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The political roots of divergence in carbon market design: implications for linking

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ABSTRACT

There is a substantial literature on optimal emissions trading system (ETS) designs, but relatively little on how organized political interests affect the design and operation of these economic instruments. This article looks systematically at the political economy of the diffusion of ETS designs and explores the implications for carbon-market linking. Contrary to expectations of convergence – as has been observed in many areas where economic policy diffuses across markets – we found substantial divergence in the design and implementation of ETS across the nine systems examined. The architects of these different systems are aware of other designs, but they have purposely adjusted designs to reflect local political and administrative goals. Divergence has sobering implications for visions of ubiquitous linkages and the emergence of a global carbon market that, to date, have been predicated on the assumption that designs would converge. More such ‘real world’ political economy analysis is needed to understand how political forces, mainly within countries, act as strong intervening variables that affect instrument design, implementation and effectiveness.

Key policy insights

- Our finding of design divergence indicates that policy efforts aimed at achieving integrated international markets are unlikely to be successful.
- Visions of carbon market linkage will need to confront the reality that there are well-organized political coalitions, anchored in the status quo, that prefer divergence.
- In linking ETS, policy-makers should devote more attention to preventing excessive capital flows that can undermine political support for linkage, while also creating incentives for convergence in trading rules over time.

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1. Introduction

Carbon markets have been regarded as a means of creating incentives for deeper cooperation to mitigate emissions of greenhouse gases (GHGs). In the 1990s, it was possible to imagine a set of ‘first best’ mechanisms for promoting global climate cooperation, with internationally linked trading mechanisms at the core (e.g. Barrett & Stavins, 2003). The original logic for emissions trading was anchored in the idea that all countries involved would adopt similar systems. As a consequence, a global market might emerge (e.g. Flachsland, Edenhofer, Jakob, & Steckel, 2008; Stavins, 1988; Stewart & Sands, 2001; Tangen & Hasselknippe, 2005). Most theories of diffusion and learning predicted the same outcome – early adopters would set patterns and superior, favoured forms would spread more widely. Today, the size and scope of carbon markets are smaller than originally expected, and the world is distinctly the realm of the ‘second best’; that, by virtue of its practicality, may actually be superior (Victor, 2011).

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Debates over the practical relevance of ‘second best’ policies are now playing out, once again, in the aftermath of the adoption of the Paris Agreement. On the one hand, there are growing calls for even more ambitious action to stop global warming. On the other hand, there are the pragmatists who point to a shift, embodied in the Paris Agreement, to a more decentralized (some say ‘bottom up’) process of coordination, through which countries have flexibility to set their own commitments and to work in small groups. The logic for this approach is that it will be easier to work out deals and monitor behaviour in small groups, while giving countries more control over the content of their commitments will make it easier for them to align pledges for efforts with what they are willing and able to implement (Victor, 2011). Where those efforts are linked – such as between emission trading systems (ETS) – scholars have theorized that there is a feasible bottom-up route, via market interconnections, to a well-functioning global climate regime (e.g. Jaffe & Stavins, 2008; Jaffe, Ranson & Stavins, 2009; Metcalf & Weisbach, 2010; Ranson & Stavins, 2016). Indeed, that vision is reflected partly in Article 6 of the Paris Agreement, which explicitly encourages linkages that can transfer emission obligations akin to trading (Article 6.2) and a host of indirect linkages (Article 6.4). The flexibility and cross-border connections in these approaches may facilitate deeper bottom-up coordination and club-based cooperation (Bodansky, Hoedl, Metcalf, & Stavins, 2016; Mehling, Metcalf, & Stavins, 2018; Victor, 2015).

This article looks systematically – in theory and practice – at the diffusion of carbon market designs and explores the implications for carbon-market linking. It is based on the ETS Diffusion project, a large-scale research project on the design and diffusion of ETS around the world (Wettestad & Gulbrandsen, 2018). With this backdrop, we address two key research questions. What are the underlying political economy forces that are causing divergence in ETS designs? And what are the implications of diverging designs for cross-jurisdictional linking of trading systems?

