

## Reply to Referee Report 2dp 2014-17-1

Dear Anonymous Referee,

First and foremost of all, I have to say that I am honestly and greatly indebted to you for having gone so thoroughly through my manuscript and especially its mathematical and theoretical aspects. All of your remarks and suggestions are extremely valid and valuable and I will comment on each of them in the following:

**Comment1:**

*I have some sympathy for the approach since it is obvious that the problem of collusion in the gasoline market is interesting, and since the paper introduces a new regulatory response to collusion. As I see it, the tax is in effect a tax on collusive behaviour because, on the one hand, it punishes the inefficiently high price that is the upshot of collusion, and, on the other hand, punishes cartel response to deviations. However, in spite of the fact that I am, basically, positive I think the paper needs an overhaul before a final publication.*

**Reply:** Thank you very much. If the editor-in-chief were to decide in favor of an overhaul-and-resubmit decision I would be more than happy to revise my paper according to your constructive suggestions.

**Comment2:** *In the abstract. State what kind of tax you discuss and why it works.*

**Reply:** I agree, this should be altered my wording “implementation of corrective taxes” is quite vague.

**Comment3:** *From my point of view, you can shorten section 2.1, or maybe simply drop it and incorporate the content in the introduction. You do not really use all the numbers you discuss in section 2.1 anyway.*

**Reply:** This probably depends on the journal’s preferences, e.g. some journals explicitly demand a separate literature review section apart from the introduction – however, I agree with you that it could either be shortened or incorporated into the introduction section.

**Comment4:** *In addition, I would have thought that a literature review deals with papers that are similar to ours. As it stand, the title of section 2.1 is in my opinion somewhat misplaced.*

**Reply:** This also holds true, I guess the literature review in its current form focuses mainly on empirical research papers related to analyzing the gasoline market, and actually does not contain an equal amount of information on literature dealing with other approaches or the kind of tax proposed. So, it really does look a little lopsided from that perspective. So I would agree that the content be better balanced and, maybe, I had better include it in a much more concise form in the introduction section.

**Comment5:** *In section 2.2 I am puzzled by the term saturation level. Equation (2.2) comes from solving  $a - bx = a - s - 1x/2, = x = xsat$ . Why is this a saturation level? It is simply where the two different demand curves intersect. Incidentally, why not discuss the two demand curves in a little detail in order to justify why you have opted for a linear demand curve and a demand curve where the second derivative is negative (meaning that there is an upper limit to demand even if the price is zero).*

**Comment6:** *I have a hard time seeing the exact role of (using your term) the saturation level. Is the idea that we study  $x$ 's satisfying  $x \leq xsat$ ? If yes, this implies that we study  $x$ 's for which  $(x) > D'(x)$ , that is, the demand function  $D''$  is placed above the demand function  $D'$  for  $x$ 's in the relevant*

range. You have to explain the implication of this. I suppose that it is important later on in section 2.3 since you determine the parameter  $b$  using the saturation level?

**Reply:** Going over this section again, looking at it from a third person point of view, I have to say that it actually does appear quite awkward the way I presented it.

To clarify the issue: The whole idea behind it was to not only have a linear demand curve, but also one that holds more elasticity within the upper price range and at the same time more inelasticity within the lower price range than a standard linear demand curve<sup>1</sup>, but still retain the same intersections with the price and quantity axes (that is why the two are connected through the condition stated in equation (2.2)) for better comparison. Also, it is meant to illustrate a situation in which there really is a point at which, although price is zero, demand remains at a certain level (that is where I introduced the strange wording – saturation level) – intuitively speaking, a consumer has only so much distance to travel to work and only so much spare time to make road trips, so other exogenous variables would have to change which could then cause the demand curve to shift outward.

This whole idea has actually been well received at a cartel and collusion researchers' conference that I already presented the manuscript at, even amongst more empirically based researches, so I think the underlying idea itself is fine, but I just presented it badly in the paper and, in addition, confuse readers with my terminology (saturation level).

To sum it up, I would certainly have to go over that section again in case of a revision and not just clarify and rephrase but also probably need to adjust the terminology.

**Comment7:** Incidentally, at this point, in equation (2.3), the restriction on prices,  $0 \leq p \leq 250$ , is not needed. State the restriction in the example were it is relevant.

**Reply:** Sorry about this, I totally agree.

**Comment8:** You write  $MC = c + tE + tU$ . It might give the impression that the marginal cost is fixed. But it is not fixed since  $tU = (xt)$ ,  $i = I, II$ . I think that you should write out the firm's profit in full and then, based on the profit function, discuss the marginal cost. Less important, why not use  $\tau$  (rather than  $\beta$ ) for the ad valorem tax rate.

**Reply:** Good point, I totally agree. Also using the standard notation  $\tau$  for the tax rate is, of course, more than appropriate.

**Comment9:**

In section 2.2.4 I am a little confused with respect to proposition 1. I think that your message becomes clearer by writing the firm's profit under that cartel-tax ( $t_{cartel}$ ) and then based on this expression state two lemmas:

Lemma 1: A tax given by  $t_{cartel} = \dots$  implies:

- a.
- b.
- c.

