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Trade and Climate Change: Focus on Carbon Leakage, Border Carbon Adjustments and WTO Consistency

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ABSTRACT

This monograph provides a comprehensive review of the literature on competitiveness and leakage concerns associated with differentiated climate abatement commitments among countries. The literature reviewed is not exhausted, but it is sufficient to provide a balanced view of both academics and policy circles. Section 2 discusses main channels of carbon leakage. Section 3 discusses how to identify the sectors at a risk of carbon leakage. Section 4 examines *ex ante* estimates of potential carbon leakage rates, and explains why they differ from *ex post* results of environmental tax reforms and greenhouse gas emissions trading schemes that have been implemented in the European Union. Section 5 discusses broad policy options to address competitiveness and leakage concerns, and compares which anti-leakage policy, border adjustments or output-based allocation, is more effective to

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limiting carbon leakages or mitigating production loss in the sectors affected. Given that border carbon adjustment measures were incorporated in the U.S. proposed congressional climate bills to level the carbon playing field and could have potential conflicts with World Trade Organization (WTO) provisions and practical difficulties associated with their implementation, Section 6 discuses in great detail the WTO consistency, the effectiveness and methodological challenges of border carbon adjustment measures. The monograph ends with some concluding remarks.

1

Introduction

There is increasingly scientific evidence confirming man-made climate change and its resulting negative effects. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change, the most comprehensive assessment of the science relating to climate change, reported with 95% certainty that the major cause of global warming was increasing concentrations of greenhouse gas (GHGs) produced by human activity (IPCC, 2014). Continued GHG emissions will cause further warming and have the potential to seriously damage the natural environment and affect the global economy, making it the most pressing long-term global threat to future prosperity and security. However, with greenhouse gas emissions embodied in virtually all products produced and traded in every conceivable economic sector, effectively addressing climate change will require a fundamental transformation of our economy and the ways that energy is produced and used. This will certainly have a bearing on world trade as it will affect the cost of production of traded products and therefore their competitive positions in the world market. This climate-trade nexus has become the focus of an academic debate (e.g., Bhagwati and Mavroidis, 2007; Brack *et al.*, 1999; Charnovitz, 2003; Copeland and Taylor, 2005; Ismer and Neuhoff, 2007; Swedish National Board of Trade, 2004; Zhang, 1998b and 2004; Zhang and Assunção,

2004; Zhang and Baranzini, 2004), and gains increasing attention as governments are taking great efforts to implement the Kyoto Protocol and forge a post-2020 climate change regime to level the carbon playing field (e.g., Parker and Grimmett, 2009; The World Bank, 2007; UNCTAD, 2010; WTO and UNEP, 2009).

Under the United Nations Framework Convention on Climate Change (UNFCCC) principle of "common but differentiated responsibilities," developing countries are allowed to move at different speeds relative to their developed counterparts. As a result, the Kyoto Protocol in 1997 to the UNFCCC drew a clear line between developed and developing countries. Developed countries had specific obligations to control their GHGs, but developing countries did not. This difference in climate abatement commitments could lead production of carbon-intensive products to move away from carbon constrained countries to non- or less carbon constrained countries. This could in turn lead to losses of employment and economic output, in carbon-intensive sectors of these more carbon regulated countries. The fears of competitiveness losses undermine the support for abatement policy in developed countries.

Though extensively used in the public debate, the notion of competitiveness remains ambiguous. Some scholars (e.g., Krugman, 1994) view this notion meaningless at the national level. At the firm level, competitiveness refers to the ability of a firm to maintain or even increase international or domestic market shares and profitability. A firm' competitiveness is influenced both by micro factors, such as cost structure, product quality, trademark, service and logistical networks, and by macro factors, such as exchange rates, trade rules and political regime stability (Baron and ECON-Energy, 1997). Environmental taxes and regulations affect a firm's competitiveness by changing its relative production costs. For example, if a firm makes intensive use of energy, *ceteris paribus*, then imposing an environmental tax will increase its production cost relative to those less energy-intensive firms in the short term. Thus, it would experience a decline in competitiveness, whereas less energy-intensive firms would obtain a relative cost advantage in the short term. The changes in relative competitive positions would lead to "winners" as well as "losers" from the imposition of an environmental tax. "Losers" might even threaten to relocate their business activities

to those countries that have relatively lax environmental regulations, if such a tax were put in place. This raises the question: do environmental taxes and regulations hurt firms' competitiveness so badly that they are forced to move to pollution havens?

