A Theoretical Model Predicting the WTA-WTP Disparity: Public Policy Implications

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Abstract

A robust finding in economics is that decision-makers often exhibit a much smaller dollar willingness to pay (WTP) for an item than the minimum amount that they claim to be willing to accept (WTA) to part with it. The spread between these two numbers is particularly large for public goods, raising serious public policy concerns regarding which number, if either, is appropriate for valuing such goods. A number of explanations for this phenomenon have been advanced, each perhaps of relevance in particular settings, with little consensus being achieved as to whether any explanation satisfactorily resolves the problem. A traditional utility maximizing model is presented here that predicts that WTA will exceed WTP, quite plausibly by a substantial amount. Moreover, WTA, and *not* WTP, as the latter is traditionally measured, is seen to be appropriate for use in public policy decisions about increases in the supply of public goods. The central argument stems from a failure to properly value public goods by traditional methods. Since individuals cannot individually purchase public goods by generating income, they will under-generate any income that would have been devoted to public goods. The marginal WTP observed for such goods will, as a consequence, be understated in economic and survey data relative to true values. Moreover, the striking disparity between WTA and WTP for public goods provides support for the practical importance of economists' failure to properly value public goods.

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1. Introduction

Subjects in experimental analyses of economic behavior frequently display a large discrepancy between the dollar value they are willing to accept in order to sell an item (WTA) and the dollar value they are willing to pay to purchase it (WTP) (see Kahneman et al. 1990). In an important recent review, Horowitz and McConnell (2002a), hereafter HM, survey forty-five studies reporting on a wide variety of goods and document quite large WTA/WTP ratios.[1]

The observed gap is sometimes believed to be the result of unsound experiments.[2] However, HM find that WTA/WTP ratios either are not affected or are actually higher for 1) real versus hypothetical experiments, 2) incentive compatible elicitation, and 3) the general public, rather than student subjects. The high WTA/WTP ratios are not so readily dismissed.

One general explanation relates to the nature of the goods examined, with Hanemann (1991) pointing out (Harless 1989 providing empirical support) that goods lacking good substitutes in consumption may have divergent WTA and WTP values even if income effects are modest. Although this may explain responses for some goods, it does not explain several existing experimental results.[3] Moreover, in yet another recent paper, Horowitz and McConnell (2002b) argue that a result from Sugden (1999) implies that WTA/WTP ratios of the magnitudes observed "are not consistent with neoclassical preferences."

Of critical interest here is the principle HM result that, "on average, the less the good is like an 'ordinary market good,' the higher is the ratio." They find the highest WTA/WTP ratios for public and

[1] It would seem that the WTA-WTP gap is a somewhat better formulation (the ratio could be small, but the gap large, in terms of the dollars that would be used in, say, a cost-benefit analysis). However, HM's findings are very likely to be robust to this alternative formulation.

[2] The presence of this large gap is one of the reasons that many economists

non-market goods, with ordinary private goods and various forms of money having ratios progressively closer to unity. The model presented below predicts the seemingly anomalous large spread between WTA and WTP, hence the large ratios, for public goods.[4] It should be emphasized, however, that the argument presented here also applies for *new*e n t e 4

public and private goods would appear to be forthcoming. In practice, demand revelation problems led Samuelson to be pessimistic about arriving at such an optimal public good level because of the well-

perfect public good *output* demand revelation setting, we remain in a 2nd best world, because people will fail to optimally generate the income that would have gone toward public good purchases.

Perhaps ironically, in a world of heterogeneous preferences, the more important public goods are, relative to private goods, in one's preferences, the lower will be the observed income. And, as a consequence, marginal WTP for public goods will *appear*

would make them worse off, as seen at U*(too much work) in Figure 1. Similarly, if the labor force is

Figure 1, there would be some new, but sub-optimal, tangency of an indifference curve from this set with the corresponding production possibility frontier.[9]

But, economists do not observe either true preferences or the proper production possibility frontier. In a rational world (but one initially without any government public goods provision) we would observe actual production at AOG_{max} and G = 0, that is, where the dashed production possibility frontier intersects the vertical axis in Figure 2. Such a situation would not persist, because the level of utility with true (Regime 1) preferences would be quite low—citizens would clamor for collective action in providing for the public good. Hence, government would begin supplying the public good, but how much should they supply?

