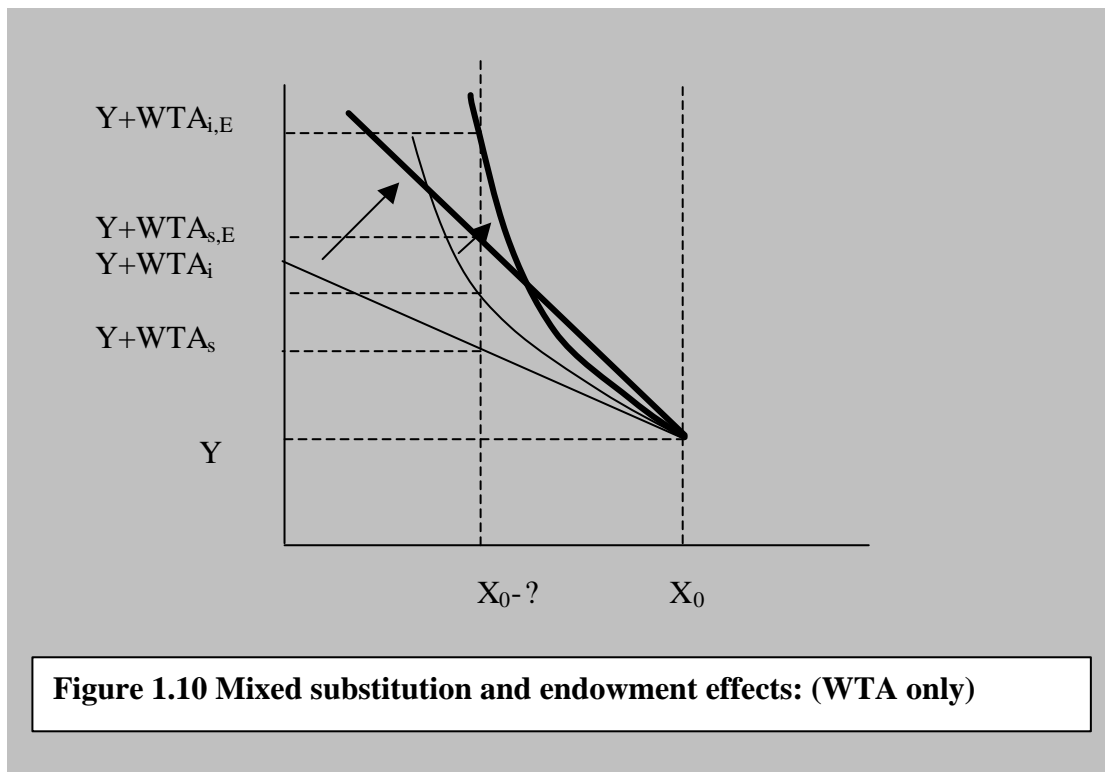
### **WTA<sup>-</sup>-WTP<sup>+</sup> Explanation III: mixed substitution and endowment effects.**

Some authors (e.g. Morrison, 1996; 1997; Knetsch, 1989; Knetsch and Sinden, 1984) have argued that both an endowment effect and a substitution effect explain  $WTA > WTP$ . Effectively, loss aversion magnifies the substitution effect by shifting the indifference curve, as shown in Figure 1.10.



**Figure 1.9 WTA > WTP due to substitution effect alone**

Consider an initial situation  $X_0$ . Prior to being endowed with  $X_0$  the individual's indifference curve is shown by the light curved line (imperfect substitutes,  $i$ ) or by the straight line (perfect substitutes,  $s$ ). But once endowed with  $X_0$  the relevant indifference curve shifts upwards because once he/she 'possesses'  $X_0$ , attitudes to some loss in  $X_0$  (-?) change. The  $i$  curve shifts to the heavy curve and the  $s$  line shifts to the heavy line. Both substitution and endowment effects are present. For the straight line indifference curves, however,  $WTA = WTP$  (imagine the line extending to the right of  $X_0$  to  $X_{0+}$  ?). For the curved indifference curve, there is both a gap in  $WTA - WTP$  due to the substitution effect and a further gap due to the endowment effect (E).



