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Discussions

Interactive comment on "A synthesis of carbon in international trade" *by* G. P. Peters et al.

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General Comments

The manuscript "A synthesis of carbon in international trade" is a valuable contribution that achieves two important milestones in the literature on embodied carbon flows. First, it provides the first detailed and thorough quantitative comparison between studies on embodied CO2 emissions (that use MRIO models) and second, it quantifies physical carbon embodied in international trade and addresses methodological issues with some comparisons to other work in the literature. The methodological comparisons are particularly useful as different dataset and model setups have been used with little insight to possible sources of variations in results.

My main criticism of the paper is that it appears too long. I don't know the length restrictions of this journal but the paper often reads more like a report than a journal

publication. Some methodological comments and results are repeated several times. I have provided explicit examples in the specific comments below. My feeling is that the text could probably be shortened by a quarter and significantly streamlined.

Conceptually, it is important to acknowledge and make it very clear that IO models ATTRIBUTE physical flows to certain economic activities. The authors rightly point out the different definitions of 'consumption' but another important difference between mass-balance/MFA approaches and IO is that the first takes into account physical relocation whereas the second does not really (though there is a link of course). A comment on this should be included somewhere.

Apart from that only some minor issues need attention as outlined below. I recommend publication after these and the length issue have been addressed.

Specific comments

Referring to line numbers ABOVE page numbers.

L20, p3952: maybe mention here that you will provide a more detailed explanation of 'apparent consumption' in the methods section.

L22, p3952: "... we are not aware of other analyses of physical flows of carbon that have used the more detailed and established models that have been developed and used to model embodied emissions." > one has just come out (Bruckner et al., in press) and I think one from the same author team is forthcoming in JIE. Please compare results.

L2, p3953: "... previous studies that use "apparent consumption"..." > I wonder (but not totally sure) whether there are some more MFA/DMC studies that would fall under this category?! Please check e.g.: Steger and Bleischwitz, 2011; Steinberger et al., 2010; Schandl and West, 2010; Dittrich and Bringezu, 2010; Muñoz et al., 2009; Giljum et al., 2009; Bringezu et al., 2004; Weisz and Schandl, 2008.

Section 2.1.1.: important and very useful to have these definitions and examples!

L3, p3957: > "Exports. . . including the domestic supply chain only." > why only domestic supply chain? A full MRIO should include inputs from domestic and foreign economies to produce exports?

L15, p3958: "... this can be allocated in a variety of different ways..." > how for example?

L8, p3959: rather than saying "emissions ... end... at" I would say 'emissions are allocated to'. The emissions actually don't move along the supply chain, they are just attributed to an activity.

Section 2.2.4: at what resolution are the crop data? Just total crops? Maybe a list of the crops could be included in an Appendix.

Section 2.2.5: what were the " additional calculations."?

Bottom of page 3962: You Could add that global totals need to be the same.

First para on page 3963: Para seems to say the same thing several times! Please prune!

p3963: I don't understand what is meant by "... this involves the method of compiling the data into an allocation model"?

Last para on page 3963: this para is not well written. Please rephrase and be clearer.

First sentence of section 3.2: Delete sentence. You can and have to be much more succinct. There is too much repetition.

First sentence of section 3.2.1: It's about the sixth time I'm reading this sentence!

L11-15, p3967: yes. good.

Top of p3968: NAMEA has been defined before.

Last para on page 3969: pls clarify. do you mean differences in direct emissions?

Section 3.2.2.: First Sentence superfluous.

First line of page 3971: "... this thereby reduces the overall VARIATION IN consumption-based estimates". I think?

L9, p3971: it would be appropriate to cite Lenzen, 2011 here as well.

L19, p3972: ...using a comparison BETWEEN GTAP7.0 and GTAP7.1

L3, p3974: "... the variation in economic data may not be that important for consumption-ased estimates...". True for NATIONAL footprints, but might be different at sector level.

Section 3.3. there is some duplication here as well. Not sure where this would be best placed but I think this could be streamlined, moved upfront or incorporated into the text.

L24, p3975: is there no MFA study about fossil fuels?

First lines on p3979: How much of that is embodied and how much is actual physical trade?! This is important to distinguish.

L1-3, p3981: this (good) example could be mentioned earlier

What is VXMD??

L8-10, p3985: Again this is embodied carbon and not actual carbon as some would go into waste.

P3987: "... Figure 12 shows the top-10 trade flows for CARBON IN HWPs, crops, and livestock..."

P3989/3990: carbon in office paper example appears twice > shorten

pen-ultimate paragraph: "... we consider a higher level of processing...". You Could also say 'more intermediate steps', 'longer supply chains'.

Discussion and conclusions. Much text in discussion and conclusions is repeated!

Table 3: Make clear that these are TERRITORIAL emissions

Table 8: I don't understand "... consumption of fossil fuel carbon (hence the production of emissions)..." Can you rephrase?

Fig 11: Very useful, definitions are important, i.e. Important to mention that differences are expected.

References

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