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Is it feasible to link the European Union emissions trading system with the Californian cap-and-trade programme?

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List of Acronyms & Abbreviations

Agreement	Agreement between the California Air Resources Board and the Gouvernement du Québec concerning the harmonisation and integration of cap-and-trade programs for reducing greenhouse gas emissions.
APCR	Allowance Price Containment Reserve
CARB	Californian Air Resources Board
CAT	Californian Cap-and-Trade Programme
CDM	Clean Development Mechanism
CO_2	Carbon Dioxide
ETS	Emissions Trading System
EC	European Commission
EU	European Union
EU ETS	European Union Emissions Trading System
GHG	Greenhouse Gas Emissions
IETA	International Emissions Trading Association
JI	Joint Implementation
KP	Kyoto Protocol
MRV	Monitoring, Reporting and Verification
MS	Member States
MSR	Market Stability Reserve
PAM	Price Adjustment Mechanism
WCI	Western Climate Initiative
UN	United Nations

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Abstract

*This thesis examines the technical, legal and political feasibility of linking the European Union emissions trading system (**EU ETS**) with the Californian cap-and-trade programme (**CAT**). The technical feasibility of linking refers to the alignment of four key design features in the EU ETS and the CAT: (i) offset credits; (ii) price adjustment mechanisms (**PAM**); (iii) complementary climate and energy policies and (iv) monitoring, reporting and verification (**MRV**). Unless Europe and California can align their polar positions regarding land use, clearance and forestry (**LULUCF**) offsets and price floors, linking appears unlikely. There is also the question of how California's Allowance Price Containment Reserve (**APCR**) and the EU's proposed Market Stability Reserve (**MSR**) would function together in a linked scheme. Aligning the complementary climate and energy policies and MRV systems is less problematic, as harmonisation is not necessary. Regarding legal feasibility, it is unclear whether California, as a sub-national state, has the authority to negotiate and enter into a linked scheme with the EU. Politically, California may be reluctant to link with the EU, as this will lower both its allowance price and fiscal revenue. Furthermore, it could decrease the level of domestic investment and abatement. Assuaging California's concerns rests heavily on the extent to which the proposed structural reforms to the EU ETS boost the allowance price. In the case of linking the EU ETS and the CAT, domestic policy objectives are more important than the cost-efficiency gains of linking. As such, establishing a partial link may be more feasible.*

Section I Introduction & Background

Section I.A Introduction & Literature Review

Although countries have pledged to form a global climate change agreement in Paris in 2015 (Decision, CP19, 2013; Decision, CP17, 2011), the development of an international climate change regime has been problematic: not only has progress been slow, but there are real concerns over the quality of this new agreement (Figueres, 2014; Fujiwara, 2013; Haites, Yamin & Höhne, 2013). This has increased the focus on the potential of fragmented, bottom-up responses to climate change.

Traditionally, the United Nations' (**UN**) approach to climate change has been top-down, as exemplified by the Kyoto Protocol (**KP**) (1997). The KP is an agreement based on multilateral membership that sets out legally binding commitments, managed under the centralised authority of the UN Framework Convention on Climate Change (1992) (Leal-Arcas, 2011). However, efforts to produce another universal, legally binding treaty have 'been producing diminishing returns for some time' (Falkner, Stephan & Vogler, 2010, p.253). There has also been an increasing tendency for the international climate change regime to adopt a mix of top-down and bottom-up approaches (Edenhofer, Flachsland, Stavins & Stowe, 2013), rather than attempt to create another KP. This is evident in the pledge-and-review approach adopted at the Copenhagen and Cancun Conference of the Parties. Although there is still a degree of centralised monitoring and oversight by the UN, it is up to each individual country to voluntarily submit their national mitigation commitments.

Rather than wait for a global unified climate change regime to emerge, perhaps there is also a role for bottom-up responses, such as ETSs, in combatting climate change (Jaffe, Ranson & Stavins, 2009; Keohane & Victor, 2010). Indeed even if an agreement in 2015 emerges, it is likely to be modeled on the system adopted in Copenhagen and Cancun (Edenhofer et al., 2013). As such, there is still a significant role ETSs can play in addressing climate change, as it can help countries achieve their national mitigation targets.

An ETS is a quantity-based market mechanism that sees climate change 'as market failure on the grandest scale the world has ever seen' (Stern, 2007, p.25). It establishes a set of property rights, in this case, tradable permits, as an optimal means of controlling pollution. The resultant market transactions would ensure 'an optimum utili[s]ation of rights' (Coase, 1960, p.27). In practice, the scheme caps the amount of greenhouse gas (GHG) emissions for a target population. Within this cap, it distributes emission permits among participants and then allows them to trade such permits with each other in order to meet their commitments. Unlike classic command and control regulations, there is no set emissions reduction strategy. Rather, the trading mechanism helps to keep reduction costs down by redistributing permits to firms for whom emissions reductions are the hardest or costliest.

Such systems are evident on the local, national and regional level, and linking such schemes could help reduce the cost of addressing climate change. There has been significant work done outlining the economic and political advantages of linking ETSs (Burtraw, Palmer, Munnings, Weber & Woerman, 2013; Flachsland, Marschinski & Edenhofer, 2009a; Jaffe et al., 2009). However, the benefits of linking are highly contingent on the design of the ETS and the goals of its regulators. Indeed, although there is significant literature on the theoretical benefits of linking, this is often based on ideal conditions in order to achieve an optimum outcome, with less focus on the institutional and political constraints (Convery, 2009). Partly, this is because no credible linking alternatives for the EU ETS have emerged until recently.

However, contemporary literature has begun to address the practical and political aspects of implementing a linked scheme (Duscha & Schleich, 2009; Haites & Mullins, 2001; Jaffe et al., 2009; Tuerk et al., 2009a; Zetterberg, 2012). This thesis seeks to add to the emerging literature and focuses on the governance aspects of a linked ETS. Specifically, this thesis will expand on Zetterberg's paper, which has analysed the alignment challenges of linking the EU ETS and the CAT (2012).

Section I.B Research Question

This thesis purports to answer the following research question:

Is it feasible to link the EU ETS and the CAT?

In addressing feasibility, this thesis will look at two components: (i) technical feasibility and (ii) political and legal feasibility.

Section I.B(i) Technical Feasibility

The first component focuses on whether the design features of both ETSs allow them to be linked. This does not mean that all features need to be identical. In order to identify the relevant features, this thesis focuses on whether the alignment of these features is necessary for: (i) stability and investor confidence; (ii) environmental integrity and (iii) minimising negative economic and distributional impact (based on criteria used by Mehling, Tuerk & Sterk, 2011; Sterk & Kruger, 2009; Tuerk et al., 2009a; Zetterberg, 2012).

Figure 1: ETS design features & Relevancy to linking

Design Features	Relevancy to Linking
MRV & registries Banking & borrowing Compliance periods New entrants and closures Enforcement Type of cap Allocation methods	Harmonisation not needed/relatively easy to achieve
Target stringency*	Contingent on similar levels of ambition
PAMs*	If unaligned, will decrease efficiency of linked scheme
Eligibility of offsets*	Differing views on offset types and limits could inhibit linking

* = critical features
Source: Mehling et al., 2011; Sterk & Kruger, 2009; Tuerk et al., 2009a; Zetterberg, 2012

Given the EU ETS and the CAT have similar levels of ambition (Flachsland et al., 2008) this aspect will not be addressed. Thus, this thesis focuses on the coordination of carbon offsets and PAMs in order to facilitate linking between the EU ETS and the CAT. However, given the divergent views of Californian and

EU policy makers on LULUCF offsets and PAMs, aligning these two elements pose significant political challenges. Additionally, two further design features will be addressed: complementary climate and energy policies within the EU and California, and MRV systems. Coordinating these complementary policies may be necessary given the potential impact they can have on the carbon price. Finally, aligning MRV systems is important in order to ensure the linked system is perceived as credible and trustworthy by regulated entities in both systems.[1]

Section I.B(ii) Legal and Political Feasibility

Even if these four key features are aligned, the legal and political feasibility of linking must also be addressed. One point to bear in mind is that the EU ETS governs several countries, whereas the CAT is a sub-national scheme of a single US state. It is unclear whether California has the legal authority to negotiate and link with the EU. Equally, it is unclear how the actual linking negotiations would proceed. For instance, would the European Commission (**EC**) negotiate with California as an equal partner, if so, how would member states (**MS**) react to this? From a political perspective, linking may not necessarily benefit both parties as it could have a significant impact on their policy goals and revenue. The preferences and perceptions of Californian and EU actors - including its MS – need to be taken into account, as divergent views and priorities can constitute a serious barrier to linking (Wettestad & Jevnaker, 2013). In this regard, the potential distributional impact of a linked EU-CAT scheme, particularly for California, may outweigh the gains realised by way of political symbolism and cost-efficiency.

Section I.C Research Methodology

To answer the research question, this thesis will undertake a qualitative comparative analysis of the CAT and the EU ETS' key design features. The legal and political feasibility of linking will also be considered. In order to evaluate the design features that must be aligned in order for a linked scheme to operate, I also undertook a literature review on the advantages and disadvantages of linking. The most important criteria are: environmental effectiveness, design compatibility, cost-effectiveness and political feasibility. These were then used to determine the four design features outlined in the

[1] For an analysis of the alignment of other design features for the EU ETS and the CAT, see Zetterberg, 2012; more generally see Burtraw et al., 2013; Tuerk et al., 2009.

previous paragraph (section I.B). A qualitative comparative analysis of the CAT and the EU ETS' four design features is then undertaken. Moreover, I canvassed and analysed a number of primary sources including the legislation, regulation and guidelines from both ETSs, as well as the legislation, guidelines and government reports surrounding other ETSs (i.e. Australia and Quebec), which are linked, or may link, with my case studies to help understand how the various design features were negotiated.