Contrary to expectations of the emergence of a more interconnected, global carbon market, we find that emissions trading has remained a domestic or regional policy instrument with diverging designs. The architects of these different systems are aware of other designs – especially the EU ETS, the largest and earliest major carbon market – but they have purposely adjusted designs to reflect local political and administrative goals (see also Flachsland, Marschinski, & Edenhofer, 2009a; Goulder & Schein, 2013). Although there is also some evidence of learning from frontrunners and their market designs, carbon markets have not converged on a ‘best practices’ design model (see also Haites, 2018; Narassimhan, Gallagher, Koester, & Rivera Alejo, 2018; Schmalensee & Stavins, 2017; World Bank/Ecofys, 2018).

Our finding of design divergence has sobering implications for the vision of a global carbon market. We argue that research is needed to reveal how the ‘real world’ of political forces, mainly within jurisdictions, act as strong intervening variables that affect policy instrument design. Such research is particularly needed to help explain the actual design and implementation of trading systems. Looking to the future, what is also needed is closer attention to how international linkages – once they exist – might alter the incentives within jurisdictions to adjust market designs toward convergence.

This paper proceeds as follows. Section two presents our analytical approach and methods. We identify key ETS design features and expected outcomes of policy diffusion processes. In section three, we confront the general expectation of design convergence with findings of design differences across the nine ETS systems we have examined. Section four discusses the implications of our findings for the linking of carbon markets. Section five offers some concluding reflections and extends the analysis to outline an agenda for future research on the politics and policy of carbon-market linking.

2. Analytical approach and method

Our principal research question in the ETS Diffusion project concerned the causal role of international diffusion in shaping the *design* of emissions trading systems. In practice, design has many dimensions, because trading systems can be highly complex markets in which details have a considerable impact on outcomes. We identified eight design properties that, together, broadly characterize the design of a trading system (Gulbrandsen, Underdal, Victor, & Wettestad, 2018, pp. 14–15). These design properties are described in Table 1.

In order to examine external influences on evolving ETS designs, we focused on policy diffusion mechanisms, as discussed in the political science literature: coercion, competition, learning and emulation (Gilardi, 2013;

Table 1. General ETS design features and descriptions.

Design feature	Description
Type of system	Cap-and-trade or baseline-and-credit system; the length of trading periods; the existence of specific mechanisms to allow additional flexibility within or between trading periods; governance level (e.g. sub-national, national, or supra-national system)
Level of ambition	Type of cap and level of targets to achieve emissions reductions
Coverage	Inclusion of sectors and gases in the system
Allocation	Free allocation or auctioning; allocation rules (including for new entrants and closure and for emissions-intensive and trade-exposed industries)
Offset and linking rules	Types of domestic offsets or credits based on the Clean Development Mechanism (CDM)
Monitoring, verification and enforcement	Rules and institutions for monitoring and verification and reacting to cases of non-compliance
Price-management mechanisms	Rules and possible institutions established to stabilize the carbon price, such as banking and borrowing, price floors/ceilings or quantity-focused measures
Revenue earmarking	Any rules for earmarking auctioning revenues for specific activities or sectors in systems where auctioning is a significant means of distributing allowances

Paterson et al., 2014; Simmons, Dobbin, & Garrett, 2006; Simmons & Elkins, 2004). Policy diffusion has been defined as a particular type of ‘interdependent, but uncoordinated, decision making’ in which a party *unilaterally* adopts a policy or practice initiated and pursued by others (Elkins & Simmons, 2005, p. 35). Thus defined, diffusion differs from cooperation by not being based on an explicit exchange of conditional commitments: the adopting party recognizes that a relationship of interdependence exists and takes an interest in other ETS, but designs its own system through *unilateral* decisions and with no functional links to other systems. In this sense, there is a strong overlap with tacit cooperation (cooperation based on signaling and expectation rather than codification), both of which contrast with formal cooperation (Downs & Rocke, 1990).

