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Linking Cap-and-Trade Systems

Katharina Erdmann and Aleksandar Zaklan

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Katharina Erdmann | katharina.a.erdmann@stmail.uni-bayreuth.de | Department of Energy, Transportation, Environment at DIW Berlin and University of Bayreuth
Aleksandar Zaklan | azaklan@diw.de | Department of Energy, Transportation, Environment at DIW Berlin

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Linking cap-and-trade systems promises gains in cost effectiveness and signals a strong commitment to carbon policy. Linking is also seen as one possible way of converging from regional climate policy initiatives toward a global climate policy architecture. Two linked systems have been established recently, one in Europe and one in North America. However, linking also comes with challenges, such as increased exposure to shocks originating in other parts of the linked system and a greater need for policy coordination. We first consider the benefits and challenges of linking conceptually. We then present some of the main features of the European and North American linked systems and outline the process that led to their establishment. Finally, we consider preliminary evidence on the workings of each linked system.

Linking Cap-and-Trade Schemes to Broaden Regional Climate Policy Initiatives

There is conclusive evidence that anthropogenic greenhouse gas (GHG) emissions cause harmful climate change by increasing global temperatures (e.g. IPCC, 2014). In response, the signatories of the Paris Agreement agreed to limit GHG emissions such that the anthropogenic increase in temperatures remains significantly below 2 degrees centigrade (United Nations, 2015). Cap-and-trade schemes are one option to mitigate GHG emissions. Such emission trading systems (ETS) are being established in a growing number of countries, at the local, sub-national and regional levels. However, given the global nature of the climate problem the most effective policy response is also at the global level (e.g. Stern, 2007; Cramton, Ockenfels and Stoft, 2015; Weitzman, 2015).

So far there is no binding global agreement regulating GHG emissions, with current climate policy initiatives focusing on the regional (e.g. in Europe), national (e.g. China) or sub-national levels (e.g. California). Frequently, these policy initiatives take the form of cap-and-trade schemes.[1] One way of converging from regional policy responses to climate change toward an international or a global climate regime is by linking existing cap-and-trade schemes. In a linked system allowances from one partner system are recognized for compliance purposes in the other.[2] Linking is also foreseen as one possible way to cooperate under Article 6 of the Paris Agreement (United Nations, 2015). It has several potential advantages: It may increase cost effectiveness, improve liquidity and strengthen policy commitment. However, linking also comes with challenges, e.g. a greater exposure to shocks originating in one part of a linked system and a loss of policy sovereignty.

[1] An introduction to cap-and-trade and an overview of existing schemes can be found e.g. on https://icapcarbonaction.com/en/.
[2] Links may also be unilateral, where one system recognizes allowances from the other, while recognition in the other direction does not occur.

