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Justice and cost effectiveness of consumption-based versus production-based approaches in the case of unilateral climate policies

Karl Steininger [a,*], Christian Lininger [b], Susanne Droege [c], Dominic Roser [d], Luke Tomlinson [e], Lukas Meyer [d]

[a] Department of Economics and Wegener Center for Climate and Global Change, University of Graz, Austria
[b] Wegener Center for Climate and Global Change, University of Graz, Austria
[c] SWP – German Institute for International and Security Affairs, Germany
[d] Department of Philosophy, University of Graz, Austria
[e] Department of Politics and International Relations, University of Oxford, United Kingdom

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ABSTRACT

In recent years, climate policy under the United Nations system has been characterized by bottom-up, national approaches to climate mitigation. This raises concerns about the overall effectiveness of these mitigation policies, for example due to carbon leakage. In response to these concerns, authors have repeatedly suggested that policy makers consider a consumption-based climate policy approach. We analyze the potential merits of a switch to a consumption-based policy approach using the criteria of justice and economic efficiency. We argue that emissions must be understood as being contributed by both, consumers and producers, but that this fact does not by itself settle the question whether consumption or production ought to serve as the climate policy base. Rather, the perspective of justice necessitates an analysis of the distributive consequences of switching from a production- to a consumption-based policy.

We find that both (global) cost-effectiveness and justice can be improved if the unilateral climate policies of industrialized countries are based on emissions from consumption. There are preconditions, however, the switch in the policy base must be accompanied by clean technology transfer, and if implemented by border carbon adjustments, import tax revenues need to be channeled to developing and emerging economies. We further show that in such a setting, export rebates are of minor importance for efficiency and justice.

1. Introduction

Emissions raise the atmospheric concentration of greenhouse gases at the global level, wherever they are emitted. The environmental impact from any unit of emissions is the same whether it is emitted when heating a private home in Europe from either domestic fossil fuels or imported ones, or for producing a unit of aluminum for use in a manufacturing process on a different continent (e.g. to produce a car, which may be later delivered to Europe). Accordingly, three different perspectives have been identified for tracking greenhouse gas emissions, which relate to three different accounting principles (or 'responsibilities'). First, one can account for emissions at the point of production (production based accounting), irrespective of who ultimately uses the good, where it is used, or where the inputs originate from. This is the accounting principle currently implemented under the United Nations Framework Convention on Climate Change (e.g. UNFCCC, 1992, 1997). Second, one can account for emissions at the point of consumption of goods and services, attributing all of the emissions that occurred in the course of production to this consumption (consumption based accounting; e.g. Peters and Hertwich, 2008b). Third, one can account for the fact that emissions are enabled by supplying fossil fuels, irrespective of where these emissions ultimately occur in production (or where those goods are consumed). As providing fossil fuels to the world markets generates income, this perspective has recently been termed income-based emission responsibility (Marques et al., 2012). Some of the investigations into carbon and fuel trade

* Corresponding author at: University of Graz, Wegener Center for Climate and Global Change, Brandhofgasse 5, A-8010 Graz, Austria. Tel.: +43 316 380 8441; fax: +43 316 380 9830.
E-mail address: karl.steininger@uni-graz.at (K. Steininger).

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balances have suggested switching the accounting principle or combining production-based accounting with consumption or income-based accounting (Andrew and Forgie, 2008; Peters and Hertwich, 2008a; Marques et al., 2012). We focus on the most prominent of these, which suggests fully or partly applying the *consumption-based* accounting principle.

For a single country integrated via trade in the world market, the application of different accounting principles results in different national emission levels. The difference between consumption- and production-based emissions is the 'net carbon trade balance'. It is determined using data on worldwide trade flows in goods and services, taking into account the respective implicit carbon content (carbon embodied in goods, also termed "virtual carbon", e.g. Atkinson et al., 2011). The magnitude and direction of the net carbon trade balance vary considerably across the globe. Industrialized countries tend to be net importers of carbon, whilst emerging and developing countries tend to be net exporters (e.g. Peters and Hertwich, 2008a; Davis and Caldeira, 2010; Atkinson et al., 2011; Peters et al., 2011). 23% of total global fossil-fuel CO_2 emissions in 2004 were emitted during the production of goods that were ultimately consumed in another country (Davis and Caldeira, 2010).

We illustrate the two accounting principles in Fig. 1 with two regions: one that follows a carbon abatement policy (the policy region, denoted by A (for abatement)) and a second one that does not (the non-policy region, denoted by N).

Region A produces goods for both domestic supply (related emissions together with direct emissions from the household sector are denoted by H_A) and export (related emissions denoted by X_A). The same holds for region N. For simplicity, we assume that export production does not use imported intermediate inputs, i.e. there is no through-trade. According to the production-based principle, the sum of H_A and X_A is the accounting basis for the emissions of region A, while the sum of H_N and X_N is the basis for region N.