This brings us to Regime 2. As government begins supplying the public good, labor supply will be increased to pay the necessary taxes, and utility will increase as resources are reallocated to provide positive amounts of the public good. But, how do we decide when to stop increasing the public good from zero? Samuelson argued that we should continue to supply the public good until aggregated marginal willingness to pay equals the marginal cost of provision. But, this is flawed as discussed earlier, because we continue to have free riding in input markets, apart from labor supply increases required to pay the higher taxes associated with any existing G provision level. Hence income will be too low at the apparent Samuelson optimum. The seemingly optimal level of satisfaction, *as seen by the economic analyst*, is depicted by the dashed indifference curve in Figure 2 labeled U*. This Regime 2 indifference curve understates the true marginal rate of substitution between ordinary goods and the public good. The true marginal rate of substitution (shown along U_0**) between private and public goods is not being observed at G* in Figure 2, because people are working only enough to pay the taxes for the sub-optimal G provision level.

[9] Note that the production possibility frontier associated with forced labor reductions under the regime in which free riding does not occur is not that depicted in Figure 2. Forced labor reductions without free riding would result in balanced reductions in AOG and G, while free riding only results in reductions in the labor that would have been used to

gaps (or large WTA/WTP ratios) in the literature. The large WTA/WTP ratios for public goods stem from having mis-measured WTP, because input market failures result in income not being generated and spent on public goods.[13] Second, it is clear from the figure that it is the traditionally defined WTA that is closest to the *true* but unobserved WTP. Thus, the appropriate values to use in policy analysis of public goods provision are the much larger WTA numbers.

4. The WTA-WTP Gap: Conclusion and Public Policy Implications

The model presented here predicts the many empirical findings of a large gap for public goods between WTA and WTP. The analysis does not, of course, disprove the existence of other supplementary explanations for a gap between WTA and WTP. However, the implications of the model are derived from a conventional economic individual optimization framework, combined with market failures of traditional sorts. Those with a predilection for resolving anomalous WTA-WTP behavior within a traditional economic expected utility framework might find the present approach preferable as a starting point, invoking other explanations only as necessary in particular market or experimental settings.

The public policy implications of the findings here are pronounced. Reiterating, Graves 2001 and Flores and Graves 2002 provide an argument, briefly sketched here, that public goods will be under-provided if the traditional mechanism (vertical aggregation of WTP at an initial income level) is used to determine the optimal quantities to supply. It should be emphasized that *small* percentage changes in generated income lead to very large percentage changes in public goods provision, since the

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generation of more income, as the value of leisure is re-equated to the marginal values of goods of both types.

[13] As discussed in Graves 2002, the introduction of attractive *new* (previously unavailable) private goods will also result in an increase in the desired income since the purchase of the new good will increase the marginal utility of the (smaller) optimal quantities of the originally consumed goods. Thus, at the new optimum there will be a small optimal quantity of leisure purchased; households will work more. Note further that, if all technological progress merely involved lower costs for existing goods, one would expect steady decreases over time in work effort, as the marginal value of leisure is equated to every lower marginal values associated with the ever-larger quantities of those goods. That hours of work

latter is calculated on a much smaller base. For example, suppose that entirely eliminating free riding in input markets would result in a mere one percent increase in generated income to provide higher quality air or water. That one percent represents $100 billion dollars with a $10 trillion GDP. But that sum would represent a roughly *twenty-five* percent increase in the roughly $400 billion currently spent on air and water quality.

Hence, the substantial under-provision of public goods (and work effort to pay for them) is shown here to provide an explanation for the large measured WTA/WTP ratios for public goods. Indeed, WTP, as traditionally measured, is found to be an incorrect proxy for the true marginal value of an increment to a public good. Rather, the WTA as usually measured provides a better proxy for *actual* WTP (allowing for endogenous labor supply) for an increment to the public good. Conversely, the observed large WTA/WTP ratios for such goods in the literature would seem to imply that the public goods mis-

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