According to Elkins and Simmons, along with most other political science research in the area, diffusion is a process that has generally been seen as leading to *convergence* (see also Börzel & Risse, 2012; Holzinger, Knill & Sommerer, 2008; Paterson et al., 2014). This expectation of convergence is understandable because research on diffusion has tended to examine processes in which there were strong incentives for convergence – for example, politically well-organized firms that would gain from larger markets and lower transaction costs created by common standards. If there are clear leaders and deviation from common standards is costly, then potential followers will follow. Moreover, if policies are adopted in the context of internationally fungible goods and services, there may be strong market pressures for convergence. In financial accounting, for example, national bureaucrats and officials have made extensive efforts to compare best practices (and codify some of them in international standards), leading to convergence (e.g. Büthe & Mattli, 2011). In environmental regulation, learning and diffusion leading to convergence has been evident, for example, in the rapid adoption of concepts like the precautionary principle as well as the diffusion of more detailed European and Californian standards on clean fuels and air quality (e.g. Vogel, 1995).

In short, the most common view emerging from diffusion research was that when policy-makers pay close attention to what is happening in frontrunner jurisdictions, they tend to choose similar arrangements (Gulbrandsen et al., 2018). That expectation came in part from theory and was bolstered by considerable previous empirical work that reported evidence of convergence (e.g. Elkins & Simmons, 2005; Shipan & Volden, 2008; Simmons et al., 2006). By contrast, the ETS experience reveals fewer such pressures, partly because policy convergence may be conditional on the perceived success of a policy in a frontrunner jurisdiction. Our case studies also indicate that as ETS arrangements are being established and developed, they tend to penetrate deeper into the domestic and local politics of the participating jurisdictions. Compared to the early stages of policy adoption, this stage tends to enhance complexity and involve governments and stakeholders in more demanding two-level game processes.

The results reported in this article are from an in-depth examination of most systems that are in operation, or have been operational, worldwide: the EU ETS, the Regional Greenhouse Gas Initiative (RGGI) on the US East Coast, California, Tokyo, New Zealand, Australia, China (regional/city pilots and forthcoming nationwide system), South Korea and Kazakhstan (Wettestad & Gulbrandsen, 2018).¹ Since more ‘mature’ systems often

reveal important diffusion dynamics and political influences not evident in the planning or early construction phases, we focused on key systems that have been operational or under development for some time.²

3. Confronting diffusion theory with evidence

Here, we confront theory with central findings about the carbon market designs we observe. We begin with an examination of the eight design features outlined in [Table 1](#) and then turn to explanations for the divergent designs we find.

3.1. Divergent design features

Contrary to our expectation of policy diffusion leading to design convergence, we find substantial ETS design divergence across the nine systems examined. Tracking the eight design features in [Table 1](#), our key finding of divergence can be summarized as follows.³

3.1.1. Type of system

With the qualified exception of New Zealand, which has a national carbon trading scheme but no cap (Inderberg, Bailey, & Harmer, 2018), and China's national ETS, which has no fixed cap as it is output based (Goulder & Morgenstern, 2018; Stensdal, Heggelund, & Duan, 2018), all systems can be classified as cap-and-trade systems. Yet, there are several differences in basic system features, such as division into phases, length of trading periods, and rules for banking and borrowing. The latter concern the intertemporal optimization of an ETS as well as prices and expectations (see price management mechanisms below).

3.1.2. Level of ambition

The types of caps and the ambition levels differ substantially. Many factors go into how each jurisdiction determines its level of ambition and the role of the ETS in concert with other instruments. Some systems seem to rely heavily on emissions trading to achieve reductions, as in the case of New Zealand. Other systems include looser references to contributing to overall GHG emissions reductions in the jurisdiction target. The systems in South Korea and Tokyo stand out as the only ones with specific sectoral caps. The considerable variation regarding the level of the cap and emissions cuts across systems is striking.

3.1.3. Coverage

All systems cover the large and relatively easily monitored emissions from the power sector, but beyond that we found substantial variation in sector and industry coverage as well as in GHGs covered. In the EU ETS, coverage includes power producers and energy-intensive industries such as steel, cement, and pulp and paper – as in China's pilot systems and its national ETS. The Chinese pilot systems have sought to cover electricity *consumption* and hence 'indirect emissions'. The South Korean system also includes such indirect emissions. This is related to the highly-regulated power sectors in these jurisdictions, where utilities have limited possibilities for passing costs on to consumers (and hence for carbon pricing to influence consumers in such indirect ways). RGGI stands out as having particularly narrow coverage: the system applies solely to CO₂ emissions from utilities. Regarding other sectors, aviation is in various ways included in the EU, South Korea, Shanghai pilot and the coming national Chinese ETS. Other transport emissions are covered in systems such as Beijing and South Korea, and to some extent California, which has the broadest coverage within the energy system. The NZ ETS is unique in its inclusion of forestry; Tokyo is unique in its focus on large-scale office buildings. With regard to gases, CO₂ is covered by all. Four systems stand out as having very wide coverage in this respect (five or more GHGs): California, China's Chongqing pilot, New Zealand and South Korea. Here, we can note a development over time: moving from the pilot phase to subsequent phases, most systems have gradually expanded their coverage of sectors and industries.