**Figure 1.10 Mixed substitution and endowment effects: (WTA only)**

The obvious problem is how one would distinguish the two effects empirically. What is needed is an experiment in which the various effects – income, substitution and endowment – can be controlled. Morrison (1996) criticises the Shogren et al. (1994) study for failing to consider the possible co-existence of the two effects. She conducts an experiment designed to strip out the substitution effect so that, if any  $WTA > WTP$  remains, it must be due to the endowment effect. A group of people were presented with a WTP question for marketed close substitute goods but were first endowed with a sum of money equal to another group's mean WTA. If an endowment effect exists, WTA should still exceed WTP. Morrison's experiment was not conclusive but did suggest that an endowment effect was present. Mansfield (1999) develops a regression-based approach which permits testing of the relative contributions of substitution, elicitation questions and the endowment effect. She finds some weak support for loss aversion.

Bateman et al. (1997) test for the role played by the reference point in determining preferences. Consider two points, a, b on the same indifference curve. We can write  $aIb$  to mean the individual is indifferent between a and b. But this indifference exists only because of a given reference point, call it r. If the reference point is changed to s, which has more of the good in question, we could have  $bPa$ , where P means 'preferred'. The ranking of a and b have changed with the reference point. Hence an endowment effect must exist if these changes in preferences can be observed when reference points are changed. Bateman et al. (1997) do find this pattern in the responses to their experiment which is strongly suggestive of the existence of reference-dependency. One problem, noted by Bateman et al., relates to the potential for 'laboratory' experiments of the kind they use to diverge from real world experience where repeated choices are made, i.e. would WTA and WTP converge

with more experience? Recall that the Horowitz-McConnell survey found little evidence that this is the case, but other studies find evidence for supposing that, if it exists, loss aversion occurs initially but disappears on learning from repetition of bids (Shogren et al. 2001).

### **Moral commitment as an explanation for reference dependency**

Most of the reference-dependency literature is concerned with the ways in which reference dependency helps to explain observed behaviour. Less of the literature is concerned with what determines the reference point. A few studies (e.g. Boyce et al. 1992, and Anderson et al. 2000) have argued that the reference point coincides with moral responsibility. Once in possession of a given good ( $X_0$  in the diagrams), it is possible that 'selling' the good carries with it some moral concern. It is easy to see that this might apply in respect of environmental goods, since any subtraction ( $-?X_0$ ) from the existing endowment might be considered 'morally' undesirable. Any addition to  $X_0$  on the other hand would not attract the same moral features – there is less moral compulsion to expanding the stock of something that is morally good than there is in reducing that stock.

The notion that the reference point coincides with some moral 'threshold' seems to be borne out in several studies and may do much to explain so-called 'lexical' preferences in which respondents refuse to trade-off environment against other goods. Much is likely to depend on the nature of the environmental good, and, of course, the policy context. For agencies concerned with *improving the environment* much of the loss aversion literature has little relevance. However, it does become relevant when there are explicit trade-offs in other policy areas, e.g. building roads, housing development etc.

### **Uncertainty as an explanation for loss aversion**

WTP is the same as the price at which one is willing to buy something, and WTA is the same as the price at which one is willing to sell it. Kolstad and Guzman (1999) analyse buyer and seller behaviour in an auction, arguing that if buyers are unsure of their valuations, and if information is costly to acquire, then buyers will state a WTP below their true WTP. In the same way, if sellers are unsure of their preferences, stated WTA will exceed true WTA. In this way, any 'natural' disparity between WTA and WTP is further widened. For these effects to hold, buyers and/or sellers must be risk averse. In the context of risk neutrality,  $WTP = WTA$ . The implication is that experience and learning should, fairly quickly, eliminate the disparity as buyers and sellers learn more.

As Hanemann notes, the resulting disparity is between observed (stated) WTA and WTP, not the underlying 'true' WTA and WTP. This raises a policy issue. What matters for policy is true WTP and true WTA, but the literature explaining the disparity between WTA and WTP is, in the main, trying to explain observed disparities, i.e. those emanating from responses given in stated preference studies. The policy implications are (a) that substantial effort is needed to maximise truth-telling in any surveys (incentive compatibility), and (b) possibly that WTP is to be preferred over WTA as a 'conservative' estimate of value.