Finally, in order to better understand the feasibility of creating a linked EU-Californian scheme, nine interviews with experts in the field of climate change were undertaken. Such experts included representatives from: the EC, the California Air Resource Board (**CARB**), the European Energy Exchange, the International Carbon Action Partnership, the International Emissions Trading Authority, the Climate Action Reserve, the Mercator Research Institute for Global Commons and Climate Change, and the University of California, San Diego. Overall, the respondents were relatively enthusiastic about the potential linkage of the EU ETS and California; although there is significant concern about its political and legal feasibility.

Section I.D Essay Structure

This essay is divided into four sections:

The first section introduces the EU ETS and the CAT, the two ETSs chosen as potential linking candidates, and also discusses the literature review on linking. The review includes the various types of linking possible, as well as the economic, administrative and political advantages and disadvantages of engaging in such action.

The second section examines the technical feasibility of aligning the offsets, PAMs, complementary climate policies and MRV systems in order to create a European-Californian scheme. This section is further divided into four sub-sections. The first looks at the use of offsets, in particular, the use of LULUCF and CDM offsets. These mechanisms let regulated entities finance emissions reduction projects to generate credits, which can then be traded on the carbon market. The second sub-section looks at the alignment of PAMs and how a

quantitative-based adjustment mechanism, like the EU's proposed MSR (EC, 2014a), can be aligned with the price-based adjustment mechanism in the CAT. Furthermore, California's auction price floor must also be aligned, as it would have a significant impact on the linked European-Californian scheme. The next sub-section looks at the role of complementary climate policies in a linked scheme. Complementary policies, like the renewable energy targets for the EU (EC, 2006), will be discussed and the extent to which they need to be aligned, especially if they will affect the carbon price. Finally, the issue of MRV systems will also be discussed.

The third section examines the legal and political feasibility of a linked European-Californian scheme. With respect to legal feasibility, the different linking methods will be addressed, with the finding that a direct link is most likely achieved by amending the respective legislations that govern the EU ETS and the CAT. However, the ability of California to negotiate and link with the EU is unclear. Regarding political feasibility, the preferences of European and Californian policy-makers will be considered.

Finally, the fourth section will summarise the key findings of this thesis. Ultimately, it will be shown that, although a linked scheme may well be legally and technically possible to establish, the political feasibility of such a scheme still presents significant obstacles.

Section I.E Case Studies: EU & California

The EU ETS (Directive 2003/87/EC) is the centrepiece of the EU's climate policy. It is the first, and largest, ETS, encompassing the 28 EU MS, as well as Iceland, Liechtenstein and Norway. It covers 45% of GHG emissions across the EU and includes energy-intensive sectors like bulk chemical or cement production, the commercial aviation industry, as well as power and heat generating facilities (EC, 2013a). The EU ETS was launched in 2005. It underwent a pilot phase from 2005-2007, followed the KP's commitment period from 2008-2012 and is currently in the third phase, from 2013 to 2020, aiming for a 21% reduction of GHG emissions from 2005 levels (EC, 2013b). In the first two phases, the EU ETS operated under national allocation plans and the free allocation of permits was

the main means by which permits were distributed. By the third phase, the EU ETS had imposed an EU-wide cap and the share of auctioning has increased to 40% (ibid).

Due to an over-allocation of allowances under the EU ETS and the economic crisis, both of which have reduced the demand for such allowances, the EU ETS has experienced a strong decline in the carbon price (Berghmans, Sartor & Stephan, 2013; Haug, Frerk, Kachi, Serre & Wilkening, 2014; van der Gaast & Spijker, 2013). As such, there has been considerable debate about potential reforms and the future of the EU ETS (EC, 2014a; Haug et al., 2014; Sartor, 2012). Although the EC has proposed delaying ('backloading') the auction of 900 million allowances, it is also considering longer-term structural reforms to address the supply and demand issue within the EU ETS (Haug et al., 2014). Specifically, the EC has proposed a MSR, which would adjust allowance volumes when it is outside a specific, pre-determined range (EC, 2014a). Essentially, allowances are removed and released in relation to the total number of allowances in the market in order to better balance out supply and demand (EC, 2014a).

In California, the Global Warming Solutions Act outlines its commitment to reduce GHG emissions to 1990 levels by 2020 and to reduce 1990 levels by 80% by 2050 (2006). Rather than mandating concrete programmes and steps, it empowers the CARB to set policy, monitor and regulate, in order to achieve the legislation's objective of making low-carbon technology more desirable and reducing GHG emissions. Passed in 2010, and coming into effect in 2012, California's CAT covers 85% of California's GHG emissions and is also linked to the Western Climate Initiative (**WCI**). The WCI is a regional ETS initiative, which, when fully implemented, will allow Californian regulated firms to trade with collaborating States in the United States, Canada and Mexico (CARB, 2011). Currently, emissions trading between WCI States, is limited to California and Quebec, which signed a linking agreement in 2013 (Agreement between California Air Resources Board and the Gouvernement du Québec concerning the harmonisation and integration of cap-and-trade programs for reducing

greenhouse gas emissions [hereinafter **Agreement**], 2013). The CAT covers electric utilities and large industrial facilities with allowances set at 90% of average emissions. These allowances will initially be free but will transition to auctioned allowances later in the programme. Furthermore, in 2015 the scheme will be extended to transportation, natural gas and other fuels. For a comparison of the two ETSs, see figure 2.

Figure 2: Overview of the EU ETS and CAT

	EU ETS	CAT
Population	500 million	38 million
Coverage	EU-28 MS + Iceland, Liechtenstein and Norway.	California
Point of regulation	Downstream	Hybrid
Trading Unit	Per metric tonne of carbon dioxide (**CO_2**)	Per metric tonne of CO_2
Gross regional product	US$ 16 trillion	US$ 1.9 trillion
GHG	CO_2, N_2O, PFCs Possibility to cover all GHGs under the KP	CO_2, CH_4, N_2O, SF_6, PFCs & NF_3
Sectors	Electricity, heat & steam production, industrial sectors (oil, iron & steel, cement, glass, pulp & paper), CO_2 from petrochemicals, ammonia, aluminum, N_2O from acid production, PFCs from aluminum	Electricity (including imports) & industry, ground transportation & heating fuels as of 2015
Allocation	Electricity: 100% auctioning Industry: 20% auctioning (2030: 70% free allocation; 2027: full auctioning) Emissions-intensive trade exposed sectors: free allocation up to 100%	Mostly free allocation to vulnerable industries and electricity generators Phase I: average entity receives 90% free allowances, this percentage decreases as CAT progresses
Energy mix by sector	Industry: 28% Households: 41% Transport: 31%	Industry: 23% Commercial: 18% Households: 18%

		Transport: 40%
Banking and Borrowing	Banking possible Borrowing within trading period (phasing out)	Banking possible No borrowing
Emission thresholds	Any combustion installation over 20 MW, sector-specific threshold for other sources	Emitters of at least 25,000 metric tons CO_2e annually
Target	21% below 2005 emissions by 2020	Reduce GHG emissions to 1990 levels by 2020 and to reduce 1990 levels by 80% by 2050
2013 allowance budgets	2039 million allowances	162.8 million allowances
Penalties	€100/excess tonne plus surrender missing allowances in the next year	3 allowances/tonne not covered
Emissions target (million metric tonnes of CO_2)	1643 (2020)	334.2 (2020)
Price floor	-	Auction price floor: US$10/tonne, rising 5% annually (+ inflation) starting in 2014
Linking	Discussions with Switzerland and Australia	Linked with Quebec (2014)
2013 offset use limit	Considering limits post 2020[2]	13 million
Offset categories	1. Clean Development Mechanism (**CDM**)[3] 2. Some Joint Implementation (**JI**) projects (exclude LULUCF; adipic acid & HFC credits)	1. Federal forestry/urban forestry 2. Livestock 3. Ozone depleting substances

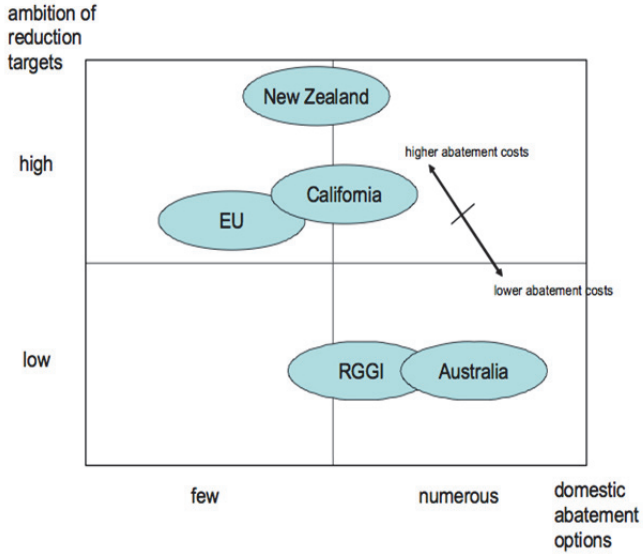
Source: Centre for Climate and Energy Solutions, 2014; EC Climate Action, 2013

[2] The EU has proposed limits for the use of CDM and JI credits during the 2012-2020 compliance period. Regulated entities are entitled to use such credits up until the higher limit of either: (i) the amount specified in the phase II national allocation plan; or (ii) 11% of the free allocation of EU allowances distributed to them during that period (EC, 2013c).

[3] However, both the use of CDM and JI credits may be banned as of 2020 (EC, 2014b).

Despite the emergence of numerous ETSs across the globe, the CAT has been chosen as a linking candidate for the EU ETS for three reasons. Firstly, linking with California would be in line with the EU's goal of establishing a transatlantic carbon market (EC, 2013b). Linking these schemes could form the backbone of a potential US-EU linked ETS. This would also add significant momentum to creating a global carbon market. It might be prudent for the EU to grasp the opportunity to link its scheme with that of California and not wait for a chance to link with a US ETS, as few consider a national ETS scheme before 2020 to be likely (IETA, 2013; Zetterberg 2012).[4]

Figure 3: Domestic abatement costs & ambition of ETS



Source: Flachsland, Edenhofer, Jakob & Steckel, 2008

Secondly, the Californian and European schemes have similar levels of ambition (Flachsland et al., 2008; see figure 3). The EU has proposed a 25% reduction below business-as-usual emissions, with California proposing a slightly more ambitious target of 40% (ibid). If the available abatement options for both schemes are also factored in, figure 3 highlights that both the EU ETS and the CAT have similar levels of ambition. Indeed target stringency is 'one of the most politically critical issues [...] [for] linkage' (Tuerk, 2009, p.2). Linking with a scheme that has a significantly lower target would require that scheme to accept a substantial reduction in domestic abatement and its carbon price (ibid). This not only undermines the scheme's own domestic preferences, it also results in a loss of revenue (ibid).