3.1.4. Allocation

All systems started out with a mix dominated by free allocation, with auctioning becoming stronger over time. Among the systems examined, only RGGI introduced full auctioning almost from the very beginning. Most systems examined have introduced preferential treatment to emissions-intensive and trade-exposed industries, but the allocation rules vary widely across systems.

3.1.5. Offset rules

All systems provide access to some types of credits to cover obligations, but quantitative and qualitative restrictions on their use vary significantly. For example, quantitative restrictions differ across trading systems, with the Californian system having relatively strict quantitative restrictions for the use of offset credits to cover obligations. Rules on scope and quality also vary. For example, the EU ETS allows for only very limited use of credits from land use, land-use change and forestry; by contrast, California, Australia and New Zealand allow for the more extensive use of credits generated by forest and land-use projects. In Kazakhstan, projects that reduce emissions of any GHG can be implemented as domestic offset projects (unlike for instance the EU ETS, which allows only CO₂ offsets).

3.1.6. Monitoring, verification and enforcement

All systems have established procedures for monitoring, verification and enforcement, but the integrity of credits in circulation and the rules regarding penalties and responses to non-compliance vary substantially among the systems. Most trading schemes have established emissions-trading registries to enable monitoring of trade in allowances and have introduced third-party verification and enforcement mechanisms. Indeed, only one ETS to date, that in Kazakhstan, was introduced without any systems in place for monitoring, verification and enforcement. However, regarding penalties and responses to non-compliance, we find significant variation among the systems, with very little common ground.

3.1.7. Price-management mechanisms

The possibility for banking has been identified as one of the major design properties influencing carbon prices (see e.g. Schmalensee & Stavins, 2017). With the exception of Kazakhstan, all systems studied here allow banking, although with many differences in the details. Regarding borrowing, the picture is more varied, with the New Zealand and planned Australian systems (and to some extent California and South Korea) more open to it, whereas borrowing is not allowed in the other systems. Several jurisdictions have also introduced a price floor or ceiling, but there are many variations across the systems. Initially, the frontrunner EU ETS had no price- or quantity-management mechanisms. By contrast, several other jurisdictions introduced a price floor or ceiling from their inception. Both RGGI and California have quite complex arrangements, with both a price floor and a form of ceiling – for example, the Allowance Price Containment Reserve in the case of California, and the auction reserve prices in both systems. Some of the Chinese pilots have included price-floor mechanisms, as well as other mechanisms for price management. The first phase of Australia's Carbon Pricing Mechanism was based on a fixed price. The intention was to replace the fixed price with a price ceiling in the second phase, which would have been removed in the third phase. Similarly, New Zealand introduced a price ceiling as part of its 2009 reform. South Korea and China (some of the pilots and the coming national system) have centrally steered quantity-adjustment systems.

3.1.8. Revenue earmarking

We found significant variation in the recommendations and requirements for revenue earmarking across the systems examined. A few systems have earmarked proceeds from allowance auctions to GHG reduction funds (as in RGGI and California). Most systems, however, have been designed with more diffuse and non-binding rules. For instance, for the EU ETS phase 3 (2013–20) there is a recommendation to use a certain proportion of auctioning revenues for climate-change mitigation and adaptation measures. In the first two phases of the EU ETS, allowances were mostly handed out for free, making the question of revenue earmarking from auctions largely irrelevant.