However, List (2000) conducts an experiment in a real market (baseball sport cards) and found that imprecise preferences fitted the Kolstad et al. predictions perfectly. There was now endowment effect for experienced traders but one was observed for newcomers for whom information costs would have been relatively high. Moreover, Shogren et al. (2001) repeats the earlier Shogren et al. (1994) experiment and found (a) possible existence of an endowment effect at the beginning of repeated trials, but (b) disappearance of this effect as bids were repeated.

### Summary on the disparity between WTA and WTP

This section summarises the fairly lengthy discussion on the WTA-WTP disparity. The issue raised was one of how to explain observed disparities in WTA and WTP, particularly those coming from stated preference surveys of environmental goods. These surveys suggest that  $WTA > WTP$  by multiples that are not consistent with 'received wisdom'. Explanations matter because, as we have some seen, some of them suggest that what is being observed is not a 'real' difference. If, for some reason, the disparity is an artefact of questionnaire design or respondent behaviour, then it would not be correct to adopt those values for policy purposes. Rather, the policy strategy might be to adopt a more conservative approach to value selection. If, however, the disparities reflect genuine features of the goods being valued, or genuine features of individuals' preference structures, then there is a case for looking again at the way in which cost-benefit appraisal and benefit assessment is carried out.

Table 1.3 tries to summarise the central points. It is not easy to derive any central conclusion because the debate continues and, while individual contributors may be clear as to what they think is the dominant explanation, any independent assessment must conclude that there are strong features to most of the arguments presented.

**Table 1.3 Summary of factors affecting the WTA-WTP disparity**

Explanation	Context	
	WTA > WTP for quantity gains (or losses)	WTA for a quantity loss > WTP for a quantity gain
Income effect	WTA-WTP must be small due to income effect: Randall and Stoll (1980); Diamond (1996)	
Income and substitution effect	WTA-WTP could be large if substitution effect small Hanemann (1991, 1999)	
Substitution effect		WTA-WTP could be large Hanemann (1999)
Questionnaire design	Possible biases to 'open ended' WTA and WTP answers such that WTA-	

	WTP widens (Hanemann, 1999). No firm evidence (Horowitz and McConnell, 2000).	
Transactions costs	Possible relevance if preferences uncertain – see uncertainty.	
Reference dependency: endowment effect alone		Bateman et al. (1997) and others find endowment effects. Moral commitment as source of reference point? Boyce et al. 1992, and others.
Mixed substitution and endowment effects		Morrison (1996, 1997) finds endowment effect plus substitution effect.
Uncertainty about preferences, and effects of learning	Imprecise preferences can understate WTP and overstate WTA. Kolstad et al. 1999.  Repeated trials may tend to reduce disparity to point where $WTA \sim WTP$ Shogren et al. 2001 (contra Horowitz and McConnell)	

## 2 Technical Report: Evidence on WTA - WTP

Section 1 assumed that there was empirical evidence to the effect that  $WTA > WTP$  by significant amounts. This section summarises the evidence. One important caveat was noted at the end of Section 1: what is being *observed* are mean stated responses from individuals responding to questionnaires in contingent valuation studies. What is required for policy purposes are the ‘true’ mean values of WTP and WTA. If, for some reason, questionnaires have in-built incentives to understate true WTP and/or overstate true WTA, then the WTA-WTP disparity will appear to be larger than it is. Section 1 observed that uncertainty about preferences, usually combined with positive costs of acquiring information, was sufficient to induce a stated disparity wider than the true disparity. How serious this issue is depends crucially on the incentive-compatible design of the surveys and it is not possible to go through each study to make a judgement on just how ‘valid’ the stated responses are.

Horowitz and McConnell’s (2002) survey has greatly assisted the task of inspecting the various studies reporting WTA and WTP. Accordingly, this section summarises their paper, adding other studies where appropriate.