[4] This point was raised in interviews with experts from the US.

Finally both parties have already met to share information and discuss linking their ETSs (Carus, 2011). Furthermore, since the CAT was purposefully designed in a manner that would facilitate trading with the EU ETS and other schemes (Executive Order S-20-06, 2006), then both parties have the means and intent to establish a linked scheme.

Section I.F Background & Literature Review

Section I.F(i) Types of Linking

Most ETSs across the world, from Kazakhstan to Tokyo, have, or have proposed, some form of linking (Ranson & Stavins, 2014). As Ranson and Stavins identify, these can be grouped into four categories: (i) unilateral and bilateral links between ETSs; (ii) unilateral links with a credit system, such as the JI and CDM; (iii) implied links through national trading as per the KP, Article 17 and (iv) other types of non-traditional links (i.e. linking by degrees (Burtraw et al., 2013)) (2014). However, unilateral links will not allow for both parties to trade allowances and California is reluctant to link with international credit systems, like the CDM. As such, this thesis will propose a direct bilateral link between the EU ETS and the CAT in the long-term, with non-traditional linkages forming in the short-term, in order to facilitate the bilateral link. Thus, it will focus only on the first category and the last category of linking.

By forming a two-way link, both schemes would commit to mutually recognise and accept allowances from the other. As a result, the political and economic circumstances of both partners would now affect the other. Furthermore, any additional links one scheme may have would also be extended to the other, such as the use of CDM offsets in the EU. Given this automatic propagation, it is important to ensure, that when negotiating the two-way link, key design features are aligned, or failing that, certain policy tools are put in place to avoid later compromising the goals of both schemes (Burtraw et al., 2013).

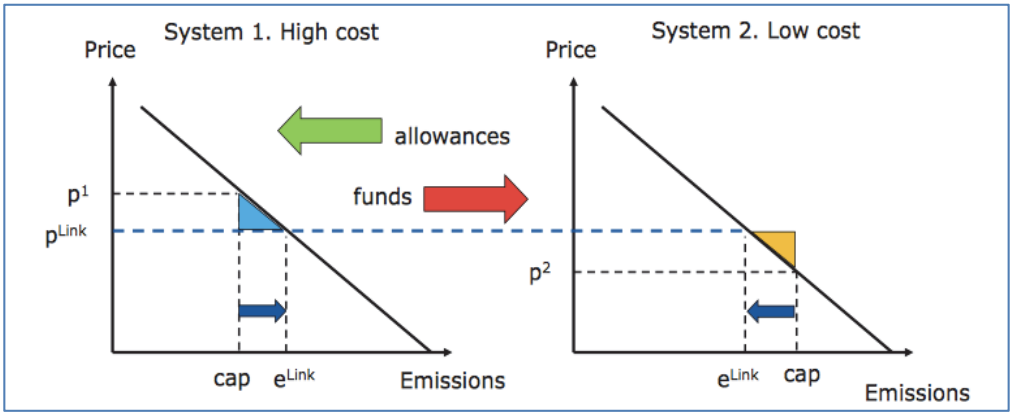
In the short-term, however, it is proposed that the EU and California begin 'linking by degrees' (Burtraw et al., 2013, p.1). Cooperating on certain aspects, such as aligning cap-setting methodologies or implementing narrow linkages, for instance, based on certain sectors or offsets. This can help pave the way for a more formal and direct link in the future. These initial links let regulators

become familiar with the institutions of the other system and are a practical means of transitioning to a directly linked system (Burtraw et al., 2013). This can also help pinpoint further areas that require cooperation or alignment.

Section I.F(ii) Advantages of Linking

Establishing a directly linked two-way system offers several economic, administrative and political advantages. In terms of economic advantages, linking offers three distinct advantages: it increases cost efficiency, sends a clearer carbon price signal and lowers competitive distortions (Ahlberg et al., 2013; Edenhofer, Flachsland & Marschinski, 2007; Haites & Mullins, 2001). The increase in cost efficiency is illustrated by figure 4. When both schemes link, this results in more abatement opportunities for both sides, leading to sales of allowances in the lower priced system (system 2) to entities under the higher priced system (system 1), until the prices in both schemes have equalised (Jaffe et al., 2009; Zetterberg 2012).

Figure 4: Effects of linking two ETSs



Source: Zetterberg, 2012

This is because system 2 will pursue additional emissions reductions and sell their surplus to system 1 entities, which will purchase the cheaper allowances from system 2 until the price in both systems are the same (Zetterberg, 2012). The cost savings for system 1 is outlined by the blue triangle, which is the reduction of abatement costs less the cost of the additional system 2 allowances. Conversely, the yellow triangle in system 2 highlights the net revenue accrued, which consists of the value of sold allowances minus the additional costs of abatement. From a theoretical perspective, the scheme is

more cost efficient as emissions are reduced at the lowest cost (Edenhofer et al., 2007).

Furthermore, the economic gains from linking can be significant. For instance, regulated EU entities have saved up to $1.2 billion from 2008-2011 through the one-way link between the EU ETS and the CDM, which allows firms to reduce emissions by funding international projects (Ranson & Stavins, 2014).

A second economic advantage of linking is a clearer carbon price signal. A bigger market not only increases the strength of the price signal but would also provide some certainty to investors in carbon-intensive industries. This is because the mutual pressure among linking partners, and the potential sanctioning mechanism (i.e. trade restrictions), helps the linked scheme to establish a credible price signal (Flachsland et al., 2009a; Zetterberg, 2012). Such pressure and the potential loss of reputation can also ensure partners do not relax their cap or the ambitiousness of their scheme. More generally, a unified carbon price would help the domestic public and businesses accept climate policy, as other jurisdictions are also subject to a carbon price (Zetterberg, 2012). Finally, a linked carbon scheme could also reduce competitiveness concerns and fears about carbon leakage, as regulated entities in the same sector would be subject to the same carbon price across both schemes.

Secondly, it would also reduce the administrative costs of emissions trading. This would also benefit regulated entities, as a linked scheme would create more consistent procedures and regulations, making it easier to conduct business across the linked jurisdictions.

Thirdly, from a political perspective, a linked scheme signals a long-term commitment to climate change and multilateralism (Zetterberg, 2012). Indeed the EU has been particularly vocal on this point, outlining its vision for establishing an OECD-wide carbon market by 2015, extending this to major emerging powers by 2020 (EC, 2009). For the EU, linking would also be a means of gaining global cooperation on climate change, as a transatlantic carbon

market would be concrete proof of the EU's commitment to climate change. Although California does not participate in international climate negotiations, linking could also have positive political benefits. Expanding their policies on climate change would be in line with its regional role as an environmental leader (Carlson, 2013). A link would also showcase California's climate efforts, despite the laggard progress on the federal level. Indeed, a transatlantic link would not only increase California's policy influence over the federal level, it could stimulate further federal action as well.

Section I.F(iii) Disadvantages of Linking

Of course, there are economic and political risks associated with linking ETSs. From an economic perspective, even though linking creates a larger market to spread the impact of price shocks, it also increases the contagiousness of political and economic conditions from one scheme to the other, potentially making the linked scheme more volatile (Zetterberg, 2012). Given the price volatility of the EU ETS and the price crash during the financial crisis (Berghmans et al., 2013), California may be reluctant to link with the EU, especially as the EU ETS does not have the same price controls as the CAT. As Ranson and Stavins argue, linkage may help stabilise the daily fluctuation in the allowance price, however it also results in an increased vulnerability to systematic risk (2014). The case of the New Zealand ETS is an illustrative example. As both authors argue, it was the New Zealand ETS' unrestricted use of CDM credits that contributed to the crash of its emission price (2014).[5] The initial collapse of the EU ETS allowance prices affected CDM prices, which, in turn, led to a decline in the New Zealand ETS price (ibid). Furthermore, although a linked ETS levels the playing field between the two parties, it does nothing against other countries, which may not have a carbon price (Flachsland et al., 2009a).

Linking partners must also consider the economic impact on their own system, as the overall cost-efficiency benefits from linking ETSs may, on a micro-level, be outweighed by negative distortionary effects (Flachsland et al., 2009a). For example, as linking lowers the carbon price in one system, this could have a

[5] Although the failure of key countries to ratify the KP, such as the United States, likely also contributed to the CDM's price decrease, as it lowered the demand for such credits.

negative impact on their expected fiscal revenue. This was predicted to be the case for Australia, with estimates that the planned link between the Australian and the EU ETS would result in an annual revenue loss of $AU3-5 billion (Priest & Drummond, 2012). As such, linking raises broader concerns about the distribution of efficiency gains between linked partners. Although linking may lead to cost-efficiency gains on the macro level, on the micro level, it creates winners and losers among linking partners, firms and consumers. Generally, the literature argues that the distributional impact depends on whether an entity is the net seller or buyer (Flachsland et al., 2009a; Jaffe et al., 2009; Zetterberg, 2012). Sellers under an ETS with an initially lower allowance price will benefit from linking, as they can sell their allowances for a higher price. Looking at the situation from the other side, the buyers in the lower priced ETS will be worse off after linking, as the allowances will become more expensive.

A linked scheme also has its political disadvantages, for instance, the potential for unilateral regulatory intervention is restricted. This is not only because parties may have to jointly operate certain aspects of the linked scheme, for example, market monitoring, but also because of the indirect impact of one scheme on the other. For instance, a price floor in one system will automatically have an impact on the other system. This is a major concern for the CAT and the EU ETS, as only the CAT has a price floor. As such, linking may also pose another political risk for participants. That is, the policy goals of each separate system could become compromised when they link together (Flachsland et al., 2009a). This might be a particular concern for linking partners who have instituted an ETS as an incentive for domestic abatement, for if linking substantially diverts domestic abatement overseas, then this policy goal will be compromised.

