***Carbon Tax and Emissions Transfer a Spatial Analysis***

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## Overview

As environmental concerns are growing worldwide, controversies appear on the best way to reduce pollution: quotas or taxation. Scholars maintain that a global carbon tax is the best policy for managing pollution. With the rising role of globalisation since the turn of the century, assessing the impacts of carbon taxation on carbon emissions embodied in the trade becomes a key question (Rich countries try to produce their high-carbon goods in carbon-free countries to avoid paying taxes). However, this question has been overlooked. This paper aims to bridge this gap. Our contribution consists in examining an emissions tax system through trade in the framework of the input-output table. Using data from 43 countries and 56 sectors, we exploit variation in the economic sector of each country to identify the most and fewer contaminated sectors and investigate the spillover effects of carbon taxes on the emission embodied in trade.

This paper contributes to the literature in three ways. Firstly, we perform a quantitative (sectoral) analysis of the share of pollution in five different sectors to show which sector released the most pollutants. No such research has ever been done for this period and this group of countries (see Wang et al., 2020), and (Wang & Yang, 2020))

Hence, secondly, the Spatial econometric method is used to respond to the question of the effect of carbon taxation through carbon embodied emissions in trade on host countries and on neighboring countries. We add to the literature on carbon taxes and emissions trading approach (Elliott et al., 2010, and Ekins, 2009) by considering interaction between countries.

Finally, we investigate the spillover effects of trade emissions before and after taxation. Most empirical estimations, and theoretical modeling of embodied carbon emissions, focus on the immediate impact of trade. Less attention is directed toward the tax implementation's impact on trade of these events even though these might be even more important. Our paper fills this gap.

## Methods

With the input-output (IO) method analysis, the economic effect of emissions of carbon could be measured. The EEBT (Emissions Embodied in Bilateral Trade) system is generally used to calculate an inter-regional trade scale of emissions. MRIO model (multi-regional input-output model) describes the ties between foreign industries, taking into account trade between intermediate and final products and services, for an assessment of pollutant emissions along the global supply chains. In a particular context, greenhouse gas emissions are determined by electricity consumption and final demand. Separate research offers a methodology to explore the implications of direct trading for emissions.

We assess the pollution differences of green tax. The costs of production increase, contributing to higher prices.

Today, trade pollution and carbon taxes do influence surrounding areas nevertheless Spatial dependence is found. The techniques of spatial regression are then the proper method of estimation. Spatial measurements are used to decide whether the data are spatially related. We then use the Log-Likelihood function to see what spatial model is best suited to our data collection.

We analyze 43 countries based on a spatial panel data model, data cover the 2000-2014 period.

## Results

At sectoral level, the highest direct, total, and indirect emission of CO2 comes from the sector [Electricity and heat production], while the lowest indirect and complete emissions of CO2 occurs in the sector [Other sectors (for example: Forestry and logging, fishing and aquaculture, mining and quarrying, publishing activities,…)].

In this study, the consequences of introducing a full border tax adjustment were scrutinized. We focus on carbon taxation and its impact on international carbon emissions reduction, via an increase in the price of carbon. The rise in price leads to adjustment in the quantity of carbon emitted as CO2 in exports and imports. We highlight spillover effects of emissions embodied in exports by considering the distance matrix: after-tax, less pollution is emitted towards/in neighboring countries than before tax. When we consider the trade matrix, the results are opposite. So the outcomes are highly sensitive to the choice of trade or distance as the weight matrix. In other words, tax implementation have been effective in reducing emission embodied in export with the weight matrix of geographical distance, but this effect is less tangible when trade is considered as the weight matrix. The spillover effect of emissions embodied in imports shows up with both matrices: after-tax, less pollution is diffused in neighboring countries than before tax.

## Conclusions

The government should be taking a persuasive and punitive policy suitable for providing less pollutant emission in sectors of measuring pollutant emission that has more authorized and expected levels. Restricting carbon emissions by global rules and taxes of the worldwide community will reduce more pollution than the different decisions of each government.

The direct and indirect effects show that increased imports and exports of polluting goods after-tax explain about 0.88 % and 0.12% respectively of pollution reductions from those counties and neighboring countries. Our policy recommendation to governments should be not to stop the carbon tax but to care about their effect on neighboring countries.

Governments set tax policy to try to reduce the considerable energy consumption and the excessively high percentage of heavy industry. However, these measures have consequences allover the world. A high carbon tax rate leads to a considerable disadvantageous impact on the economy or some activity sectors probably experience extremely negative effect. Solution for this is to start with a low tax rate for carbon tax.

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