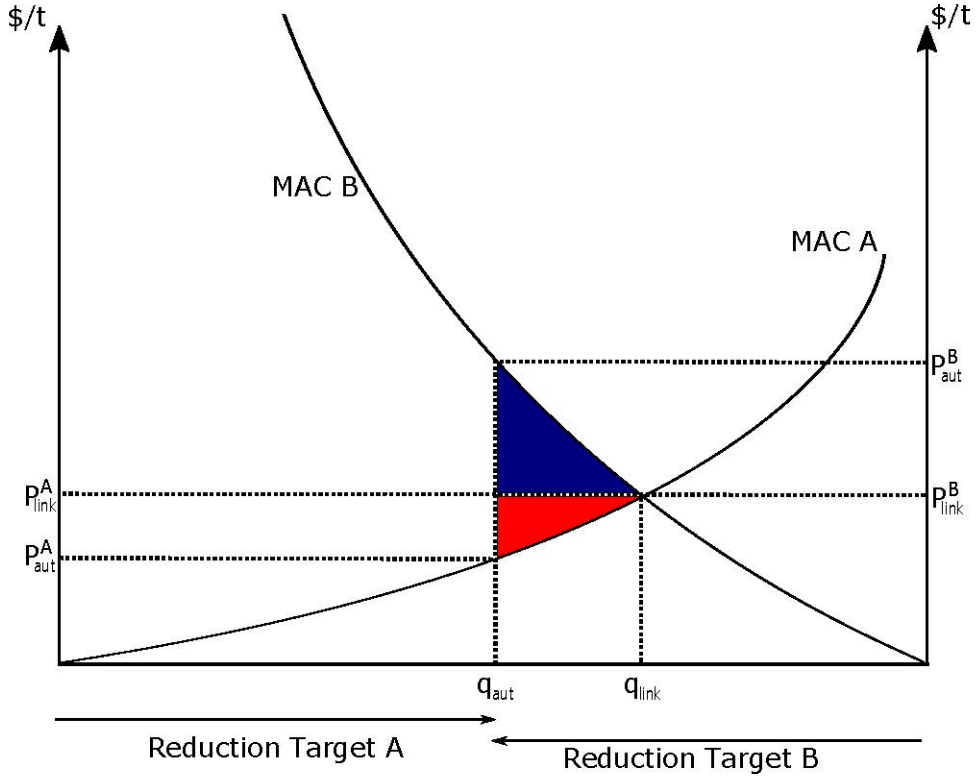
Two linking projects are currently underway, providing important policy experiments on linking as a means toward extending regional cap-and-trade initiatives in the international dimension. One is a link between the European Union Emissions Trading System (EU ETS) and the Swiss Emissions Trading System (CH ETS). The other is a link between three sub-national ETS in North America; between California, Québec and Ontario. Studying the features of the linked systems and the policy process involved in creating them helps improve our understanding of the costs and benefits of linking. It is also a first step toward evaluating the potential of linking as a means for converging toward a global climate policy architecture.

In this Roundup, we first outline some important conceptional benefits and challenges of linking. We then describe the linking projects currently underway in Europe and North America and present some preliminary evidence on their workings.

Advantages of Linking: Greater Cost Effectiveness and Policy Commitment

Linking two cap and trade systems with different marginal abatement costs – the costs to reduce an additional unit of GHG emissions – leads to larger potential gains from trade for regulated entities. Figure 1 illustrates the gains from trade in a stylized two-country/two-entity case (cf. also Flachsland, Marschinski and Edenhofer, 2009; Anger, 2008; Carbone, Helm and Rutherford, 2009).

Figure 1: Gains from Trade through Linking



Note: adapted from Flachsland, Marschinski and Edenhofer, 2009

The horizontal axis shows the emission reduction and the vertical axis the marginal abatement costs (MAC) per ton of emissions. In Figure 1, the entity in jurisdiction A is assumed to have a less steep MAC than the one in jurisdiction B. This means that for a given amount of emission reduction, the marginal abatement costs for A are lower than for B. We assume that prior to linking both jurisdictions have adopted the same reduction target (q_{aut}). To achieve q_{aut}, jurisdiction A abates such that its equilibrium allowance price in autarky is at P^{A}_{aut}. Due to its steeper MAC entities in jurisdiction B pay the higher autarky price of P^{B}_{aut}. After the link is established, entities in both jurisdictions may trade all certificates in the common market. B gets access to cheaper carbon reduction options in A and shifts part of its abatement abroad to save costs. The entity in jurisdiction A abates more than prior to the link, up to the point q_{link}, and sells its surplus allowances to entities in jurisdiction B. The link therefore involves a financial transfer from jurisdiction B to jurisdiction A. As a result, the post-link equilibrium allowance price converges to $P^{A}_{link} = P^{B}_{link}$. Jurisdiction A benefits from an inflow of trading revenue, while B benefits from less expensive abatement. Total emissions do not change. The blue area indicates the gain in cost effectiveness for jurisdiction B, while the red area shows the cost effectiveness gain for jurisdiction A.