3.2. Explanations for divergence

In most cases, compatibility of these design features makes linking easier (see e.g. Flachsland, Marschinski, & Edenhofer, 2009b; Hawkins & Jegou, 2014; Mehling, 2009; Ranson & Stavins, 2016; Tuerk, Mehling, Klinsky, & Wang, 2013). Lack of compatibility – for example, in the systems that affect permit prices – can create political and administrative barriers to linkage. For some of the features, compatibility may not have much practical impact on linking. Notably, revenue earmarking does not have to be compatible across jurisdictions to enable linking. What governments do with the money that comes from auctions and price control mechanisms does not really affect how permits flow across linked borders, as long as revenue earmarking does not have a material impact on the market itself.

Because our case studies were designed to contextualize our understanding of national and regional trading systems, they find greater divergence than might be expected from conventional diffusion theory approaches. The case studies examined the following factors: the mobilization and relative power of organized interest groups; the interdependent relationships between policy-makers and the electorate; the role of institutions in shaping which politically-organized interests get a voice in the design of a policy; and how path dependencies, lock-in-effects and experience related to previous policy programmes shaped the design of trading systems (Gulbrandsen et al., 2018). Here we summarize three core explanations for the observed pattern of divergence.

A first explanation is *the diversity of local politics*. No country adopts limits on emissions solely for the purpose of contributing to solving a global commons problem. To varying degrees, the mission of decarbonization is pursued alongside other policy goals and pressures that, in most cases, are more powerful within the jurisdiction. In some jurisdictions, the global goals may appear relatively weak and fleeting, whereas local goals – such as tackling local air pollution, enhancing energy security, or advancing favoured industries – are much stronger and more durable. A good example here is China and the challenge of tackling urban air pollution, which is due to many of the same sources that contribute to climate change (Stensdal et al., 2018).

Some design features are more adaptable to local political contexts than others. For example, the ability to manipulate allocation method is constrained by the reality that the choice is essentially along a single gradient between free and market-based allocation. By contrast, sectoral coverage varies widely across jurisdictions, as do the rules for allowable offsets. The sectors, gases and emissions covered typically reflect, at least in part, the administrative capabilities of the jurisdiction and the political power of the affected industries. More generally, we observe that policy diffusion processes are heavily influenced by local political interests and institutions (Wettestad & Gulbrandsen, 2018).

Second, *learning what not to do* goes a long way to explaining some patterns of design divergence. We observed that policy-makers often learn at least as much from the failures of others as from their success stories. Several instances of learning reported in our case studies have aimed at not replicating certain earlier designs. The EU ETS was the first major carbon trading system, and its sheer size and relevance eclipsed earlier emissions trading systems as ‘models’ for learning, such as the US sulphur trading programme. Had the EU ETS been an undisputed success, we might have seen more active efforts to follow and converge on the EU model. But the collapse in permit prices and suspicions that the EU’s offset programme (via the clean development mechanism, CDM) was not robust led other policy-makers to focus on how *not* to replicate what had happened in the EU case. Much initial learning focused on *avoidance*, not convergence; nevertheless, over time we see evidence of convergence on some design elements, such as the introduction of banking in almost all existing systems and in the rules for monitoring, verification and enforcement (Wettestad & Gulbrandsen, 2018).

Third, the *lack of relevant international standards* – for example, widely agreed caps or allowable emission rates – means that a focal point for policy coordination and convergence has been largely missing. Often, the process of diffusion and convergence is assisted by international standards that create focal points, mechanisms for coordination and a backstop against extreme divergence. The convergence around financial standards and accounting, for example, displays interplay between bureaucratic processes inside countries and international pressures for convergence conveyed through common agreed standards (e.g. Büthe & Mattli, 2011). In emissions trading – perhaps partly because of the difficulties experienced by the EU ETS – no such

single set of standards has emerged. However, some local focal points can be identified, such as the RGGI design for other US states that contemplated joining the system under the Clean Power Plan. Another example is the focal point given by the Western Climate Initiative (WCI) rules in facilitating linkage between California and Quebec (and Ontario).