Horowitz and McConnell find 45 usable studies reporting WTP and WTA. They do not separate out studies dealing with loss aversion from those that deal with moves from  $X_0$  to  $X_{0+?}$  and  $X_{0+?}$  back to  $X_0$ . The ratio of mean WTA to mean WTP (‘the ratio’) was regressed on the following explanatory variables:

- Private or public good
- Hypothetical or real valuation questions (real means actual money was involved)
- Elicitation technique (open ended questions, payment cards etc.)
- Respondents: students or non-students
- Number of observations

The results can be summarised as follows:

*The further away the good being valued is from being an ordinary private good, the higher is the ratio.* Table 2.1 shows the results:

**Table 2.1 WTA/WTP for types of goods**

Type of good	Ratio	Standard error
Public or non-market	10.4	2.5
Health and safety	10.1	2.3
Private goods	2.9	0.3
Lotteries	2.1	0.2
Timing*	1.9	0.2
All goods	7.2	0.9

\* Time at which a good is supplied.

The closer the good gets to money itself, the narrower the ratio. Given the focus of this report on environmental goods that are closest to being public goods, the breakdown of the ratios for these goods is interesting.

**Table 2.2 Ratio of WTA to WTP for public goods**

Type of good	Ratio	Standard error
Miscellaneous public/non-market goods	27.6	7.5
Hunting	10.5	5.3
Visibility	7.4	2.3
Siting	4.1	1.8
Sucrose octa-acetate*	4.0	0.5

\* Bitter but harmless substance used in several experiments

Horowitz and McConnell note the very high ratios for public and non-market goods and suggest this is consistent with Hanemann's view that, since they are likely to have few substitutes, the substitution theory of the WTA-WTP disparity is supported. They also suggest that siting, e.g. of landfill sites, is more akin to a private good and that individuals may have felt they held de facto property rights over them. But they offer no real evidence for this view. Regardless of the explanation, it is worth noting that while the siting ratio is lower than for other goods, it is still 4, which would transform waste site cost-benefit studies.

*Surveys using real goods showed no lower ratios than surveys with hypothetical goods.*

Some surveys use real money or real rewards/sacrifices. The hypothetical nature of the goods in most studies is often thought to impart a bias that would lead the WTA-WTP disparity to widen, but Horowitz-McConnell find no evidence for this.

*Surveys with high incentive compatibility do not produce lower ratios.* There is a widespread suggestion that strategic behaviour on the part of respondents will impart greater disparity on the WTA-WTP relationship, but the study found no evidence for this. Elicitation methods –i.e. the type of WTP/WTA question asked – may or may not affect the disparity.

*Students vs non-students.* It has been suggested that students may be more inclined to produce higher disparity, but no evidence for this was found. High ratios are common to all the public.

*Iteration.* Chapter 2 considered the possibility that disparity arises because studies involve 'one off' valuations which respondents are not required to repeat. This makes them divorced from market-like behaviour where purchase and sale decisions tend to be repeated. Horowitz and McConnell find only weak evidence to support this view.

Horowitz and McConnell note a few studies not included in their survey, but there are others they do not list. A selection is provided in Table 2.3 below.

**Table 2.3 Other selected WTA/WTP studies**

Study	WTA/WTP	Nature of good
Hammack and Brown 1974	4.2	Wildfowl hunting
Shaw and Willis 1982	2.9	Green belt
Anderson et al. 2000	1.5	'Ecological' eggs

By and large, these additional studies support the Horowitz-McConnell conclusions. Wildfowl hunting is closer to a private than a public good because of the existence of priced permits but the value shown here is well below that in Table 2.2. Eggs are, of course, a private good, but 'ecological' eggs (free range etc.) have some public good characteristics. The green belt example would fit into the non-market category of Horowitz-McConnell and hence one might expect the ratio to be significantly higher. However, the Shaw-Willis study is for England and the studies in the Horowitz-McConnell analysis are mainly American. Unfortunately, the sample of studies from the UK and the rest of Europe appears to be too small to separate out results applicable to the UK.

Horowitz and McConnell are clear in their conclusions that (a) the disparities are real, (b) they are not due to questionnaire-related features, and (c) they matter most for precisely the kinds of policy areas this Report is concerned with: public and non-market goods.