Linking may also increase the liquidity of carbon markets. In a liquid market individual participants can purchase and sell allowances without significantly influencing the price. Through linking a larger number of potential buyers and suppliers of allowances are in the market, increasing the potential for trading activity (Flachsland, Marschinski and Edenhofer, 2009). Furthermore, if each jurisdiction auctions allowances, there may also be a higher frequency of auctions in the linked system, with a greater number of potential auction participants (Hepburn et al. 2006). Greater market liquidity enhances the cost effectiveness of the allowance market by reducing market power of individual participants (Wiener, 1999; Hahn, 1984), decreasing trading uncertainty (Kalaitzoglou and Ibrahim, 2015) and lowering transaction costs (Liski, 2001). Cap-and-trade systems with only a small number of participants are vulnerable to losses in cost effectiveness due to illiquidity, while providing scope for strategic behavior.

Linking also demonstrates a long-term commitment to a cap-and-trade system and climate policy in general, as participants in a linked system give up some of their sovereignty with respect to climate policy. Creating a linked system can therefore raise the global acceptance of the policy tool and encourage other jurisdictions to implement emission trading systems and potentially join a linked system (Flachsland, Marschinski and Edenhofer, 2009). Linkages could thus play a role in a bottom-up approach to creating an international climate policy architecture (Sterk and Stuele, 2009).

Challenges of Linking: Price Risk Shocks and Need for Policy Coordination

Linking also involves challenges. Price shocks in one component of a linked system, e.g. caused by an economic downturn or a boom in one region, will propagate throughout the linked system. A change in demand for allowances in one of the participating schemes will influence the common allowance price (McKibbin, Morris and Wilcoxen, 2008). Such propagation of shocks may be more pronounced when business cycles in each region are very asynchronous. This is especially relevant for smaller systems, which are price takers in the linked market. A link with a larger system with a relatively volatile allowance price will diminish price stability and may decrease investment incentives in the smaller partner system, compared to autarky (Tuerk et al., 2009).

On the policy side, both jurisdictions lose some control over their domestic carbon policy and increase their interdependency. The common allowance price is determined by the caps in both systems, so that cap adjustments in one of the linked systems will have impacts on prices in the linked market. For instance, one of the systems may loosen its cap unilaterally, thus increase the overall supply of allowances in the linked system and cause a decline in the common allowance price. One of the jurisdictions could also start accepting allowances from third parties, e.g. offsets with questionable additionality properties, which may compromise the climate targets in the partner region (Green, Sterner and Wagner, 2014). Due to the increased policy risk as a result of linking, complex negotiations are required to limit unilateral action and avoid such outcomes. The negotiation power of each partner is likely to depend on the relative sizes of the partners' carbon markets. The partner with a larger carbon market will be better able to enforce its interests (Newell, Pizer and Raimi, 2013). Smaller partners may thus lose sovereignty over their climate policy. After a linking agreement goes into force, close policy coordination is required to maintain the integrity of the linked system and the policy targets of all partners.

Linking in Practice: EU ETS and CH ETS

The cap-and-trade scheme of the EU, the EU ETS, is the world´s largest cap-and-trade system for GHG emissions. It covers over 11.000 entities and about 2 billion tons of CO_2 equivalents (CO_2e). The Swiss scheme, the CH ETS, is far smaller. Only about 50 entities participate and 5.5 million tons of greenhouse gases are covered (BAFU, 2016). However, the partner´s climate objectives are compatible and the structures of the ETS are very similar. Both are mandatory systems with a cap in absolute terms. Trading cycles are synchronized, as both systems commence their next trading period in 2021. Cooperation between the partner systems occurs in a Joint Committee consisting of representatives of both parties (cf. European Union, 2017 for details of the linking agreement). The committee is responsible for the administration and the supervision of the implementation of the link, dispute settlement and the discussion of possible future changes in legislation by either party. Auction procedures will remain unchanged after linking: Both parties will conduct their auctions separately. The registries, which record all held and transferred allowances, will also remain independent. To enable the free trade of both EU and Swiss allowances, a link between the two tracking logs EUTL and SSTL[3], which document all transactions of allowances, will be established (European Union, 2017).