There is growing and mainly empirical literature on trade implications of environmental regulations (e.g., Copeland and Taylor, 1994, 2003 and 2005; Ederington and Minier, 2003; Ederington *et al.*, 2005; Jaffe *et al.*, 1995; Levinson and Taylor, 2008). Grossman and Krueger (1993), for example, have examined whether pollution abatement costs influenced the patterns of the U.S. bilateral trade and investment with Mexico and found that "the available evidence does not support the hypothesis that cross-country differences in environmental standards are an important determinant of the global patterns of international trade." Jaffe *et al.* (1995) review and analyze over 100 studies on the potential effects of environmental regulations on the competitiveness of American industry, and conclude that "studies attempting to measure the effect of environmental regulation on net exports, overall trade flows, and plant-location decisions have produced estimates that are either small, statistically insignificant or not robust to tests of model specification.". Ederington *et al.* (2005) find that the costs of environmental regulations affect trade flows depending on the extent to which manufacturing in the more regulated U.S. market (vis-à-vis developing countries' markets) is "footloose." For example, the competitiveness effects are smaller if the costs of transportation are high, or there are local agglomeration economies, or the significant plant costs of an industry. Moreover, other factors may impact the likelihood of relocating economic activity to economies with lower regulatory costs. For example, the availability of transportation means to consumers may impact the decision to relocate (Ederington *et al.*, 2005).

However, the aforementioned findings may not necessarily go to be the case of carbon prices in future (Zhang and Assunção, 2004; Zhang and Baranzini, 2004). Environmental regulations and taxes applied to date have been relatively modest, and they fall short of the levels needed to achieve the objective of keeping a global temperature rise well below 2 degrees Celsius above pre-industrial levels agreed under the Paris Agreement (UNFCCC, 2015). They could thus have significant

implications for competitiveness. Given that many governments across the globe regulate energy prices and some domestic greenhouse gas cap-and-trade schemes are designed to suppress price changes in electricity markets, the extent to which whether a domestic climate change policy translates into higher energy prices will determine the impact of that policy on the industrial competitiveness in a given economy.

Clearly, the discussion in this monograph fits within a growing trade and environment literature, and falls into this broad context of environment-trade nexus. In the context of unilateral or uneven climate policies, the fears of competitiveness deterioration could be particularly problematic for developed countries of distinct "regional" character, like Australia, Canada, and the U.S., partly because their provincial (or state) governments under the federal system are vested with significant political authority, and partly because energy-intensive industries are not spread evenly throughout these countries. Therefore, deterioration in the international competitiveness of energy-intensive sectors, while potentially economically disruptive in any country, could impose regionally uneven impacts on these countries (Rose and Zhang, 2004; Rose *et al.*, 2006; Garnaut, 2008; Rivers, 2010).

Since greenhouse gases are the uniformly mixed pollutants, namely, one ton of greenhouse gas emitted anywhere on earth has the same effect as one ton emitted elsewhere, simply shifting production of carbon-intensive products from the carbon-constrained countries to non- or less constrained ones can reduce the environmental effectiveness of the regulating country's efforts. This phenomenon is referred to as carbon leakage.

Much of discussion on leakage issues in a Kyoto-type world is very much along these lines. Does it remain relevant after the Paris Agreement? Under the Paris Agreement, all Parties have committed to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius (UNFCCC, 2015). Almost all countries have outlined their climate action plans known as "nationally determined contributions" (NDCs), to be implemented from 2020 and expected to be scaled up over time. Therefore, this world looks different

from the Kyoto-type world, where developed countries had specific obligations to meet emissions reduction targets but the rest of the world had no obligations at all. The leakage concern is reduced somewhat after the Paris Agreement (Kortum and Weisbach, 2016).

However, the carbon leakage problem does not go away. A number of assessment studies suggest that GHG reduction targets outlined by more than 190 parties in terms of NDCs are very disparate in their ambition levels (e.g., Averchenkova and Matikainen, 2016; Höhne *et al.*, 2017). Averchenkova and Matikainen (2016) suggest that the six G20 countries lack overall framework legislation or regulation on climate change, and also are either behind on meeting their 2020 targets or have not set any. Höhne *et al.* (2017) show that the climate ambition level of China, the EU, and the U.S. varies, depending on the perspective taken. Examining six key policy instruments (carbon taxes, emissions trading, feed-in tariffs, renewable energy quotas, fossil fuel power plant bans, and vehicle emissions standards), Compston and Bailey (2016) find that climate policy strength also varies across the six biggest emitters by far – China, the U.S., the European Union (EU), India, Russia, and Japan. Consequently, these differentiated ambition level and fragmented climate policy will well lead to large asymmetries in shadow carbon pricing across countries. Such asymmetries will undermine the effectiveness of more ambitious national climate policy initiatives through carbon leakage as domestic emission-intensive and trade-exposed industries will relocate to countries or regions without or with only quite lenient carbon pricing (Böhringer *et al.*, 2017b). Moreover, obligations in the Paris Agreement are legally non-binding, and countries may not comply with their obligations because there are no sanctions for noncompliance. As a result, leakage will still be a concern after Paris (Kortum and Weisbach, 2016).

This monograph aims to provide a review of the literature on competitiveness and leakage concerns associated with differentiated climate abatement commitments among countries. The literature reviewed is not exhausted, but it is sufficient to provide a balanced view of both academics and policy circles. Section 2 discusses main channels of carbon leakage. Section 3 discusses how to identify the sectors at a risk of carbon leakage. Section 4 examines *ex ante* estimates of potential

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