### 3 Technical report: the implications for policy and the EA

Chapters 1 and 2 established that there are strong arguments for supposing that  $WTA > WTP$  by amounts that are sufficiently large for the choice between the two welfare measures to make a significant difference to practical decisions. Quite what the explanations are, is open to debate. Some analysts are finding evidence of an endowment effect, other argue against any such effect, and others that such an effect may exist only in an ‘initial round’ of bidding: as experience is gained so the endowment effect disappears. Until we have substantially more tests of the endowment hypothesis, both within and outside laboratory contexts, there can be no conclusive evidence that an endowment effect exists. There are also some doubts about the ‘transferability’ of experimental laboratory-style results to the real world, so that even if endowment effects are observed in laboratory experiments there may continue to be doubts about its application to real-world policy contexts.

#### Summary on explanations for $WTA > WTP$

As Chapter 2 showed, explanations for  $WTA > WTP$  matter.

- If the disparity is an artefacts of stated preference procedures, then some form of ‘calibration’ is called for. One cannot use observed  $WTA$  estimates, for example, if they are not representative of ‘true’ valuations.
- If the argument is that substitution effects dominate and explain  $WTA > WTP$  then the policy focus shifts to identifying contexts in which these effects are likely to be important. The more unique the environment being improved, for example, the lower the elasticity of substitution is likely to be and hence the larger the  $WTA$ - $WTP$  disparity. Opting for the use of  $WTA$  in many contexts would therefore tend to give substantial support to conservation efforts for unique assets.
- If there is a ‘permanent’ endowment effect, then the policy implications are somewhat more pervasive. While not demonstrated in Chapter 2, significant endowment effects would raise fundamental questions about the validity of cost-benefit analysis since welfare measures would depend on whatever the reference point happens to be. The ‘smoothness’ of indifference curves would disappear, with implications for measuring demand functions and hence for measures of surplus. Some authors have already suggested that reference-dependency challenges the very heart of neo-classical economics, the economics that underlies cost-benefit analysis. However, this seems premature given the contradictory evidence on the presence of endowment effects.
- If some authors (e.g. Diamond, 1996) are correct,  $WTA$  literally cannot differ much from  $WTP$  and empirical findings to the contrary raise serious doubts about whether stated preference techniques are actually measuring either  $WTA$  or  $WTP$ .

#### The correct notions of welfare

Regardless of the debate about what gets measured in practice, the substantial part of the literature has established what the correct notions of welfare are for environmental goods. Since environmental policy deals, in the main, with changes to the supply of public goods, the correct notions are:

$$\begin{array}{lcl}
\text{WTP}(q+) & = & \text{CS}(q+) \\
\text{WTA}(q+) & = & \text{ES}(q+) \\
\text{WTP}(q-) & = & -\text{ES}(q-) \\
\text{WTA}(q-) & = & -\text{CS}(q-)
\end{array}$$

Where  $q+$  and  $q-$  refer to the direction of any quantity change, ES to equivalent surplus and CS to compensating surplus.

### Policy contexts and the EA

The Environment Agency is concerned both with situations where  $q$  increases – environmental improvements – and with licensing situations where  $q$  may decrease (e.g. water abstractions, new landfill sites). But it also has to deal with the wider context of more general policy which does not have environmental goals as the main goal – housing development, road building etc. This is sufficient to establish that the EA is dealing with contexts in which both WTP and WTA are likely to be eligible measures of welfare.

### Property rights and WTA, WTP

The rule of thumb for choosing WTP or WTA is:

- Choose WTP for a quantity increase if the individuals in question do NOT have a property right to the post-change situation, but do have a property right to the pre-change situation.
- Choose WTA for a quantity decrease if the individuals in question have a property right to the pre-change situation.

The rules can be stated more comprehensively as in Figure 3.1 below. The figure shows three basic contexts: where there is a ‘right’ to the status quo (the existing level of the public good,  $X_0$ ); where there is a right to at least the existing level and an increase; where there no right to the status quo or any improvement<sup>8</sup>.