If we are interested in the volume of emissions ultimately triggered by the consumption of goods and occurring in either one of the two regions, then region A′ home production and its imports are the relevant basis. We thus add up H_A and X_N for the consumption based emissions of region A, and correspondingly for region N (see Fig. 1).

While both regions could be industrialized or emerging economies, we consider – without loss of generality – region "A" (the policy region) as consisting of (a fraction of) industrialized countries, and of "N" as emerging and developing economies (and the rest of the industrialized countries). In Fig. 1, the consumption based emissions for region A are larger than production based

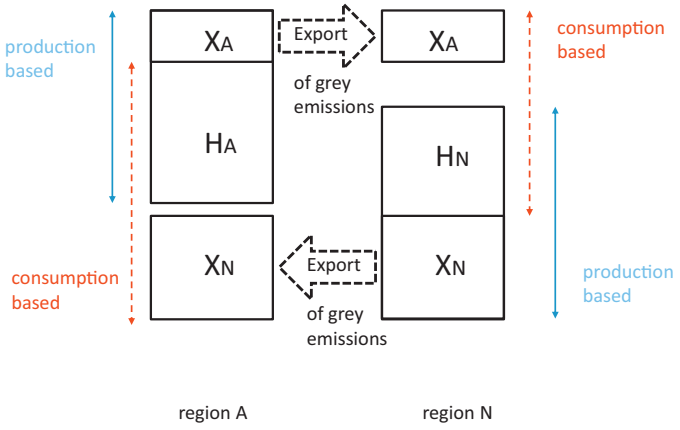

Fig. 1. Emission accounting concepts.
Note: The figure is a simplified representation, neglecting through-trade.

ones. The reverse is true for region N, depicting the current difference between industrialized and developing countries.

Consumption-based accounting is regarded as favorable in two lines of literature. First, in the literature on emissions embodied in trade, some authors argue that it is "fairer" to make countries either partly or wholly responsible for the emissions of their domestic consumption, rather than just their production-based emissions (Munksgaard and Pedersen, 2001; Ferng, 2003; Bastianoni et al., 2004; Peters and Hertwich, 2006). Adding to this concept, the application of consumption based accounting is regarded as a means of dealing with the increase of carbon imports by industrialized countries following international division of labor. The trade flows of these imports increase emissions in countries without binding mitigation policies and therefore add to a trend of growing greenhouse gas emissions globally (Peters and Hertwich, 2008a,b; Nakano et al., 2009; Wiedmann, 2009). Peters and Hertwich (2008a,b) regard this trend as (weak) carbon leakage.

Second, the relocation of greenhouse gas emissions as a direct consequence of climate policy implemented only in part(s) of the world ("strong" carbon leakage) has triggered a discussion on means to mitigate this leakage. Among the most relevant of this strand is the literature on border carbon adjustments for countries with unilateral climate policy measures, which discusses adjustments at the border for imports *and* for exports, which, if applied based on the carbon crossing the border, produces a switch to a consumption-based policy approach in order to avoid (environmental) competition between clean home and dirty foreign products. Such a full border carbon adjustment departs from climate policies that address domestic production and first adjusts the price of imports from non-policy regions for the carbon costs that are incurred on domestically consumed goods. Second, it also exempts exports to non-policy regions from the carbon cost on domestic production (see Fig. 1 for illustration of the trade flows). If applied to all products according to their true carbon content the final application of the climate policy is the same as if the country uses a consumption based accounting for its policy in the first place. However, border carbon adjustments are mostly called for by industry and politicians as a means of addressing the risk that unilateral climate policy action might lead to a loss of competitiveness and to deter free riding on international climate action by non-policy regions (Clapp, 2010). They are not discussed as a tool to correct the accounting basis. Many analyses doubt their effectiveness or political feasibility as a tool against carbon leakage or loss of competitiveness (e.g. Böhringer et al., 2010a,b; Droege, 2011a,b; Fischer and Fox, 2012). Still, given that border carbon adjustments appear to be a relatively quick and flexible method of changing the accounting basis, we analyze the introduction of these measures and ask whether they are a distributionally fair and effective policy measure for achieving this end.

We also take into account the fact that the debate on consumption- versus production-based accounting (including the leakage debate) is accompanied by strong moral intuitions. It could be argued that, because consumers are the ultimate beneficiaries of a good or because they are the driving force behind the good's production, responsibility for any emissions caused in the production of the good falls on them. Conversely, one could argue that producers have a share of responsibility, too, since these actors benefit from selling goods and because it is their choice to engage in the production of emissions (on these various aspects, see for example Ferng, 2003; Weisbach, 2010, 19; Lenzen et al., 2007, 35). A unilateral shift of the policy base from production to consumption brings up additional justice concerns. If a policy region includes imports in its climate policy base, is it simply doing so to protect its industries? If the non-policy region consists of developing and emerging economies, this can be perceived as