CARBON LEAKAGE: THE IMPORTANE OF OPEC'S BEHAVIOUR

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Overview

Without world-wide cooperation to reduce CO2 emissions, some countries have nevertheless introduced national or regional climate policies. One major problem with unilateral action, however, is the risk of carbon leakage, i.e., the relocation of emissions to regions and countries without climate regulations. Most numerical studies seem to conclude that a major share of the leakage takes place through price changes in the international fossil fuel markets.

The EU has decided to allocate free allowances to sectors exposed to leakage, with substantial allocation levels to the most exposed industries up to at least 2020. Another supplemental policy discussed to combat carbon leakge, is border tax adjustments such as carbon tariffs (i.e., tariffs on the embodied carbon in imported goods) and export rebates. So far, however, such measures have not been implemented in any country. Measures to reduce carbon leakage have been analyzed in e.g. Böhringer et al (2010, 2011), Bernard et al (2007), Fischer and Fox (2009) and Mattoo et al. (2009). For an early theoretical contribution on leakage, see Hoel (1996).

Most studies on carbon leakage so far have assumed competitive behaviour in international energy markets. Thus, they have disregarded that the oil market is significantly influenced by the behaviour of OPEC. There is a large literature on OPEC behaviour (see e.g. Alhajji and Huettner, 2000b; Smith, 2005). Although the conclusions from this literature is rather mixed, one quite clear conclusions is that OPEC does not behave as a competitive producer.

The purpose of this study is to investigate whether OPEC's behaviour has substantial influence on the extent of carbon leakage when the EU or other industrialized countries implement climate policies. That is, are the leakage rates much changed when we replace the competitive behaviour assumptions with alternative assumptions about OPEC's behaviour? Furthermore, does policies to reduce carbon leakage have more or less of an impact when we alter the assumption about OPEC?

Methods

We use a generic multi-region, multi-sector CGE model of global trade and energy established for the analysis of greenhouse gas emission control strategies (see, e.g., Böhringer et al., 2010). The CGE model is based on the GTAP 7.1 dataset which includes detailed national accounts on production and consumption (input-output tables) together with bilateral trade flows and CO_2 emissions for up to 112 regions and 57 sectors (Badri Narayanan and Walmsley, 2008).

CGE models build upon general equilibrium theory that combines behavioural assumptions on rational economic agents with the analysis of equilibrium conditions. Our model features a representative agent in each region that receives income from three primary factors: labour, capital, and fossil-fuel resources. Labour and capital are intersectorally mobile within a region but immobile between regions. Fossil-fuel resources are specific to fossil fuel production sectors in each region. Final consumption demand in each region is determined by the representative agent who maximizes welfare subject to a budget constraint with fixed investment (i.e., a given demand for savings) and exogenous government provision of public goods and services. Consumption demand of the representative agent is given as a CES composite that combines consumption of composite energy and an aggregate of other (non-energy) consumption goods. Bilateral trade is specified following Armington's differentiated goods approach, where domestic and foreign goods are distinguished by origin. A balance of payment constraint incorporates the base-year trade deficit or surplus for each region. CO_2-emissions are linked in fixed proportions to the use of fossil fuels, with CO_2-coefficients differentiated by the specific carbon content of fuels. The composite dataset in use includes all major primary and secondary energy carriers: coal, crude oil, natural gas, refined oil products, and electricity. In addition, we separate the main emission-intensive and trade-exposed sectors: chemical products, non-metallic minerals, iron and steel products, and non-ferrous metals, as they will be the most affected by emission control policies.

We consider the following alternative assumptions about OPEC's behaviour, consistent with various hypothesis put forward in the literature on OPEC behaviour: i) Competitive behaviour (benchmark assumption), ii) Fixed oil price, iii) Fixed quantity, iv) Fixed revenue, and v) Profit maximization. For each assumption, we consider the following climate policy scenarios in the EU: a)

Uniform CO2-price only (tax or quota market), and b) Quota market with Border tax adjustments for energy-intensive and trade-exposed (EITE) industries (carbon tariff and export rebates).

Results

Our preliminary simulations show that leakage rates may depend significantly on the assumptions about OPEC behaviour. Obviously, assumption ii) implies that there is no leakage at all through the oil market, whereas assumption iii) increases leakage vis-à-vis the benchmark assumption. When going from assumption iii) to ii), leakage rates fall by about 15% (from 18% to 15%). Assumptions iv) and v) seem to imply that OPEC chooses to *increase* instead of decrease production when the EU implements climate policies. Thus, the overall leakage rate is increased to 21-24%.

When border tax adjustments are introduced, leakage rates fall, irrespective of OPEC assumption. The effects are biggest when OPEC maximizes its profits (assumption v)), and smallest when OPEC aims for a target revenue (assumption iv)).

The results are very preliminary, and will be updated in the nearest future.

Conclusions

We show in this paper that the extent of carbon leakage depends quite a lot on OPEC's behaviour. We test various assumptions about this, and find that overall leakage rates with uniform CO_2-pricing in the EU may vary between 15% and 24%, depending on OPEC's behaviour. If CO_2-pricing is supplemented with border tax adjustments, leakage rates vary between 9% and 16%. Thus, the remaining leakage, i.e., when leakage through the EITE markets are mitigated, depends quite significantly on how OPEC responds to climate policies in the EU.

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