The negotiations between the European Union and Switzerland began in 2010 and were concluded in 2016. The agreement was signed recently (European Commission, 2017b) and will be implemented in January of the year after the ratification by the respective parliaments (European Union, 2017). It is expected that it will come into force in 2020 (Carbon Pulse, 2018a). Although the design of the CH ETS is based on the structure of the EU ETS, negotiating the necessary adjustments to achieve compatibility with the EU ETS took several years. Important steps were the modification of the CH ETS from a voluntary to a mandatory system for large emitters and the inclusion of the Swiss aviation sector (European Commission, 2017a).

Except for the EU-Swiss link, there are currently no plans to establish further links between third-country cap-and-trade schemes and the EU ETS. However, one possibility is a future link between a UK ETS as a result of the UK leaving the EU. The United Kingdom announced that it will remain in the EU ETS until at least the end of 2020 – the end of the current trading period. It is to be determined if and how

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[3] EUTL: European Transaction Log, SSTL: Swiss Supplementary Transaction Log

the European carbon market will change starting with the fourth EU ETS trading period, from 2021 onward, as a result of Brexit (UK Parliament, 2018). Among the available options are that the UK either remains in the EU ETS, establishes a link to it or introduces an independent carbon pricing policy.

Linking in Practice: The North American Carbon Market

In 2007 and 2008, seven western US states[4] and four Canadian provinces[5] joined forces to set up sub-national emission reduction programs and founded the Western Climate Initiative (WCI). The purpose of the WCI is to provide administrative and technical support to its members when implementing cap-and-trade systems. However, except for California, all other US states revoked the collaboration in 2011 and only California and the four Canadian provinces continued to work together (WCI, 2013). Except for Manitoba and British Columbia, the remaining members introduced emission trading systems which are linked (WCI, 2017a). In May 2018, Nova Scotia joined the WCI and aims to implement a cap-and-trade system (Nova Scotia, 2018).

California operates the largest cap-and-trade system in North America. It covers emissions of about 350 million tons CO_2e, which is nearly twice as much as the combined caps of Québec and Ontario (ICAP, 2018). As in Europe, the trading schemes are very similar in their structure. Collaboration takes place in a Consultation Committee and within the WCI. Using the same auction platform, joint auctions are held. Allowance transactions may be undertaken in U.S. and Canadian dollars, as well as in both English and French (California Air Resources Board, 2017). The WCI also provides a common registry platform and tracking system called CITSS[6]. At auctions, allowances are not differentiated by origin (MDDELCC, 2018). Compared to the European case, there is a higher degree of administrative integration between the linked systems.

The cap and trade systems of California and Québec have been linked since 2014, while Ontario joined the common market in January 2018 (State of California, 2017). Soon after the latest link entered into force, the partners held their first joint auction (California Air Resources Board, 2018a). Unlike in the European case, a comprehensive harmonization process of the three systems was not required prior to linking, because all systems were developed collaboratively following the guidelines of the WCI (WCI, 2017b). This is also in contrast to the European case, where the larger system served as the benchmark, while the smaller system, the CH ETS, adjusted to it.

Unlike with the European carbon market, further linking opportunities may be available in North America in the short term. In 2016, Québec, Ontario and Mexico signed a joint declaration to collaborate in the area of climate policy. Mexico intends to establish an emissions trading system compatible with the WCI´s systems (Ontario, 2016). However, the North American market is also more dynamic than the European one with respect to de-linking. Especially Ontario´s commitment to carbon pricing is uncertain and may change as a result of the recent provincial elections (Carbon Pulse, 2018b). Thus, the North American market is potentially more volatile in terms of the composition of its members than the European one.

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[4] Arizona, California, New Mexico, Oregon, Washington, Montana and Utah.
[5] British Columbia, Manitoba, Ontario and Québec.
[6] CITSS: Compliance Instrument Tracking System Service.