A linking scheme might not only be politically damaging on a national level, but internationally as well. For instance, UN negotiations on climate change may be hampered by the presence of linked ETSs, which present an alternative avenue and means of tackling climate change (Flachsland et al., 2009a). However, as the EU has demonstrated, a linked ETS does not preclude a UN global agreement, rather it can also be employed as a tool for achieving one's international commitments. Finally, the complexity of the governance structure

required to manage a linked scheme – from managing responses to policy or economic shocks and monitoring standards – may outweigh the efficiency gains of equalising one's carbon price; particularly for the party that benefits the least from linking.

The trade-off is similar to debates about adopting a common currency, '[...] where increased economic efficiency (reduced transaction costs and exchange rate uncertainty, higher price stability) and the wider political benefits are weighed against the costs of ceding discretionary regulatory control over the domestic economy' (Flachsland et al., 2009a, p.12), as well as the uneven distributional impacts of linking. But, even if the advantages are perceived to outweigh the disadvantages, the benefits of linking are highly contingent on the design of the system. Thus, it is important that the linked scheme is carefully designed in order to minimise such risks – this includes the challenge of harmonising the key features of each system. Furthermore both systems would have to adapt existing legislation that governs their respective ETSs. In the case of the EU ETS and the CAT, a particular challenge will be reconciling the use of offsets, aligning the various PAMs, coordinating complementary climate policies that may affect the carbon price and MRV systems.

Section II Technical Feasibility

Section II.A Offsets: Stringency & Limits

The harmonisation of offsets is a key step towards linking (Flachsland et al., 2009a; Sterk, Mehling & Tuerk, 2009). If offsets are not harmonised, there is a risk this frees up domestic allowances (Zetterberg, 2012). For instance, if the EU were to purchase offset credits in a sector California does not recognise, like biomass, then the EU could use these credits for domestic compliance purposes, freeing up allowances they would have otherwise bought on the linked market.

There are three components that need to be considered when aligning offsets: stringency, limits and project eligibility (Tuerk et al., 2009b). Firstly, offsets must be of a high quality, that is, additionality and high MRV standards must be guaranteed on both sides. Although the exact definition of additionality is still a contested concept (Streck, 2010), at its most basic, entities must show that the

project or the actual reduction in emissions would not have occurred but for their financing. In terms of MRV, harmonisation is not necessary, however, comparable standards are. Otherwise, generous crediting rules in one ETS can distort and weaken the cap in the other system. Equally, regulators must ensure projects are not counted at both the implementation and emissions trading level. That is, if an offset project also results in emission reductions for a covered installation, credits cannot be issued for both. Resolving this issue, however, should not be too difficult as both the EU and California have high MRV standards (discussed further in section II.D).

Secondly, limits. California has capped the use of offsets at 8% of compliance obligations. In comparison, the EU lets entities use emission credits from 2012-2020 up until the higher of two limits: (i) the international credit limits specified in the national allocation plans or (ii) 11% of the free allocation of EU allowances granted to them in that period (EC, 2013a). However, given the EU is phasing out CDM and JI credits (Wellman, 2013), this should not be a significant issue for linking. Finally, the major issue here is the project eligibility of CDM and LULUCF offsets.

Section II.A(i) CDM Offsets

Particularly from a Californian perspective, CDM offsets may be an important issue for negotiation. The CDM offers developed countries some flexibility in meeting their emissions targets by purchasing credits generated through emission reduction projects in developing countries (UN Framework Convention for Climate Change, 2014). However, whilst the EU is unilaterally linked to the CDM, California is not, over real concerns about its environmental effectiveness (Tänzer, Kachi & Sterk, 2013). These concerns are echoed by the WCI, which states more generally that any offsets outside of North America would have to ensure the environmental integrity of such credits in a bilateral agreement (Bumpus, 2012). Promisingly, the concerns of Californian regulators may be eased by the EU's potential ban on international offsets for 2020-2030 (EC, 2014b). Thus, the use of CDM offsets should no longer be an issue (EC, 2014b). However, any development in this regard will also be closely linked to

developments in the UN international climate change negotiations, (Zetterberg, 2012).

Finally, California would also need to consider its position on the EU's interest in a new market mechanism for developing countries, which would generate credits across whole economic sectors (EC, 2014d). Given California's reluctance to embrace international offset credits, instead preferring a domestic focus for its CAT, this suggests that the EU's adoption of such a mechanism – if it were to be established – could pose an additional hurdle to linking.

Section II.A(ii) LULUCF Offsets

LULUCF offsets may also be an important issue for negotiators, as California permits the use of domestic land-use offsets as well as international REDD credits, the latter of which is an international mechanism focused on reducing deforestation and forest degradation (CARB, 2011). However, such projects are not currently recognised within the EU ETS (Mehling et al., 2011), since there is concern that the reductions are not permanent (EC, 2008). That is, once emissions are removed from the atmosphere, they might still be released back into the atmosphere through fires or by other means, such as agricultural activities (Tuerk et al., 2009b). If California and the EU were to establish a linked scheme, and such credits were sold to the EU, then the EU could be in an awkward position. Not only must the EU assume responsibility for the permanence of these emission reductions (Tuerk et al., 2009b), but it would also need to ensure the environmental integrity of such offsets by employing MRV systems of a quality not yet present within the EU ETS (EC, 2008). Ultimately, from a European perspective, LULUCF offsets are seen as an unnecessary complication to the EU ETS and deforestation is an issue the EU prefers to address through other means. For instance, by using auction revenues to invest in LULUCF projects (EC, 2008).

Nevertheless, California has imposed additional requirements for forestry and urban forestry offsets, which ensure permanency. The California Forest Protocols require a perpetual conservation easement, which gives the government the right to protect the project area from conversion to non-forest use (Tuerk et al., 2009b), essentially guaranteeing the permanence of the

emissions reductions. Such rights are legally binding and are attached to the land title deeds (for more regulations concerning LULUCF offsets see Streck, O'Sullivan, Janson-Smith & Tarasofsky, 2010). Secondly, forestry projects must be risk-assessed and hold back a certain portion of their credits in a buffer pool ('Forest Buffer Account') to draw from in the event of an unexpected natural loss, such as wildfire (Sopher & Mansell, 2013a). These stringent, additional environmental requirements could help persuade the EU to reconsider its position on LULUCF offsets.

Although it is not necessary to have completely identical carbon offset policies (Tänzler et al., 2013), if no solution can be reached, one compromise could be for the EU to apply an import quota on Californian LULUCF offsets. As long as the accounting system provided a means of identifying different allowance types, it would then be possible for both markets to maintain their offset preferences. One suggestion by Burtraw et al. is the use of unique serial numbers for compliance instruments (2013). However, an import quota would also reduce the effectiveness and increase the complexity of the linked scheme (Mehling et al., 2011). At the same time, the marginal potential benefit from California's LULUCF offsets would also decline (EC, 2008). Even if the EU were to impose import quotas, it would still be indirectly allowing the use of such offsets in its system. Californian entities could simply use LULUCF credits for domestic compliance, thus freeing up Californian allowances that could then be sold to EU entities (Sterk et al., 2009).

Nevertheless, there are indications that the EU may be willing to allow the indirect use of such offsets. For instance, the EU was prepared to enter into linking negotiations with Australia, despite the fact that Australia's ETS used offsets generate through domestic agriculture and land-use management projects under the Australian Carbon Farming Initiative. However, it must be noted that during those discussions Australia had already made significant concessions in relation to its other design features, in particular, the abolishment of its AU$15 price floor (de Wit & Gould, 2012). Furthermore, as Hawkins and Jegou speculate, if negotiations were to continue, Australia's LULUCF offsets 'would likely be raised as an issue in future negotiation rounds'

(2014, p.37). Although Switzerland is also in linking negotiations with the EU, it changed its international offset credit rules to exclude LULUCF credits (Hawkins & Jegou, 2014). As such, it is likely the EU's acceptance of LULUCF offsets in California will also hinge on the agreements reached over other design features.

Section II.B PAMs

PAMs are difficult to align 'because they reflect the politically accepted objectives and priorities of the domestic program[me] [...] and also reflect characteristics of the regulatory setting' (Burtraw et al., 2013, p.30). For an EU-Californian linked scheme, not only must parties align California's APCR with the EU's proposed MSR, the issue of California's auction price floor must also be addressed.

Section II.B(i) Market Strategic Reserves

California employs an APCR in order to combat market volatility and drastic inflation. The APCR receives a percentage of allowances from the annual cap, starting from 1% in the first compliance period and increasing to 4% and 7% in the following two periods (CARB, 2011). When the market price reaches a certain price trigger, the Reserve will release allowances in three price tiers; starting in 2013, the tiers will be set at US$40, US$45 and US$50 (Ahlberg et al., 2013).

Currently, the EU has no reserve mechanism, however, in an attempt to address the oversupply of over 2 billion allowances in the EU ETS, the EC has proposed to establish a MSR, to begin operation in 2021 (2014a). The EC proposal outlines a rule-based, quantitative adjustment mechanism that would release or remove a number of allowances when certain conditions are met. If the EC's legislative proposal is adopted, the EU ETS would have a yearly adjustment cap, depending on the size of the allowances in circulation. If there are over 833 million surplus allowances in the previous year, the EC will place 12% of allowances into the MSR. If the total number of allowances in circulation drops below 400 million, then allowances will gradually be released in installments of 1 million allowances (EC, 2014a; Hope, 2014). Alternatively, if the carbon price is more than three times the average price in the last two years, then

allowances will also be released (EC, 2014a). In order to avoid sudden price fluctuations, the Commission would announce such adjustments months in advance (Hope, 2014). This could go a long way to addressing the oversupply of allowances in the EU ETS. This, in conjunction with the more ambitious linear reduction factor for the EU ETS cap, proposed to increase from 1.74% to 2.2% at the start of phase four, is anticipated to help stabilise allowance prices (EC, 2014a).

