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Energy pricing impact on domestic economy under recent climate action

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ABSTRACT

This article analyzes the adverse competitive effect of climate policy on domestic supply using industry-level data from forty countries. In accordance with the theoretical literature, we define the competitive effect as the difference between the energy price elasticities of demand and supply; the magnitude of the competitive effect is captured by estimating the supply and demand functions. We find adverse competitive effects for certain country–industry pairs; however, these impacts are small. Additional simulation analysis shows potential for substitution between an imported product and a domestic good in less energy-intensive sectors. The results indicate the importance of considering industrial characteristics when formulating and implementing a climate policy.

1. Introduction

International agreement is difficult to achieve and enforce, and developing adequate mitigation goals to implement effective global climate policy is even more difficult. However, domestic climate and energy policies have been implemented, and both country- and local-level mitigation policies have produced successes (Managi et al., 2009, Wang and Chen, 2013). Although climate and energy policies have proven effective in reducing emissions, studies also have examined the market effects of these policies and related regulations. In particular, the topic of carbon leakage has been extensively explored using Computable General Equilibrium (CGE) models (Maisonnave et al., 2012; Paltsev et al., 2009; Ross et al., 2009).

Domestic mitigation policies may impose abatement costs on domestic suppliers and may lead to the migration of domestic suppliers to less-regulated areas. This shift leads to a reduction in domestic supply and a mismatch between domestic demand and supply or to the substitution of imported goods in response to the reduced supply of domestic goods. Industry migration associated with carbon leakage is one of the symptoms of the adverse competitive effect resulting from the implementation of climate policies. In some cases, shifting abatement costs to domestic industries may drive them out of business.

Although many studies have used a calibration method based on the CGE model to simulate the size of the adverse competitive effect of climate policy, Aldy and Pizer (2011) (AP henceforth) estimate the impact of mitigation policy on the manufacturing sector using industry-level US data. AP argue that the adverse competitive effect can be expressed as the

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difference in the level of domestic supply between two cases, namely, when the US policy is implemented globally and when it is implemented solely in the US. AP identify a competitive effect, and their industry-level estimation results indicate that the size of this effect differs across industries.

We extend AP's empirical analysis by expanding the data to forty countries. Although AP consider effects on energy-intensive industries, we also analyze comparatively less energy-intensive industries. To perform our cross-country analysis, we use data from the World Input–Output Database (WIOD henceforth) and estimate the adverse competitive effect in accordance with AP's estimation model. We observe a competitive effect for certain country–industry pairs. Furthermore, we perform an additional simulation analysis and identify potential for substitution between an imported product and a domestic good in less energy-intensive sectors.

When we estimate the adverse competitive effect using AP's model, we must consider an explicit assumption made in their analysis: that the US and other countries implement the same policy. Thus, in our analysis, we must consider whether the countries in our data implement a similar climate policy. International agreement, which can effectively harmonize mitigation policies across countries, has been difficult to achieve, and many countries are implementing domestic climate policies. Additionally, certain countries are pursuing border measures that attempt to impose domestic climate policy on other countries through border tariffs and rebates for domestic suppliers (Dissou and Eyland, 2011; Fischer and Fox, 2012; Ghosh et al., 2012; Maisonnave et al., 2012). Thus, these countries are implicitly sharing the abatement cost of climate policy, which has a global impact on climate change through both the implementation of domestic climate policies and the adoption of border measures. This implicit abatement cost sharing by these countries supports the assumption that countries implement comparable climate policies. The validity of this assumption is important and is therefore further discussed in the next section.

The remainder of this article is organized as follows: Section 2 introduces the theoretical framework for competitive effects; Section 3 presents the estimation model and the dataset used to measure the competitive effect; Section 4 summarizes the results of our estimation; Section 5 considers the competitive effect across the sectors and countries; and finally, Section 6 concludes our analysis.

2. Competitive effects and recent climate policy

2.1. Recent climate policy

Given the difficulties experienced in negotiating global climate policy, country-specific climate policy has become more meaningful in mitigating global climate change. The EU emissions trading scheme was introduced in 2005 and has since been improved to expand the scope of regulation and the scale of EU allowance markets (European Commission, 2009). Australia will soon implement cap-and-trade regulation (Australian government, 2011; The Korea Herald, 2014).

Developing countries have also introduced market-based mechanisms to limit fossil fuel use and GHG emissions. China has initiated pilot projects in its major cities to protect air quality and to achieve its national emission intensity target (Zhang et al., 2014). India has discussed and implemented policy measures to promote domestic energy efficiency through market-based mechanisms (Ministry of Power (India), 2012).

Given their inability to progress in nationwide mandatory regulation, local governments have led efforts to limit GHG emissions in the US and Japan. The US government attempted to introduce a GHG emissions trading system at the federal level (Kerry and Boxer, 2009; Waxman and Markey, 2009), and each attempt to advance these bills was carefully followed worldwide. The state-level schemes that exist in the US are the Regional Greenhouse Gas Initiative, the Western Climate Initiative and California's Cap-and-Trade Program; Tokyo has had a cap-and-trade scheme in place since 2010.

These country- and local-level mitigation policies provide us with different perspectives from those considered in previous works that analyze the impact of climate policy. Previous studies compare two cases, namely, one in which a climate policy is implemented globally and another in which policy is implemented only in certain countries (Nordhaus, 1994). When a country considers introducing mitigation policies, it is important to note that other countries have already implemented such policies. Therefore, the comparison considered in prior studies is unsuitable for the current situation given recent country- and local-level adoption of mitigation policy.

This simple comparison may also conceal the extent to which mitigation policy influences trade flows at the industry level. When developing and developed countries pursue disparate climate policy actions, the international competitive environment within industries in the international market may not be substantially altered because there may be minimal differences in the marginal abatement costs between industries in different countries. An important consideration in determining the effects of climate regulations on industry is how such regulations affect industrial activities in international markets.

2.2. Competitive effects and climate policy

When devising and implementing GHG mitigation policies, it is important to consider their adverse competitive impacts because concerns over such effects generate opposition to mitigation policies. Carbon leakage is one symptom of the adverse competitive effect of the implementation of climate policies. Kellenberg (2009) demonstrates that a stringent mitigation policy leads to the emergence of pollution havens and that such regulation has a greater effect on more footloose industries than on less footloose ones. In the more recent literature, Aichele and Felbermayr (2015) empirically investigate the flow