Preliminary Evidence on the Workings of Linking: The European Case

Due to the early stages of linking in Europe, it is only possible to evaluate the workings of the link in terms of expectations. We may expect some gains in cost effectiveness, as the marginal abatement cost structures of the EU ETS and CH ETS may be assumed to differ to some extent. Gains for installations regulated under the smaller CH ETS may be expected to be proportionately greater than for those in the EU ETS (Doda and Taschini, 2017). Furthermore, especially Swiss entities will also benefit from greater market liquidity (Oberauner and Krysiak, 2008). In the current unlinked state, Switzerland has the smallest trade volume relatively to its size of all implemented cap and trade systems worldwide (EFK, 2017). Access to the world´s largest emission trading market will raise the number of buyers and sellers of allowances and liquidity will thereby increase significantly in the CH ETS.

In exchange, Switzerland loses autonomy in its climate policy and had to adjust the structure of its cap-and-trade scheme to the EU ETS. As the EU ETS is the considerably larger system, it will be the price setter. We may expect that the Swiss allowance price will converge to the EU ETS allowance price. We may also anticipate that price shocks originating in the EU ETS will strongly affect the CH ETS, while the converse effects are expected to be small.

Evidence on Effects of Linking in North America

As in the European case, there is a lack of ex-post assessments of cost effectiveness effects of linking in North America. We may also assume that marginal abatement cost curves differ somewhat, so that gains in cost effectiveness may be expected. Given the existence of common auctions, more information about price convergence is available for the North American market. The linked system is characterized by a common auction price. As the supply of allowances is currently generous, the common allowance price is determined by the highest floor price of the three systems. Currently, this is the reserve price of California with USD 14.53 in 2018[7] (California Air Resources Board, 2018b). The joint price has behaved as outlined in Figure 1. Prior to linking, the auction price was close to the floor price in each component system. After the link was established, the auction prices for allowances in Québec and Ontario increased, while the price in California remained at its floor (California Air Resources Board, 2018b). Especially in the smaller systems of Ontario and Québec, entities benefit from greater liquidity stemming from more trading options and a larger number of auction participants (Purdon, Houle and Lachapelle, 2014).

The three jurisdiction increased their interdependency, raising their exposure to policy and economic risks. However, these risks appear limited, as even prior to linking they all followed the guidelines developed under the WCI. To our knowledge, there is currently no evidence on the transmission of price volatility or on major negative economic effects due to the link.

Conclusion

[7] The current price floor in Ontario is CAD 14.68. In Québec, it is CAD 14.35. For example, on 19 June 2018, the exchange rate was 0.753 U.S. dollars for one Canadian dollar. Expressed in U.S. dollars, the carbon price floors in Ontario and Québec were 11.05 and 10.81 U.S. dollars, respectively.

Linking promises gains in cost effectiveness and provides an opportunity to signal a jurisdiction's commitment to climate policy. The two linked schemes currently implemented show that linking may be a feasible approach to the bottom-up extension of the climate regime beyond a collection of autarkic local approaches. However, considering these policy initiatives closely also reveals that linking is a complex undertaking in practice. In North America and in Europe, as well as in other parts of the world, decision-makers will benefit from the experience gained from creating and operating linked carbon markets. Observing the linked systems over time will provide evidence on whether the links will remain stable and will allow us to draw firmer conclusions on whether entities belonging to the linked systems are able to reap the predicted benefits from linking. The experience operating linked systems in Europe and North America will also help clarify the prospects for including further cap-and-trade schemes to the linked systems or for creating further clusters of linked systems. It will help the global policy community better understand the prospects for building a global climate policy architecture through linking. If the current more limited initiatives prove to be successful, they may pave the path toward ambitious large-scale linking projects in the more distant future, e.g. the creation of a transatlantic carbon market or linking of the EU ETS with the Chinese ETS.

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DIW Berlin – Deutsches Institut
für Wirtschaftsforschung
Mohrenstraße 58, 10117 Berlin

Tel. +49 (30) 897 89-0
Fax +49 (30) 897 89-200
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