Nevertheless, with regards to linking, although the MSR proposal *may* boost the price of EU allowances, hence bringing it closer to the Californian price, linking negotiations must also consider how the MSR would interact with California's APCR. An indicator of how California might deal with this issue comes from its former linking negotiations with Quebec. In that case, both Quebec and California also had market reserve mechanisms. As a solution, the sale of reserve allowances was to be limited only to entities covered by the jurisdiction conducting the sales (CARB, 2012). Complete harmonisation was not deemed necessary by both parties, although it should be noted that both reserves already had the benefit of the same structure, escalation rates and starting prices (ibid). For an EU-Californian linked scheme to operate, California could once again agree to confine the market reserve sales to Californian-registered entities. This would minimise the amount of additional allowances sold to the EU ETS and make it easier for both parties to control their respective ETSs (Schüle & Sterk, 2008).

Nevertheless, further policy modifications would likely be required in order to minimise the negative impacts of having multiple market reserves operating at different trigger points. Although California's APCR functions on price and the EU's proposed MSR is a quantity-based mechanism, as both aim to achieve price stability, some level of coordination is surely possible.[6] For instance, forming a body with both EU and California representatives could help establish common principles and criteria as to when their respective Reserves would be triggered. However, further research is necessary to determine how this would look like in practice. If the EU is genuinely interested in pursuing links with California, this

[6] This was mentioned during several interviews.

could be an opportunity to consider how they could align both market reserves and adjust the MSR proposal accordingly.

Section II.B(ii) Price Floor

California has a price auction floor set at US$10 (rising 5% annually, plus inflation). Conversely, the EU ETS does not. This means that regulated Californian entities must pay at least the minimum price at auction. There is no price floor for the secondary market, although the price should converge to the auction price floor. In practice, this essentially functions as a de facto price floor, as the scheme is quickly transitioning to full auctions (rather than free allowances) (CARB, 2011). However, the EU ETS has no such scheme. This is problematic, since in a linked scheme, a price floor will be automatically exported to the other system, consequently affecting the other system's carbon price and its allowance supply (Burtraw et al., 2013). If the EU and California were to link with California's auction price floor intact, it is expected that Californian firms would purchase the cheaper allowances available in the EU scheme, until the carbon price equalises. This would have consequences for the Californian State budget, as the expected auction revenue would be exported to the EU. Moreover, the EU ETS would be adversely affected, as it would lose some control over its allowance price.

The indirect impact that a unilateral price floor has on linking might be resolved in one of three ways; either the EU adopts an auction price floor, California removes its or adopts an exchange rate. It must be noted that the EU has already dealt with this once before, during linking negotiations with Australia, with the latter party repealing its price floor (de Wit, 2012).

From a theoretical perspective, implementing a price floor in the EU ETS could help counter price volatility and risk in the carbon market (Grubb & Neuhoff, 2006; Wood & Jotzo, 2011). Indeed these issues have been of major concern to the EU. However, from the EC's perspective, price-based mechanisms, such as a price floor, interfere with the very nature of the carbon market, which is a quantity-based market instrument (EC, 2012). Furthermore, a price floor carries the risk of having the carbon price decided by political and administrative decisions rather than the market (ibid). These misgivings are reflected in the

Commission's official assessment of reform proposals for the EU ETS, which focuses heavily on the risks of a price floor, rather than the advantages it offers (EC, 2012).

Moreover, there is probably some reluctance on the EC's part to propose a mechanism that resembles a European carbon tax, which could raise subsidiarity objections from the MS (Tindale, 2012). However, unlike a tax, a price floor merely determines the *minimum* allowance price; it does not set the price per se. As such, one cannot assume all MS will raise subsidiarity concerns. France, for instance, has voiced its support for a price floor and one could argue that the UK would also support such an instrument, given its introduction of a domestic carbon price floor (Ares, 2013). Equally, the increased revenue a minimum price floor would imply may draw support from MS in need of additional sources of revenue (Tindale, 2012).

However, there are also MS opposed to EU ETS reform. In particular, the Polish government has been quite vocal in its opposition to raising the EU ETS allowance price (Tindale, 2012). Of course Poland alone could not prevent changes to the EU ETS, however, as Tindale points out, other MS may simply be keeping quiet, knowing that the Polish government will speak out, and if it comes to a vote, they will side with Warsaw (2012). In any event, despite potential support for a price floor among some MS, the EC's proposal in favour of a MSR (as discussed in section II.B(i)) suggests the likelihood of the EU proposing, let alone adopting, a price floor is very low at the moment (EC, 2014a).

The second option, that California repeals its auction price floor, also seems relatively unlikely, particularly because California explicitly adopted a price floor as a learning response from the EU ETS's performance (Nichols, 2013). Furthermore, given California uses its auction revenue to fund additional climate programmes and compensate its citizens who are more vulnerable to climate change, it is unlikely to want to undermine the credibility of these programmes by dismantling its price floor.

Finally, California could impose an exchange rate. This would maintain its auction price floor, control the flow of allowances, and safeguard some level of fiscal revenue. California could stipulate that, in the event the price floor was triggered, an exchange rate would come into place. For instance, Californian firms could submit either one Californian allowance or two European allowances for one tonne of emissions. However, the environmental integrity of a linked scheme with an exchange rate cannot be guaranteed, as it is unclear whether emissions would be higher or lower in such a situation compared to a non-linked market (Burtraw et al., 2013). If environmental integrity cannot be guaranteed, parties may be reluctant to link. Furthermore, in practice, differing notions of acceptable carbon prices remain a significant barrier to linking (Ranson & Stavins, 2014).

Section II.C Complementary Climate & Energy Policies

Complementary climate policies are designed to supplement an ETS. For instance, the EU's CO_2 standards for new cars could help reduce emissions from the transport sector, which is not covered by its ETS (Reuters in The Guardian, 2014). Although the merits of these policies go beyond the scope of this paper, it is important to consider the extent to which they interact with the trading scheme. Such policies could interfere with the offset programme and, more importantly, reduce the demand for allowances, which also decreases the price.

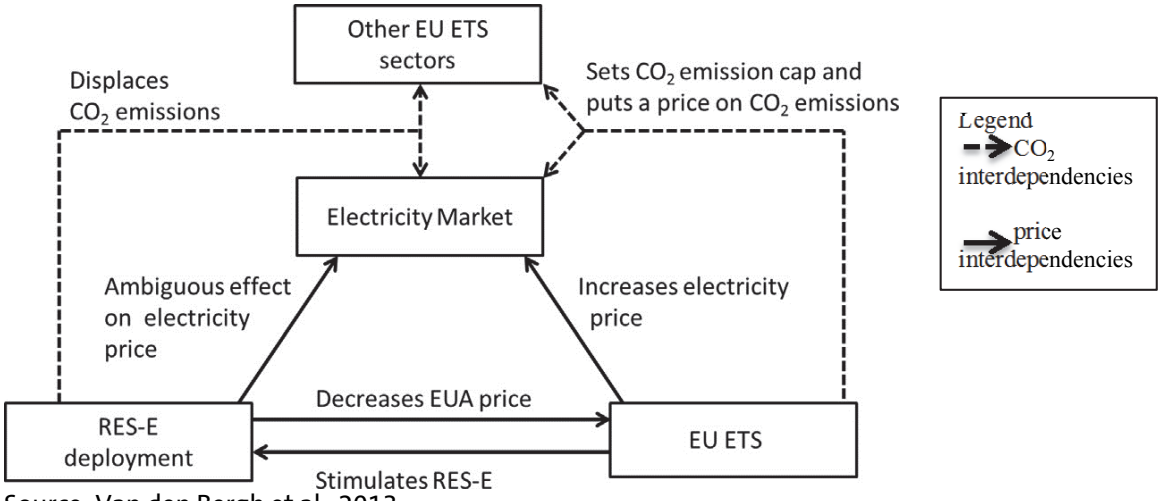
California would be particularly concerned with the issue of offsets, since it has experienced this problem during linking negotiations with Quebec, as Quebec's landfill emission reductions offset projects were similar to California's GHG emissions regulation for landfills (Regulation to Reduce Methane Emissions from Municipal Solid Waste Landfills, 2010). California is opposed to the offset programmes of its linking partners that cover sectors already under domestic regulation in California, as they would receive financial incentives for mitigation mandated by direct regulation in California (CARB, 2012). During their negotiations, Quebec overcame this obstacle by opting to implement a threshold, which excluded landfills of a similar size to those directly regulated in California. With respect to EU-Californian linking, given that EU offset credits are only for international projects, this issue is unlikely to be of significant concern.

However, the impact of complementary policies on the demand for allowances is also an important issue. This is because in an ETS, any external factors that affect emissions would necessarily have an impact on allowance demand, thus also affecting the allowance price (Weigt, Ellerman & Delarue, 2013). Consider, for example, the EU renewable energy quotas for the electricity sector. Stavins contends that such quotas can have a perverse interaction with the ETS that is neither good for the environment nor the economy (2014). For instance, it would result in emission reductions that would cause electricity generators to have additional allowances they do not need. These extra allowances would then be sold on to other sectors, which in turn would generate more emissions than otherwise there would have been. The overall effect would be a neutralization of the emissions reduction created by the electricity sector. This complementary policy could also serve to increase aggregate abatement costs, since reductions no longer take place where they are most cost efficient (ibid). Equally, if renewable energy is not cost-effective, it will increase the marginal abatement cost of the electricity sector by mandating the use of a more expensive fuel source (Fankhauser, Hepburn & Park, 2010). Moreover, within the electricity sector itself, the demand for carbon allowances would be reduced, which would drive down the allowance price (Van den Bergh, Delarue & D'haeseleer, 2013).

This shows that complimentary energy and climate policies can have unforeseen consequences for an ETS (see figure 5), particularly in terms of market volatility. This is only further complicated when it is linked to another ETS with differing goals and policies.[7]

[7] For an overview of EU and Californian climate and energy policies that could impact the carbon price, see Annex B.