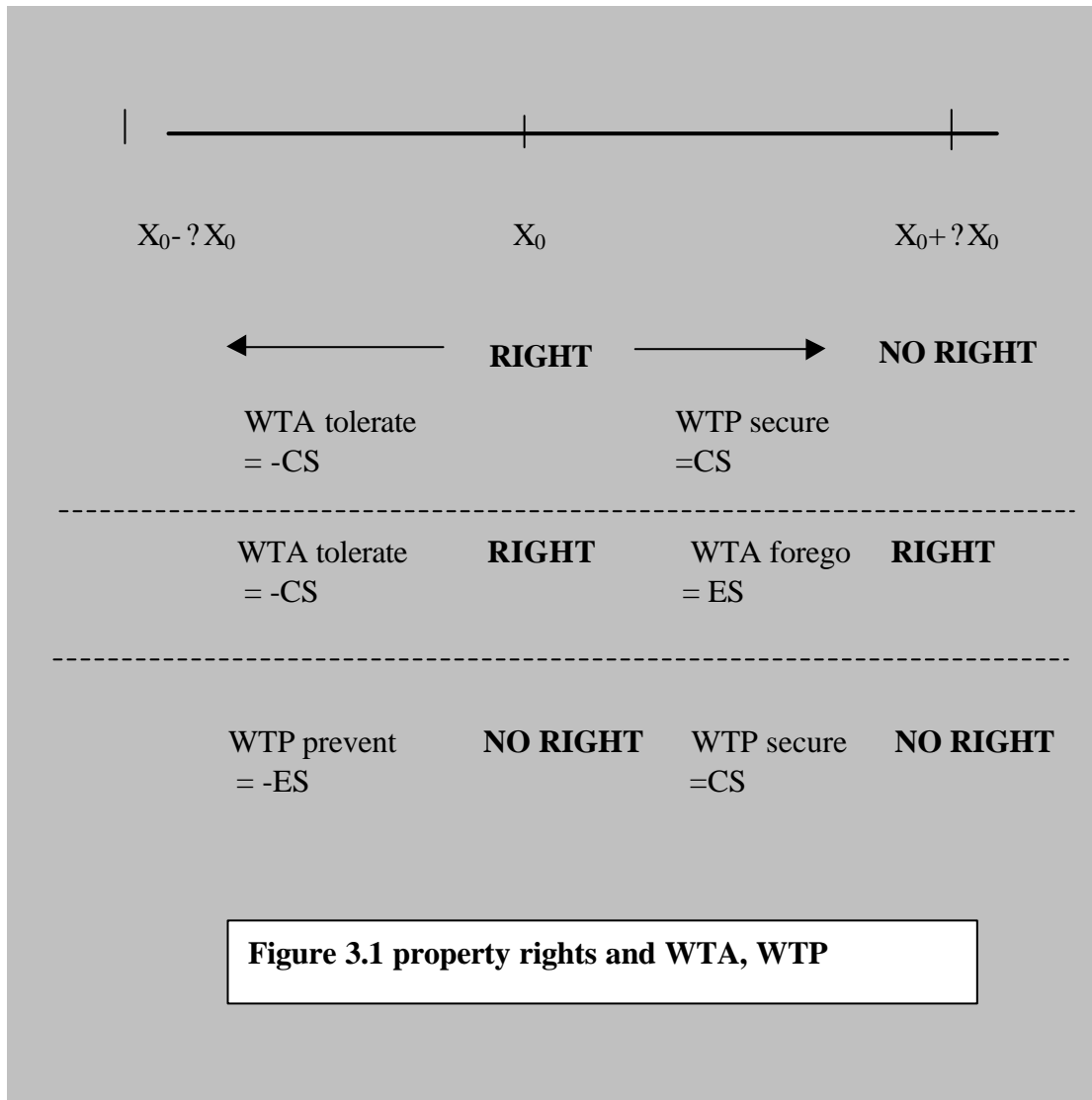
Some examples of how these classifications would be applied in practice are given below (following Freeman, 1993, p89).

#### A new landfill site

Imagine a new landfill site is proposed for a local area. There will be gainers and losers. The losers will be those who would have to tolerate the noise and disamenity from vehicle movements, litter, odour etc, and there would be ‘national’ losers because landfill sites emit greenhouse gases. Gainers would be those who might gain employment, plus a larger class of people whose waste is deposited at the site. We can imagine two sets of potential property rights:

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<sup>8</sup> Mitchell and Carson (1989, pp38-41) propose a different set of links between property rights and WTP, WTA which would substitute WTP (CS) for ‘collectively held’ rights of access to a prevailing level of a good. Their argument is that taxpayers are *already paying* for the good, so that if payments are stopped the good would deteriorate. The (Hicksian) surplus is what individuals are WTP to prevent the deterioration of the good. So, rather than WTA to tolerate the reduction, the Mitchell-Carson classification would substitute WTP to prevent it.