Proof: see appendix

Lemma 2: Under the cartel tax...

- i.
- ii.
- iii
- iv.

Proof: see appendix In the text you can discuss the most crucial aspects of the arguments given in the proofs.

**Reply:** This suggestion is in line with **Comment8** and, again, I admit that writing out the cartel's tax-adapted profits and then taking it from there really is the clearer and better way to present the analysis.

**Comment10:** *Particularly, I think that you need more text concerning the point about tax fraud (just before figure 2). These suggestions are about exposition only but my guess is that you have more readers if you follow them.*

**Reply:** This is an excellent point. I would certainly follow your suggestion in case of a manuscript revision.

**Comment11:** *Moreover, in comparison to your existing discussion, I think that the lemma/proposition-proof calls for analysis that is a little more formal. As it stands, it is at verbal discussion that cannot go as a proof (in my opinion).*

**Reply:** Unfortunately, this is very true. I really need to go over these sections again. The proof itself should only contain formal aspects which can then be followed by verbal and intuitive elaborations, e.g.:

**Proof of Lemma 1 part (a):** Given that  $a > \frac{c+t^E}{(1-\tau)}$ , and  $b(\tau-1)^2 > 0 \forall \tau < 1$ , unregulated collusive

behavior renders positive profits  $\pi^{cartel}$  of

$$\pi^{cartel}(\tau, a, b, c, t^E) = \tau \frac{(1-\tau)a - c - t^E}{b(\tau-1)^2} > 0. \quad (0.1)$$

Inserting equation (2.4) as well as (T1.11) and (T1.IV) in to equation (2.6) renders  $t^{cartel} \equiv \frac{\pi^{cartel}}{x^{cartel}}$ ,

and, hence,  $\pi^{cartel}(\tau, a, b, c, t^E, t^{cartel}) \equiv 0$ . ■

[...] ← Add possible intuitive or further verbal elaborations here, if necessary.

**Comment12:** *You can collect the findings of the two lemmas in a recap of the existing proposition 1.*

**Reply:** Good idea, I totally agree.

**Comment13:** *I do not have specific comments on section 2.3. But maybe it is a good idea to discuss how different assumptions on numbers affect the looks alike of the tax scheme?*

**Reply:** This is a good point, I probably should do something along those lines – maybe not too elaborate but at least a couple of lines to round it off.

**Comment14:** *There is one comment that applies to the paper as a whole. It seems to be an implicit assumption in the paper that the market for gasoline produce high but stable prices. At least, there is no mention of price wars. There is in fact a large literature on this. From a personal point of view, I think it is all right to ignore this aspect but it might be better to mention that you do so.*

**Reply:** I agree, come to think of it, I only discussed the dynamic price cycle issue (e.g. Noel 2007) in the “results and discussion” section and really do say nothing about price wars. Hence, it would probably best to mention that it is not part of the analysis presented in my manuscript, to name some reasoning why and to refer to relevant literature along the way (e.g. Schendel and Balestra 1969, Slade 1997).

**Comment15:** Finally, make sure that you write *Figure 1* rather than *Figure1*, and *Proposition 1* rather than *Proposition1* and so on.

**Reply:** I am sorry about the mishap. I think it is probably best to have the manuscript proofread again to make sure these issues disappear entirely.

Thank you again for this detailed and at the same time so constructive and instructive review report!  
Sincerely,  
The author

## References

Adelman, M.A. (1978). Constraints on the world oil monopoly price, *Resources and Energy* 1: 3-19.

Dahl, C.A. (2012). Measuring global gasoline and diesel price and income elasticities. *Energy Policy* 41: 2-13.

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Schendel, D.E., Balestra, P. 1969. Rational Behavior and Gasoline Price Wars. *Appl. Econ.* 1, pp. 89-101 [Online source: <http://www.tandfonline.com/doi/pdf/10.1080/00036846900000023> ]

Slade, M.E. 1992. Vancouver's Gasoline-Price Wars: An Empirical Exercise in Uncovering Supergame Strategies. *The Review of Economic Studies*, Vol. 59, No. 2 (Apr., 1992), pp. 257-276 [Online source: [http://www.jstor.org/stable/2297954?\\_redirected](http://www.jstor.org/stable/2297954?_redirected) ]

## Footnotes

[1] The intuitive explanation behind this is given in the manuscript as follows: “In general, demand within retail gasoline markets has proven to be rather inelastic (Haucap and Mueller 2012). However, it is certainly not perfectly inelastic along the entire range of the demand function. Rather, elasticity increases as the price rises (e.g. Adelman (1978)) which is also in line with the findings of Dahl (2011) that have been presented in section 2.1. Intuitively speaking, when gasoline prices are low, consumers’ behavior, e.g. patterns of car usage, will not change significantly when prices fluctuate marginally. Once a significantly higher price level is reached, however, demand becomes increasingly more elastic with respect to price changes, because now people might more often choose to go by foot or take the bike instead of their car, as the opportunity cost of taking the car, just to get to the bakery around the corner, have become considerably higher. And, at the very end, i.e. a price approaching the reservation price, consumers start to switch almost entirely to using public transportation or to a car that runs on a different type of fuel.”