4. Implications for carbon market linking

Ever since the mid 1990s when serious efforts were made to promote the use of emission trading for carbon it has been widely assumed that the least cost policy outcome would involve extensively linked international carbon markets (e.g. Barrett & Stavins, 2003; Stavins, 1988). By this logic, the many different national and regional emissions trading efforts were merely waystations – eventually to be combined into larger international markets, perhaps even a single global carbon market. The logic for large scope markets comes straight from prevailing economic theory (see e.g. PMR & ICAP, 2016). Bigger markets that span jurisdictions with wider variation in marginal abatement cost allow for the largest gains from trade, which can lower the overall cost of cutting emissions (Green, Sterner, & Wagner, 2014). Similarly, bigger markets that comprise diverse economies and sectors, with varied marginal costs of control, offer the greatest advantages. The Kyoto Protocol to some extent seemed to affirm that vision through the creation of a market in offsets that could, indirectly, lead to some integration across different national markets within the advanced industrialized countries.

Mindful of this logic, bold visions for carbon markets have been offered, and large trading companies have been created around that vision (Rosenzweig, 2016). Several governments have also outlined bold plans for linkage between markets – such as linkages between the EU and Australia and other markets (Bailey & Inderberg, 2018; Jevnaker & Wettestad, 2016). However, apart from Quebec linking up to California, and Switzerland and European Economic Area (EEA) members Norway, Iceland and Lichtenstein to the EU ETS, none of those linkages have materialized.

Our finding that the governing rules in different carbon markets have diverged has sobering implications for these visions of ubiquitous linkages and the emergence of a global carbon market. In effect, divergence has created various different ‘currencies’ that are regulated by national ‘central bankers’ who respond to different rules (Victor, House, & Joy, 2005). Unfettered linkage between these markets would not create incentives for cooperation. Instead, it would create currency and capital flows along with incentives for firms to seek the least well regulated, cheapest compliance credits – a carbon variant of Gresham’s law.⁴ Fixing these problems to create truly global carbon markets would require radically different institutions that seem politically infeasible to create – in effect, an autonomous central carbon bank that could oversee and harmonize different national institutions (Green, 2017, p. 486). Policy-makers who have overseen this divergence – who have chosen rules that align with local political interests rather than aspiring to international harmonization – know that unfettered linkage would give them less control over local outcomes (Green et al., 2014). Visions of linkage will need to confront the reality that there will be well-organized political coalitions, anchored in the status quo, that will want the opposite outcome.

We are mindful that other contributions are more optimistic about linking. Such contributions have explored the possibilities for the creation of an integrated international market that links national and regional systems with different designs as well as alternative options when direct, unfettered linking is not feasible (PMR & ICAP, 2016). For example, Rose, Wei, Miller, Vandyck, and Flachsland (2018) consider how a stepwise approach that involves two intermediary stages could ultimately lead to a global system of emissions trading. They discuss, among other things, indirect harmonization of domestic carbon prices, e.g. via harmonization of price floor levels, which would capture most of the efficiency gains associated with linking. Similarly, Burtraw, Palmer, Munnings, Weber, and Woerman (2013) propose a framework for ‘linking by degrees’ and discuss which design elements need to be aligned prior to the trading of allowances between systems. Other contributions acknowledge the challenges of linking ‘heterogeneous’ cap-and-trade systems but maintain that careful linking can provide incentives to increase mitigation ambition under the Paris Agreement over time (Mehling, Metcalf, & Stavins, 2017). While this is an area of ongoing debate, our political economy perspective sees well-organized political coalitions emerging against satisfying the precondition needed for linkage. At the root of those coalitions are groups who, for various reasons, fear loss of control over outcomes that would be implied by

unfettered linkage. For example, when California debated rules about international linkage – either through direct linkages or via offsets – the opponents included environmental groups that feared linkage would erode California’s supposedly tight control over environmental quality (Bang, Victor, & Andresen, 2018).

If the political foundations of local carbon markets lead to persistent divergence, then the future roles for international carbon markets are likely to be much smaller and also quite different from what analysts expected when they imagined a golden age of global carbon trading. Today, and for the conceivable future, carbon markets are not moving large volumes of commodity credits across borders. Instead, such markets can be envisioned as operating at the ‘seams’ between different national policy efforts to promote decarbonization. The core of these national and other policy efforts will reflect local political and administrative realities. They will reflect how different jurisdictions see market instruments serving different functions – for some, like California, the market is a ‘backstop’ that sweeps up remaining cuts that are not addressed through other regulatory measures; for others, like the EU, the market plays a more central role. Still others, like China, see the market more as a mechanism for promoting experimentation; even as China formally moves into a system that purports to cover the whole nation, in fact experimentation is still well under way because the political processes in the country do not fully rely on the market to inspire the difficult decisions about where to invest and alter behaviour to control emissions. In preparing for national emissions trading, China has learnt from its regional/city pilots and other ETS, but the national system must also confront domestic and local challenges that are particular to China (Duan, Qi, & Wu, 2018; Stensdal et al., 2018). In most cases, emissions trading will not be the core mechanism affecting emissions – a host of other regulatory measures will have greater influence on the technology and production choices of firms and households.