Figure 5: Interdependencies between European renewable energy policy, electricity market and EU ETS



Source: Van den Bergh et al., 2013

The impact of overlapping policies from multiple ETSs was considered during the linking negotiations between California and Quebec, with Quebec ultimately adopting California's low emission vehicle and electric vehicle standards. However, identical policies are not necessarily required. In fact the EU ETS itself highlights that a linked ETS can function despite the various energy and climate policies of its MS,[8] although policies like the EU 2020 Climate and Energy Package do attempt to provide some measure of coordination. In the case of the EU and California, regulators on both sides will need to identify and consider very carefully the impact that certain complimentary policies could have on the carbon price. However, the fact the EU cannot give California a level of certainty regarding its exposure to certain climate and energy policies may make California reluctant to link, as this would expose it to policy shocks from all 28 MS (as well as Iceland, Liechtenstein and Norway). Moreover, as the German *Energiewende* suggests, such policy shocks could not only happen without any deference to the EU, but also be quite sudden and radical (Strunz, 2013).

[8] This was mentioned during one of the interviews.

Section II.D MRV

When linking ETSs, the MRV of emissions is vital in order to sustain a certain level of mutual trust and credibility in the system (Schüle & Sterk, 2008). In order to achieve this, the MRV systems of the two parties must be aligned and double accounting must be avoided. Furthermore, the registry of allowances may need to be jointly governed and enforcement should also be of a comparable standard.

Firstly, both parties need to be aware that they are aligning systems from two very different origins and that these domestic MRV systems may be operating with different rules and guidelines. In EU-Australia linking discussions, the alignment of the two MRV systems was not a significant factor, since both states were KP signatories. Both states used the treaty's accounting system, accredited third-party verification, and flexibility mechanisms, like the CDM. However, California is not a signatory to the KP, and does not use the same system; instead, it abides by a different set of rules based on stringent guidelines established by the United States Environment Protection Agency (Hsia-Kiung, Reyna & O'Connor, 2014). For instance, covered entities must have their data independently verified by an accredited, CARB-trained verifier in line with International Organisation for Standardisations standards (Haug et al., 2014), and they are also subject to CARB audits (Nichols, 2013). However, even though the California and EU MRV systems have different origins, they are of a comparable standard. That prerequisite, along with aligned MRV methodologies and allowance tracking, should be sufficient to ensure linkage (Ahlberg et al., 2013).

When aligning the two MRV systems, regulators must also be aware of the risk of double accounting. That is, where the operator gains allowances on both trading schemes for the same reduction in emissions, and, conversely, obtains allowances on both schemes if emissions increase. At present, this is not a main concern, since the EU ETS and CAT are downstream systems, where emissions are regulated at the actual point of emissions. However, it could become an issue once the CAT moves into its next phase and becomes a hybrid system, including upstream emitters, such as the producers and importers of fossil

fuels. With a hybrid scheme in place, there is a risk, for example, that if California were to export energy to EU emitters, these emissions could be counted twice. However, if negotiators instigate additional MRV requirements, which pay specific attention to the origin of fuel or energy products, this should help minimise the risk of double accounting.

Secondly, although most aspects of a linked ETS can be arranged through diplomatic or other bilateral channels, the registry of allowances should be jointly managed. For instance, California and Quebec use WCI, Inc., which is a non-profit independent corporation that assists with the technical and administrative aspects of their linked scheme. One benefit of a joint registry is that it can help combat issues like fraud and market manipulation. Indeed, the EU ETS experienced several incidents of fraudulent activity and the establishment of a single union registry has helped solve these problems (European Voice, 2013). It would also allow for more efficient market oversight, which could further guard against market manipulation (Burtaw et al., 2013). Moreover, as Burtraw et al. mention, 'the appearance of shared governance may [also] convey legal consistency, which can play a key role in establishing confidence' about the credibility and durability of the linked scheme (2013, p. 26).

However, two issues arise in establishing a joint European-Californian registry: public access and legality. The first issue can be resolved relatively easily by ensuring that both schemes provide for the same level of public access, in order to reassure entities with any concerns regarding strategic business information (Burtraw et al., 2013). However, the legality of a joint EU-California registry may be problematic and would be contingent on the willingness of the US administration to allow California to set up and partake in such an entity.

Finally, both schemes need to be credibly enforced with relatively stringent penalties in order to ensure mutual trust. This is a key concern for California, since State law stipulates that the Governor must be satisfied with the ability of both the EU and California to credibly enforce their ETS within a linked scheme (California Government Code, s 12894(f)). EU regulated firms must pay

€100/excess tonne of emissions, plus surrender the missing allowances in the next year. Conversely, California requires firms to surrender three allowances for every excess tonne. Although the EU and California use different types of penalties, they are both of a similar standard; therefore, alignment should not be problematic.

Figure 6: Design elements for alignment of EU ETS and CAT

Design Elements	Difficulty to Align	Political Importance	Importance for Functioning Market
1. **Offsets**			
a. Stringency	Medium	No	No
b. Limits	Medium	Maybe	No
c. CDM	Easy*	No	No
d. LULUCF	Hard	Yes	No
2. **PAMs**			
a. Market Reserve	Hard	Maybe	No
b. Auction Price Floor	Hard	Yes	Maybe
3. **Complementary Policies**	Hard	Yes	Maybe
4. **MRV**			
a. Methodology	Easy	No	Yes
b. Joint Registry	Medium	Yes	Yes
c. Enforcement	Easy	Maybe	No

* = if EU's international offsets ban comes into effect.

Section III Legal & Political Feasibility

Section III.A Legal feasibility

The EU ETS can be linked to any mandatory ETS 'whose design elements would not undermine [its] environmental integrity' (Flachsland et al., 2008, p.16). This also includes schemes instituted at the sub-national level. However, linking with California raises legal and procedural questions for both parties (Tuerk et al., 2009a). There are three means of creating a direct link: (i) a formal and binding international treaty; (ii) mutual amendment of both ETS legislations, complemented by an agreement, such as a memorandum of understanding or (iii) establishing a system to convert ETS units via private law (Sterk et al., 2009). This thesis considers the potential legal and procedural questions that arise from pursuing the first two options, as the latter only results in highly limited trading between the contracting individuals (Mehling, 2007).

Section III.A(i) International Treaty

A binding international treaty is an agreement between two or more countries or international organisations that sets out legally binding rights and obligations under international law (Vienna Convention on the Law of Treaties, 1969). Concluding an international treaty would provide a strong level of legal certainty, as it is a formal agreement that has been negotiated and ratified by both parties. It also allows parties to respond to non-compliance or a breach of treaty terms through internationally sanctioned compliance mechanisms (Mehling, 2007).

For the EU, this process is relatively straightforward. Although the EU is a supra-national entity, Article 300 of the Treaty establishing the European Community gives the Commission the authority to negotiate international agreements if authorised to do so by the Council. Ratification is then subject to Council approval via a qualified majority vote. However, one potential hurdle could be the role of the European Parliament in this process (Mehling, 2007). It is uncertain whether the Parliament must merely be consulted or must also approve the linking agreement. A linking agreement could be read as an 'agreement establishing a specific institutional framework by organising cooperation procedures'; if so, Parliament's approval will be necessary (Treaty

on the Functioning of the EU, Art 218(6)(a)(iii)). In this instance, obtaining Parliament's approval may be problematic, given their less-than-enthusiastic reception of market-based instruments (Mehling, 2007).

Concluding an international treaty may be problematic for California (Ranson & Stavins, 2014),[9] as American States are not formal subjects of international law (Vienna Convention on the Law of Treaties, 1969). The United States Constitution forbids States from entering into any 'treaty, alliance, or confederation' regardless of the 'title, designation, or form' (Art I, s 10), if said agreement gives the State elements of international sovereignty (Tuerk et al., 2009a; Virginia v Tennesee, 1893). The Constitution also gives Congress the power to 'regulate Commerce with Foreign Nations' (Art I, s 8, clause 3). As a carbon market can be construed as a form of commerce, this could pose another obstacle to linking. However, as the US has no federal ETS, this clause is unlikely to hamper linking (Tuerk et al., 2009a).

However, as the US Constitution only prevents States from entering 'into any Agreement or Compact [...] with a foreign power' 'without the Consent of Congress' (Art I, s 10), California could try and seek Congressional consent before undergoing negotiations with the EU. More generally, there may be more leeway for agreements to control pollution (Tuerk et al., 2009a). Obtaining such consent however, would likely be contingent on the attitude of Congress towards climate change and international affairs. Approval would be more easily granted under an environmentally conscious administration that embraces a multilateral approach to international relations.

Absent Congressional consent, California could argue that they still have the authority to conclude a linking agreement with other states as agreements over local trans-border issues, such as pollution control, do not require Congressional consent (Mehling, 2007). However, this argument has not been tested and it is therefore unclear whether California would have the necessary authority to negotiate a direct bilateral linking agreement with the EU. In any event, even if

[9] This was mentioned in all interviews.

California had the authority to do so, the lengthy negotiation and ratification process may not make a treaty the best option.

Section III.A(ii) Mutual Amendment

Establishing a direct bilateral link can also be achieved through reciprocal unilateral linking. This is achieved through adjusting the respective legislation underlying both schemes (Burtraw et al., 2013) and could be supplemented by a memorandum of understanding. This is how California and Quebec linked their ETSs. In doing so, neither party experienced any legal issues from their federal counterparts. Though this link was probably not seen to be an overly controversial step as both schemes were sub-national entities.[10]

Furthermore, as with an international treaty, the likelihood of the EU and California concluding a linking agreement will depend on the attitude of the US administration.[11]

The California-Quebec agreement was negotiated under the Obama administration. Things could have been very different under a more conservative administration. Nevertheless, assuming legality is not an issue, mutual amendment would be the preferred means of linking the CAT and the EU ETS. It would drastically shorten the time for negotiations and the ratification process is rapidly shortened (Tuerk et al., 2009a). It would also give local regulators more control over the allowance price; for instance, by letting them establish quotas, exchange rates or apply fees (Burtraw et al., 2013).