- A set vested in the local residents, the losers
- A set vested in the gainers.

The former implies a presumption against siting the landfill and the latter in favour. The relevant welfare measures are then:

	Potential losers have property rights: (right to status quo)	Potential gainers have property rights: (right to new situation)
Losers (residents)	WTA tolerate = -CS	WTP prevent = -ES
Gainers (disposers)	WTP secure = CS	WTA forego = ES

Now consider an *existing* hazardous waste site with an option of de-contaminating it.

	Waste site owners have property rights	Residents have rights to clean-up
Losers (site owners)	WTA the clean up = -CS	WTP prevent = -ES
Gainers (residents)	WTP secure = CS	WTA forego = ES

## Defining property rights

While it is *reasonably* straightforward to determine the rules about which measure to use given the existence of well-defined property rights, it is far less easy to determine what property rights exist. The reason for this is that ‘property rights’ relate not just to legal ownership of physical assets, but to rights to secure some flow of benefits. In other words, ‘property’ = ‘benefits’ and ‘rights’ refer to the right to secure those benefits without being prevented from doing so. Rights therefore imply a duty on the part of everyone else not to prevent those benefits being secured.

Nonetheless, the obvious place to start is with prevailing legal rules. These establish the legal basis to rights to the status quo, but often also to certain standards of environmental quality. So long as those standards relate to environmental quality levels beyond those currently prevailing, Figure 3.1 and the examples above indicate that the relevant welfare measure is WTA, *not* WTP. For example, in the clean-up example, those who have rights to the clean-up, i.e. the future state of the environment, have their benefits valued by WTA. *Cost-benefit studies of those regulations ought then to adopt the potentially higher valuation implied by WTA rather than WTP.* In the same vein, liability contexts in which laws are developed that confers rights on sufferers and duties of care on polluters, should have damages valued by WTA, not WTP, as Bromley (1995) has pointed out in the context of US liability legislation.

The practical question is how easy it would be to elicit a WTA estimate from valuation studies, which would have to be stated preference studies. Existing WTA studies tend to relate to WTA to tolerate damage rather than WTA to forego an improvement. This, however, is an issue of questionnaire design beyond the scope of this report. But some authors have noted that WTA is the correct valuation technique in many contexts, only to then reject WTA in favour of WTP on grounds of ‘practicality’.

## Practical arguments favouring WTP

The valuation literature has tended to opt for WTP rather than WTA as a ‘consensus’ procedure. Part of the consensus derives, however, from a presumption that there is something not quite credible about answers to WTA questions. The reasons for this were given in Chapter 2, e.g. the potential for exaggerated responses when there is no apparent income constraint on the answer given to a hypothetical question, and potential disbelief among respondents that anyone would actually pay compensation. This view received considerable support from the NOAA Panel (Arrow et al. 1993) in the USA which reviewed contingent valuation and which emphasised the need for

‘conservative’ approaches to valuation. Interestingly, the Panel in fact studiously avoided discussing the issue of WTA measurement. Despite this conservative bias against WTA, there is no real evidence that WTA answers are any more exaggerated than WTP answers. On the basis of a laboratory experiment, List and Shogren (2002), for example, suggest that hypothetical and ‘real’ WTA are very close together.

Overall, policies that improve the status quo environment to some future state to which individuals can be deemed to have property rights would seem eligible for WTA valuations rather than WTP valuations. While there have been some attempts to argue against this on theoretical grounds, the more likely reasons why WTA valuations are unlikely to be forthcoming are practical. These practical considerations need to be evaluated by experts in questionnaire design, but if they are accepted and WTP is chosen instead, it is at least worth remembering that WTP measures could be *understatements* of policy benefits.