Given this diversity in goals and administration, it is hardly surprising that unfettered interconnection of markets across borders – which would create the equivalent of a single common currency and would force some homogeneity in price and effort – has remained elusive. For some analysts who imagine a world of global trading, this is a bleak picture, far removed from their ‘first best’ vision of what should be done. For students of politics and public administration, it is much more rooted in reality. In this world of divergence, far more attention will be needed to the mechanisms for linking different carbon markets – not unfettered linkages, but careful links that can be managed to prevent excessive capital flows and linkages that create incentives for convergence in trading rules over time (cf. Burtraw et al., 2013; Green, 2017; Lazarus, Schneider, Lee, & van Asselt, 2015; Mehling et al., 2017; Rose et al., 2018). That process will be slow, since it must confront the need not just to learn the right lessons but also to rewire local politics and administrative procedures around common standards and expectations. Linkages will need to create benefits and interest groups that seek to advance those benefits.

Although the overall finding of divergence is sobering for visions of global trading quickly leading to global cooperation, our findings do indicate some areas where there are some elements of convergence. Lessons are being learned – from failures, and from successes. For example, the efforts in many jurisdictions to avoid the price volatility seen in the EU has led to more widespread use of price floors – so that ETS, in part, mimic carbon taxes more closely. In some jurisdictions, including the EU, that lesson is known but is impractical to implement – because tax/price-focused measures require member state unanimity under EU law, creating higher political hurdles when compared with cap-and-trade. Instead, the EU has adopted a quantity-based mechanism, which could be of interest to other jurisdictions with similar political hurdles (Jevnaker & Wettestad, 2017). The national system in China aims at dealing with the challenge of price volatility by allocating allowances annually.

In addition, there is much more widespread agreement today on the need for market measures to play a role in emissions policy – a lesson that the firms most exposed to the cost of emission controls are themselves keen to promote. The world may be on the cusp of another major push to using market instruments – this time, guided by greater technical and political awareness of exactly where and how such instruments can function, and how they can be linked across borders.

5. Conclusion: a research agenda for carbon-markets linking

We expected to find that diffusion – to the extent it actually occurred – would lead more often to convergence in the design of emission trading systems than to divergence. Our case studies provide only limited support for

that expectation. Instead, they indicate that policy-makers quite often respond differently to what appear to be quite similar challenges, because the learning and adaptation process is heavily influenced by local political interests and institutions. Equally important, political jurisdictions are observing what does not work in other jurisdictions and are purposely adopting different rules. What does all this mean for future research on carbon-markets linking? Future research should explore five fronts.

First and foremost, the diversity of local politics means that researchers must contend with the fact that there are many complex domestic processes and mechanisms to uncover and understand. There is clearly a need for more research on how design choices are rooted in domestic conditions – and to search for patterns in how those domestic factors shape outcomes. A place to begin that investigation is the same place where most political economy research originates – with attention to the organization and power of contending interest groups.

Our studies show that linking faces, often, a considerable political feasibility challenge: despite the obvious and likely economic benefits, the resistance of central political actors, due to uncertainty about distributional effects, can render linking efforts complicated or futile (Cullenward, 2014, 2015; Green, 2017; Green et al., 2014; Jevnaker & Wettestad, 2016). The standard insights from political economy apply. Where most of the national benefits are expected to be collective or at least widely distributed, while anticipated costs are concentrated to specific industries, sectors, companies or regions, the latter will likely invest a considerable amount of their time and energy in blocking the deal in its present format. Policies that do survive these domestic politics will need to reflect local interests. The result will be policies aimed at building political coalitions, resulting in a ‘second best’ outcome (Barrett & Stavins, 2003). This perspective also helps to explain where interest groups that favour linking may emerge – and how efforts to create those links can generate rents to such groups that, as they magnify, yield stronger political pressure for linking. The aim here is nothing less than a dynamic political economy theory of linking.