Section III.A(iii) Procedural Issues

However, a link established purely by technical alterations may be perceived as illegitimate, particularly given the significant transfer of revenue that would flow across the two systems. As such, mutual amendment would need to be preceded by and/or involve a certain level of public debate, which would increase the transparency and scrutiny of the process (Tuerk et al., 2009a). This is already a requirement for California. Prior to linking with the Quebec ETS, the CARB underwent an extensive public consultation process (CARB, 2013b). Equally, before the Californian government can alter the CAT legislation, it is obligated to notify the public and receive their input concerning the linking

[10] This was mentioned in one of the interviews.
[11] This was mentioned in several interviews.

amendment (Administrative Procedure Act 2008, s 11340 et seq). Furthermore, the Governor of California must be satisfied that (California Government Code, s 12894(f)):

(1) The EU ETS is similar to or identical to the CAT in all material aspects;
(2) Linking would not change California's ability to enforce the CAT against entities in or outside of California;
(3) The EU ETS laws and regulations allow for equivalent enforcement of the CAT;
(4) Linking is unlikely to place significant liability on California.

For the EU, the process to amend the EU ETS directive is laid out in the European Community Treaty (Art 175.1). Amendments would have to be initiated by a proposal from the EC to the European Parliament and Council. The matter would be taken to a vote, requiring a qualified majority. The transparency of the EU decision-making process, its openness to public submissions and the resultant media coverage would allow adequate time for comments from the public and key stakeholders.

If the EU and California were to pursue linking by mutual amendment, a potential model for the memorandum and points for discussion could be the linking agreement signed by California and Quebec (Agreement, 2013). However, as California and Quebec worked together on the design of the WCI ETS model and had been cooperating and negotiating emissions trading for five years prior to the actual linking agreement. There may be other issues not mentioned in the linking agreement that would need to be addressed by the EU and California.

Section III.A(iv) Negotiations

Even if California has the legal leeway to conduct linking negotiations with the EU, how such negotiations will take place is uncertain.[12] New EU MS, along with Norway, Liechtenstein and Iceland, essentially imported the EU ETS model without negotiating any design features. Although Norway sought to negotiate

[12] This was raised in several interviews.

a link with the EU, the EC insisted that Norway simply import the EU ETS Directive (Hawkins & Jegou, 2014). However, the EU agreed to negotiate a link on equal terms with Australia. In light of this, how the EU will negotiate with California is unclear. Would California demand, and would the EC agree, to meet and negotiate on equal terms with a sub-national entity? It is also unclear how the MS would react to such treatment. This symbolically suggests that the EC would be willing to give California the same say over the final ETS design as all 28 MS combined.[13] Although in reality, this is somewhat exaggerated as the final outcome of EU environmental agreements have mostly required both the approval of the EU and its MS (Mehling, 2007). As such, MS still have the final say over any linking agreement.

Linking negotiations with California would be very different to the EU's previous linking negotiations, in which 'the other schemes had a significant interest in linking [with the EU ETS], which made them willing to accept the necessary compromises' (Hawkins & Jegou, 2014, p.44). It is not clear that California would be willing to make such compromises. Thus, the EU may not be able to dictate terms and conditions to the extent it was able to do so in previous linking arrangements.

Section III.A(v) Quebec & The WCI

Although beyond the scope of this paper, an element not discussed is the question of linking with Quebec, and more broadly, the WCI. California and Quebec have already signed a linking agreement (Agreement, 2013), which means that most of their design features have already been harmonised for linking. Therefore, the final design of the linked EU-Californian scheme would also be compatible with the Quebec scheme. While it is not vital for Quebec to play a role in the negotiation of a linked EU-Californian ETS from a design perspective, politically, Quebec would surely want (and need) to play a role in the linking negotiations. Given all three parties would be present for any EU-Californian linking negotiations, should a more formal link also be established with Quebec?

[13] This was discussed in many interviews.

From a Californian perspective, having Quebec would help strengthen its bargaining position vis-à-vis the EU. However, it is debatable whether Quebec would even be in favour of linking with the EU, as the Quebec scheme is more ambitious than the EU ETS, reducing emissions 20% below 1990 levels by 2020 (Sopher & Mansell, 2013b). Furthermore, the negative distributional impacts California would experience from an EU-Californian scheme would be felt even more in Quebec, as its ETS is significantly smaller than California's (CARB, 2012). For the EU, including Quebec in linking discussions may make it harder to convince California about the merits of an EU-California linked scheme.
Furthermore, it is unclear whether the EU would be interested in directly linking with Quebec. Although the EU was willing to directly link with Australia, it showed little interest in linking with the New Zealand ETS, even though Australia was also looking to link with New Zealand.[14] Thus, for the EU, direct linking with key partners, supplemented by indirect links with other regional players may be sufficient. However, meeting with the WCI as a regional entity could help the EC sell the negotiated agreement to its MS, as the EC could frame the linking agreement as a compromise between two major regional ETSs.

Ultimately, while a more detailed consideration of the intricacies of linking and negotiating an ETS between three players (or two regional systems) is beyond the scope of this thesis, it is important for European and Californian regulators to acknowledge the role of Quebec and the WCI when engaging in linking discussions.

Section III.B Political feasibility

Section III.B(i) Distributional Impact

Linking the EU ETS and the CAT will lead to a more efficient outcome on the macro level. Emissions would be reduced at least cost, market liquidity would increase and firms would have more flexibility to achieve their target. Equally, the price convergence as a result of linking would decrease allowance prices in California, easing the burden on its firms and consumers. Furthermore, it offers California the opportunity to link with a major trading partner, as the EU is California's second largest export market (California Chamber of Commerce,

[14] This was raised in an interview.

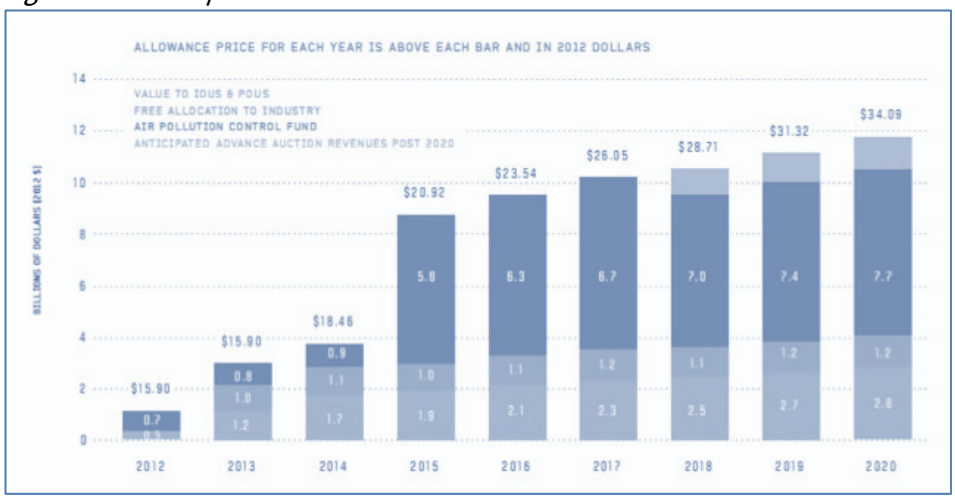
2014). Linking could quell domestic competitiveness concerns that might arise absent such a link and could lead to further trading opportunities with the EU. From a European perspective, linking would also signal their commitment to climate change, strengthening their position in international climate change negotiations.

However, linking may not necessarily lead to an equitable outcome on the micro level. As the allowance price increases in one system and decreases in the other, linking will create distributional issues (Haites & Mullins, 2001). As a result, there will be winners and losers on three levels: the linking partners, firms and consumers. This is particularly true in the linking of the EU ETS and the CAT. Even though both schemes have similar levels of ambition, the significant difference in the size of their carbon markets (Newell et al., 2014) means that EU conditions will have a greater impact on California. Given Californian allowances (US$11.48/tonne per Thomson Reuters, 2014) are currently more expensive than the EU's (€7/tonne per Reed, 2014), linking will lead to a drop in Californian allowance prices. On the other hand, the EU could experience a slight increase in carbon prices, which may raise concerns about carbon leakage. Both the issue of capital flows between linked partners and carbon leakage are political issues, which must be addressed on both sides.

Firstly, the linking partners would experience significant capital flows between both jurisdictions, which would have fiscal consequences, for California particularly, if it maintains its auction price floor without an exchange rate. In this scenario, if the EU's allowance price falls below California's auction price floor, Californian entities will purchase the cheaper EU allowances until prices equalise. This would result in a temporary, but potentially significant, loss of fiscal revenue for California (see figure 7). Although revenue raising is not the main purpose of the CAT, such funds do go into additional GHG emission reduction programmes and help compensate communities most vulnerable to climate change (Hsia-Kiung et al., 2014). Thus, the loss of such revenue would threaten the credibility of these programmes.

Similar concerns were also voiced with the planned Australian-EU link, with economists estimating AU$3-$5 billion loss in annual fiscal revenue (Priest & Drummond, 2012). In fact, Australia pre-emptively cut AU$2.4 billion from its climate programmes in anticipation of the lowered carbon price (Alexander, 2013). Rather than axing its climate change programmes, California could choose to offset the decrease in revenue by making cuts in other sectors. However, this would only be an issue if California did not impose an exchange rate for EU ETS allowances once the price drops below its auction price floor (as discussed in section II.B(ii)), as this would safeguard its fiscal revenue.

Figure 7: Anticipated CAT Allowance Revenues: 2012-2020



Source: Sopher & Mansell, 2013a.

