

Ward,RE

From: Schmuhl, Fritz, Springer SBM NL <Fritz.Schmuhl@springer.com>
Sent: 29 January 2014 10:14
To: Ward,RE
Subject: RE: Errors in Tol (2012)

Dear Mr Ward,

Many thanks for your message. Upon receipt I immediately forwarded it and subsequently discussed it with the journal's editor-in-chief, Ian Bateman. In order to give due consideration to this matter may require some time. We hope to get back to you at the soonest opportunity but request your patience in advance as Dr. Bateman currently is traveling until the first week of March.

If you have further questions, please do not hesitate to get back to me.

Yours sincerely,
Fritz schmuhl

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From: R.E.Ward@lse.ac.uk [mailto:R.E.Ward@lse.ac.uk]
Sent: Tuesday, January 28, 2014 2:59 PM
To: Schmuhl, Fritz, Springer SBM NL; Murphy, Catherine, Springer SBM NL
Subject: Errors in Tol (2012)

Dear Dr Schmuhl and Dr Murphy

I am writing to draw your attention to a number of small but significant errors in a paper which was published by the 'Environmental and Resource Economics' in 2012. I believe they require not only prompt correction but also action by the author to make available details of the calculations he carried out so that the rest of his data may be replicated and verified. The paper is now being cited in the media and in policy debates, so the errors could be causing quite widespread damage.

The paper is 'On the Uncertainty About the Total Economic Impact of Climate Change', by Richard S. J. Tol, which was published in volume 53, pages 97-116. The errors occur in Table 1 on page 99 and Figure 3 on page 105, as well as in the accompanying commentary in the text of the paper.

Specifically, Table 1 purports to compile the results published by other authors, but contains two clear mistakes in the column labelled 'Impact (% GDP)', which are also wrongly plotted in Figure 3. These are:

1. The Nordhaus 1994a paper, which is listed in the references as 'Expert opinion on climate change' and published in 'American Scientist', found that a rise of 3°C in global average temperature by 2090 would result in a loss of between 0 and 21 per cent of gross world product, with a mean value of 1.9 per cent and a mode of 3.6 per cent, as shown in Figure 2 in the paper. However, Table 1 of Tol (2012) indicates that the paper found a loss of between 0 and 30 per cent, with a mean of 4.8 per cent. In fact, these figures correspond exactly to the results in Figure 3 of the Nordhaus 1994a paper, which provides the estimates of the likelihood of a high-consequence event from global warming. It seems that Tol (2012) accidentally mixed up the two, and used the wrong numbers.

2. The Nordhaus 2006 paper, which is listed in the references as 'Geography and macroeconomics: new data and new findings' and published in the 'Proceedings of the National Academy of Sciences', presents an estimate of impacts from two scenarios, one which considers warming only and one which includes mid-continental drying as well. On page 3516 of the paper, Nordhaus states that the scenarios are drawn from the IPCC TAR and "have been rescaled to correspond to a 3°C global average equilibrium increase". However, Table 1 of Tol (2012) wrongly lists the Nordhaus 2006 paper as relating to a warming of 2.5°C.

In addition, another likely mistake occurs in the column labelled 'Impact (% GDP)'. It is:

1. The Hope (2006) paper, which is listed in the references as 'The marginal impact of CO₂ from PAGE2002: an integrated assessment model incorporating the IPCC's five reasons for concern' and published in 'The Integrated Assessment Journal', estimates the marginal impacts of a 10 per cent reduction in carbon dioxide emissions. These are calculated from the PAGE2002 model which incorporates regional impact factors listed in Table 5 on page 24 as percentage GDP loss due to global warming of "2.5°C above the tolerable level in each impact sector in the EU, with regional multipliers for other regions". Apart from the EU, regional weight factors are provided for seven other regions, with mean values ranging from -0.35 for Eastern Europe and the Former Soviet Union (the only regional impact factor implying a positive change in GDP) to 2.5 for India. It is important to note that nowhere in the paper does Hope (2006) provide an estimate of the global impact of global warming relative to present day or pre-industrial levels. However, Table 1 of Tol (2009) indicates that Hope (2006) found that the range of global impact on GDP of global warming of 2.5°C was 0.9 per cent, with an "uncertainty" of -0.2 to 2.7. This result obtained from the calculations of Tol (2009) is unlikely to be accurate, given the information provided in the Hope (2006) paper.

I note that these mistakes also appeared in an earlier paper by the same author which was published in the 'Journal of Economic Perspectives' in 2009.

I have been able to verify that five other values (for Nordhaus (1994b), Fankhauser (1995), Tol (1995), Nordhaus and Boyer (2000), and Tol (2002a)) listed in Table 1 and plotted in Figure 3 of Tol (2012) are correct. However, the five remaining data points (for Nordhaus and Yang (1996), Plambeck and Hope (1996), Mendelsohn et al. (2000), Maddison (2003), and Rehdanz and Maddison (2005)) were derived by Tol using his own calculations based on the other authors' work, so I have been unable to verify their accuracy.

I exchanged e-mail messages with Professor Tol in October 2013 about these issues and he eventually confirmed that each represented errors in Table 1 and Figure 3 of Tol (2012). However, he has still not expressed any intention of providing a corrigendum to correct these small errors. Nor has he responded to my request for him to make available the details of his calculations so that I might verify the other data he presented in the paper. Therefore, I have been left with no other choice but to write to you at the 'Environmental and Resource Economics'.

I suggest not only that Professor Tol correct these small errors without any further delay, but also that he makes available immediately the details of his own calculations used to derive the unverified results for the five studies, so that their accuracy can be checked. The curves fitted to the data in Figure 3 will also need to be re-plotted, and the commentary in the text will need to be amended to reflect the updated analysis. Although these small errors appear to be the result of sloppiness rather than a concerted effort to misrepresent other authors' work, I note that the effect of correcting the data would be that only one data point indicates any significantly positive impact of global warming on global GDP.

Finally, I would point out that Professor Tol's reluctance to correct these basic errors in his work is in stark contrast to the positive attitude adopted by Carmen Reinhart and Kenneth Rogoff when they recently learned of similarly sloppy mistakes in their 2010 paper on 'Growth in a Time of Debt'. I do hope that Professor Tol can be persuaded to adopt a more constructive approach to addressing the mistakes in his paper, which are having an impact not just on his reputation but also that of the 'Environmental and Resource Economics'.

Yours sincerely,

Bob Ward

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