## **Public trust and property rights<sup>9</sup>**

How far do current environmental laws embody ‘rights’ to some future state of the environment? In the USA, the ‘public trust’ doctrine has resulted in regulations that make the goal of policy in face of damages, the restoration of the pre-damage state of the environment. This goal is unrelated to revealed or elicited human preferences, but reflects instead legal judgement about the role of Federal government as trustee of citizens’ rights. Moreover, it is also deemed to be independent of cost. What is restored (‘made whole’) is the environment itself, not any baseline level of human wellbeing. The doctrine is clearly definable in most liability contexts: the damage that has to be removed is whatever has occurred, and the relevant baseline state of the environment is that which existed prior to the accident causing the damage. What constitutes a pre-damage baseline is less obvious if the damage has been cumulative over lengthy periods of time, as with much land contamination. It can also be noted that the doctrine removes any need for explicit valuation through WTP/WTA measures. The value of the damage is simply equal to whatever it costs to restore the environment. Cost-benefit is then redundant since benefits are always at least equal to costs!

There are strong signs that something akin to the public trust doctrine has entered into legislation dealing with non-liability contexts. In the USA, for example, the Supreme Court has ruled that the US Clean Air Act need have no regard to cost (the ‘no cost’ doctrine) because Congress did not intend that cost should be a barrier to achieving the health-based goals in the Act. In Europe, standard-setting based on something clearly akin to the no-cost doctrine can be found in the Water Framework Directive and the Habitats Directive (Pearce, 2002). Essentially, environmental goals are set in such a way that only prohibitive cost, or ‘overriding public interest’ can be used to prevent those goals being achieved, and even then offsetting measures have to be taken to compensate for the lost ‘conservation’. The relevance of these public trust, no-cost style doctrines is that they imply some form of right to an improved environment rather than to the status quo. This feature they hold in common with all environmental improvement legislation. But in so far as they relegate cost

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<sup>9</sup> More detail on the arguments in this section can be found in Pearce (2002).

considerations to be comparatively unimportant, they remove the entire purpose of economic valuation of the benefits of such measures. Thus the debate about WTA and WTP is relevant only in so far as anyone wishes to check whether the legislation passes a cost-benefit test. There is no suggestion that cost-benefit should be used to determine the goals in this public trust style legislation. In terms of property rights, fairly arbitrary property rights (in the sense that costs and benefits are not weighed up) are being assigned to individuals concerning the future state of the environment. The goals being set neither acknowledge public preferences nor (generally) cost considerations. But non-implementation of EU law, i.e. a failure to achieve targets set in Directives, is potentially the subject of legal action by the Commission against the offending Member State.

In other contexts, what constitutes 'rights' is not always easy to determine. Suppose an environmental goal is set but not achieved. If individuals had rights to the environmental context associated with the goal, should they now be compensated for a failure to achieve the goal? In some contexts that is how compensation works (e.g. railway service failures are taken to be de facto breaches of contract with government), but it is not clear that the law would uphold such a case in the context of a failure to secure a clean air target, or a climate change goal. There may also be considerable ambiguity in other contexts – e.g. agricultural pollution. Do subsidies confer a right on taxpayers to demand a given level of environmental quality from farmers? Or can farmers argue that they hold the property rights to their land and that, beyond direct compliance with regulations, they have no obligation to taxpayers to do more than this? It is not readily apparent who holds the property rights to the countryside (Hodge, 2000).

## **Recommendations**

The case for using cost-benefit analysis to appraise new regulations remains a strong one. The case is also strong in the context of real investments in infrastructure etc. that affect the environment. Where regulations or investments *improve* the environment, consideration needs to be given to the nature of the property rights in the *post-decision* context. By virtue of the legislation, individuals can be thought of as having been assigned property rights to the new, improved context. If so, the relevant measure of value is the WTA of the beneficiaries to forego the benefit. If, for various reasons, it is thought impossible to elicit this measure, then policy-makers and regulators should bear in mind that WTP measures may well *understate* the benefits being secured.

Where policy or investments *damage* the environment (e.g. roads, airports etc.) consideration again has to be given to the property rights to the status quo and to the post-change context. If potential losers have a right to the pre-change context, then their WTA to tolerate the loss from the change is the relevant magnitude. If potential gainers have a right to the post-change context, then their WTA to forego the change is again the relevant context. Once again, using WTP may understate the benefits (to the gainers) and the costs (to the losers).

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