A second front for new research is to investigate whether one of our central findings – design divergence rather than convergence – holds for cases not analyzed here, like the emerging systems in countries such as Thailand, Vietnam and South Africa. Perhaps new cases – especially where they engage small countries that must be price takers in any linked market – can reveal convergence through diffusion, with convergence around a better design model that has been refined through more experience. For small markets, just like small economies in the global system for trade in goods and services, the costs of not being linked to the outside world are larger. That is why small systems have been the first to link with larger systems, such as Switzerland and the (now shelved) system in Australia and the EU ETS. Other examples include the link between Quebec and California.

Third, additional research – with an eye to policy application – is needed to know more about the implications for the design of linking mechanisms. We have made the case that unfettered linkage is unlikely, and few who are observing the real-world political economy of climate policy would disagree. Yet in some jurisdictions there is pressure for linkage, the economic logic for doing so is powerful, and with success in some linking efforts, the interest groups that favour linking – along with the evidence and resources they can use to advance their case – can grow. Those pro-linking groups include, not surprisingly, groups whose members face high compliance costs and see linkage as a way to reduce compliance costs and volatility. In Australia, for example, a major domestic motivation for linking was to reassure companies that they would not have to pay appreciably more than international permit prices (Bailey & Inderberg, 2018). With that as a backdrop, from theory and evidence in analogous cases, it would be possible to explore design of linkage systems that do not attempt full-blown linking but rather aim for political simplicity. For example, harmonization of floor prices in systems designed for operation around the price floor could be easier than working out a full linking scheme (e.g. Rose et al., 2018). It might also be possible to create safety valves around linking systems to help prevent most-feared behaviours – such as large capital flows – by looking at safety valves and springs that exist in other areas of cross-border activity such as trade. The question of safety valves in linking has received some technical attention (e.g. Mehling et al., 2017), but not from a political economy perspective. It could also be possible to design linkage systems to help reveal information about arbitrage opportunities between markets – information that could help policy-makers identify flaws in their own local markets that, in turn, would help to reduce future politically inconvenient flows through linkage mechanisms.

Fourth, a political economy of linkage could help to reveal how interest groups could emerge to favour further linkage – just as, for example, interest groups that favour freer trade in goods and services have emerged in countries that joined the World Trade Organisation (e.g. China) and then helped to solidify the country's membership and engagement with that international institution. By this logic, a dynamic theory and practice around the political economy of linkage can emerge – starting in the largest, most centralized and best organized sectors where the gains from linkage may be greatest, and then spreading as the economic benefits from linkage grow. Since essentially no such linkage exists today, research of this type will need to rely on formal and simulation models along with examination of analogous cases.

Finally, it would be useful to use results from our study to take a fresh look at the literature on policy diffusion and convergence. Earlier research may have been biased in the direction of finding convergence because it was focused on areas like financial regulation, where convergence was easier and incentives were stronger. The bias that exists there, but does not exist for emission trading, may be amenable to systematic explanation by focusing on the ease of creating linkages, the cost of preserving systems that are not linked, and the organization of interest groups that favour and oppose linkage.

Notes

1. Main systems that we did not cover at the time of writing were those in Saitama (Japan), Switzerland, and Ontario and Quebec (Canada). Switzerland has linked to the EU; Ontario and Quebec created markets that operated in parallel with California—although Ontario, for internal political reasons, has since withdrawn.
2. The Australian Carbon Pricing Mechanism (CPM) was repealed in 2014. The Kazakhstan ETS was suspended from April 2016 and relaunched on 1 January 2018. The Chinese national system was officially launched in December 2017, but the regulators are still developing the market infrastructure to prepare for simulation trading (2019) and full trading (2020).
3. For elaborations and discussion see Wettestad and Gulbrandsen (2018).
4. In economics, Gresham's law is a monetary principle saying that 'bad money drives out good' if the two forms of commodity money in circulation are accepted by law as having similar face value.

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