Furthermore, if the EU ETS allowance price were to rise as a result of linking, it increases the risk of carbon leakage (Tuerk et al., 2009a). Carbon leakage occurs because an ETS imposes direct costs on the production process, as well as indirect costs, like higher electricity prices, which can affect intermediate inputs to production. These costs could prompt firms to relocate to countries with lower emission standards. This raises both economic and environmental concerns, as both the business and its emissions would be relocated outside of the carbon market (Newell et al., 2014). Even though carbon leakage and competitiveness concerns have been flagged by industries under the EU ETS, Laing and Mehling find 'little evidence that these concerns are fully justified' (2013, p.10). Furthermore, when looking across a spectrum of carbon markets, Newell et al. see little evidence of significant carbon leakage and declines in competitiveness (2014). The EU ETS has, if anything, experienced more

problems in over-compensating for such concerns (Laing & Mehling, 2013). However, if carbon leakage still remains a real concern for the EU, there are complementary policy measures, such as freely allocating allowances to exposed industries (Grubb & Neuhoff, 2006; Reinaud 2008; World Bank 2007), which could address such concerns. As the EU has already instigated some of these measures, maintaining them may make industries more amenable to linking

Secondly, linking could be a positive development for both European and Californian firms as it gives them more flexibility to achieve emission reductions at least cost. Furthermore, a lowered carbon price also reduces allowance prices for Californian firms, decreasing their cost of compliance. Ultimately, although Ranson and Stavins offer a theoretical overview of which firms could benefit or suffer from linking (2014; see also section I.F(iii)), the exact impact on EU and Californian firms would depend on an analysis of the respective marginal abatement cost curves, as well as the extent to which firms can pass on the carbon price to their consumers. Unfortunately, this is beyond the scope of this thesis.

Thirdly, linking can have an impact on consumers (Burtraw et al., 2013).[15] As Büchs et al. outline, an ETS will not only affect energy prices, but all other goods and services as well, due to the higher energy prices during production (2011). Indeed, the EU ETS has already seen increased electricity prices (Sijm et al., 2005), and, as in many de-regulated electricity markets, the cost of the carbon price was passed on to the consumer. Given the broader coverage of the CAT, its carbon price could also affect Californian heating and gasoline prices (Mehling et al., 2011; Sterk, Mehling & Tuerk, 2009a). However, if the CAT were to link with the EU ETS, the resultant price convergence would lower the allowance price, which, in turn, would lessen the impact of the carbon price on consumers. Nevertheless, this is unlikely to be enough to persuade California to link with the EU ETS as it already has several mechanisms in place to deal with any rise in consumer prices.

[15] For a more detailed examination of the distributional impacts of climate change policies see Büchs et al., 2011; Rausch, Metcalf & Reilly, 2011.

Firstly, California has tried to minimise any potential price spikes as a result of the CAT by giving sectors plenty of time to adjust. CARB has also attempted to apply some level of public pressure, stating that any sudden rises in fuel prices would 'appear to be a deliberate measure on [the industry's] part' (Nichols in CSP Daily News, 2014). By shifting the public's attention (and blame) towards industry, rather than the CAT, this could encourage firms to absorb some of the cost. Furthermore, California also requires electric utilities to sell their allowances at state auction to create a fund that 'protects their ratepayers from costs of complying with cap-and-trade' (Nichols, 2013).

A lower carbon price is not necessarily an undesirable development for the CAT and the EU ETS, as it allows both schemes to achieve emission reductions at least costs. As the EU ETS is the larger market, linking with California will have less of an impact on its revenue, firms and consumers. Concerns about carbon leakage are also not significant, as the EU already has policies in place to address this. For California, linking with the EU would increase market liquidity and give its firms more flexibility to achieve its targets. A lowered carbon price would also reduce allowance prices for its firms and lessen the impact on consumers. Finally, concerns about Californian competitiveness would be partly alleviated, as it would be linking to a major trading partner. However, if California does not instigate an exchange rate, a lower carbon price could have negative consequences for its fiscal revenue. Thus, from a distributional perspective, California's willingness to link is contingent on the imposition of an exchange rate.

Section III.B(ii) Political Will

Political Symbolism

Even if all other conditions are conducive to linking, both parties must still have the political will to engage in a linked scheme. In the EU's case, although it is currently focused on the structural reform of its own ETS, it still maintains the long-term goal of a transatlantic partnership (Tuerk, 2009). Although the US lacks a federal ETS, Europe's bottom-up vision could still be realized through linking with regional ETSs operating in the US. In fact EU Climate Commissioner Hedegaard met with Californian representatives to discuss this very goal (Carus,

2011). This goal benefits the EU on the political front, as it shows a commitment to the EC's more general aim of using the EU ETS as a means of achieving a bottom-up global network of ETSs (EC, 2013a). Furthermore, linking with the CAT also reaps political benefits on the international stage, as it signals the EU's long-term commitment to climate change and multilateralism (Zetterberg, 2012), which could give its negotiators more weight and credibility during international climate change negotiations.

From California's standpoint, it might be argued that linking with the EU will increase the CAT's political influence on US national climate policy (Burtraw et al., 2013),[16] however, that may not be so persuasive, as California is already seen as a regional leader and holds a substantial level of influence over national environmental policy, as well as over the policies of other US States (Gero in Cart, 2011; Schmidt, 2007). Rather, California is focused on linking with other states in the WCI, having signed a linking agreement with Quebec at the end of last year.[17] The WCI States are also discussing linking with other regional schemes in North America (Mehling et al., 2011). As such, a transatlantic link does not seem to be a priority for California.

Lowered Carbon Price & Potential EU ETS Reform

As outlined in section III.B(i), if the CAT links with the EU ETS, the Californian allowance price will likely drop. Although linking would allow for the cost-effective attainment of emission reductions in the short-term, Californian regulators may have other objectives that would necessitate a higher carbon price (Grosjean, Acworth, Flachsland & Marschinski, 2014). For instance, the Global Warming Solution Act (2006) and the WCI aim to stimulate low-carbon technology and innovation (Tuerk et al., 2009a). This is unlikely to happen with a lower carbon price. Furthermore, as evidenced by the price auction floor it is clear that California has its own notion of an acceptable carbon price (Jotzo & Betz, 2009). In fact, California has cited the EU ETS' low allowance price as a reason for not pursuing further linking negotiations (Ranson & Stavins, 2014). A

[16] This was also mentioned as a key goal of the CAT during the interviews.

[17] Even if both parties were not currently absorbed in other matters, negotiations would probably not lead to a harmonised agreement before 2020. A case in point is that of California and Quebec, whose schemes were established with the idea of forming a regional carbon market. Both parties cooperated for five years prior to linking, with another year spent on negotiating the actual agreement (Haug et al., 2014).

lower carbon price also risks the materialization of certain side benefits (Flachsland et al., 2009). However, such side benefits, like improvements in air quality and energy security are already addressed and regulated in California, for instance, through the Air Quality Improvement Program (2007) and the California Energy Security Coordination Act (2012). Thus, this is unlikely to be their primary concern.

Apart from the effect linking would have on low-carbon innovation; another significant concern would be the impact on California's domestic investment and abatement efforts.[18] The effect of a low carbon price on domestic abatement efforts was also one of the key concerns for Australia during linking negotiations with the EU ETS (Lynn & Lake, 2012). However, Australian policymakers were confident that the Commission reform proposals would remedy Europe's low carbon price. Such an argument could also be made to Californian policymakers, however, much will depend on whether they perceive that such reforms will actually be implemented and are sufficient to raise the carbon price. As a short-term measure to deal with the low carbon price, the EU has proposed to fast-track a plan to backload 900 million allowances (EC, 2014a; Reed, 2014). Although this will neither ensure a higher carbon price in the long-term nor address the supply-demand imbalance (Reed, 2014), it will serve as a temporary measure until the EU is able to introduce a MSR to prove a more long-term solution. If implemented, this could increase the price to €12.00/tonne (Hope, 2014). The EC's 2030 draft framework on energy and climate policies, which outlines a 40% GHG emissions reduction target below 1990 levels by 2030 (EC, 2013e), could also increase the allowance price and give investors greater certainty and confidence in the carbon market (Pinsent Masons, 2014).

However, any reform to European climate policy is contingent on the willingness of its MS. As discussed in section II.B(ii), Poland, for one, is unwilling to act without a global climate change agreement (Krukowska, 2014), and although Poland alone cannot block EU ETS and broader climate reform, it is possible there may be other MS who share the same view (Tindale, 2012). Even

[18] This point was mentioned during several interviews.

if such reforms pass, the success of the MSR is contingent on the EC getting the quantities right. More broadly, it is unclear whether the MSR is indeed the most effective means of reforming the EU ETS. If the drop in allowance prices triggered the whole debate on structural reform (Grosjean et al., 2014), this suggests price is the EU's main concern. If the EU does want to impose some form of price control, doing so indirectly through the MSR may be an ineffective means of achieving this, necessitating further reforms in the future.

Ultimately, if the EU is serious about linking with California, it should also consider two alternatives. Firstly, it may have to consider additional incentives, which outweigh the risks and negative consequences for California in a linked EU-Californian scheme. Secondly, given the divergent political preferences of both parties, direct bilateral linking may not be feasible. Indeed, there are many other forms of linking both parties could pursue. Therefore, as a second alternative, a more narrow form of linking could be implemented which, if designed correctly, could still deliver some of the cost-saving benefits of a direct bilateral link. Such examples include linking sector-based offsets or allowances. Additionally, this also allows both sides to maintain regulatory control and their design preferences. This may make an attractive starting point for both parties, with the possibility of expanding these narrow links, as political preferences change or as the respective programmes evolve (Burtraw et al., 2013).

Figure 8: Political feasibility of linking the EU ETS and CAT

Stakeholder Levels	Pros and Cons: EU	Pros and Cons: California
1. Linked Market	+ Cost-effective attainment of emission reduction targets + Increased market liquidity and flexibility to achieve emission reduction targets – Undermine incentives for low-carbon innovation, domestic abatement and investment	
2. State	+ Strengthen position in international climate negotiations + Ambition of transatlantic carbon market	+ Link with major trading partner – Potential temporary loss of fiscal revenue** – Threaten programmes funded

	– Slightly increased risk of carbon leakage	with CAT revenue** – Minimal political symbolism: already seen as influential, regional leader
3. Firm *	+ More abatement options	+ More abatement options + Cheaper allowance prices for firms
4. Consumer	+ Minimal impact	+ Lower carbon price

* = Contingent on firms' marginal abatement cost and ability to pass on carbon price to consumers.
** = If California does not impose an exchange rate.

Section IV Conclusion

The analysis conducted in this thesis shows that the feasibility of linking the EU ETS and the CAT is not high. From a technical perspective, the four design features analysed highlight two major obstacles. First and foremost is the issue of California's auction price floor. If linked, this feature would be automatically propagated into the EU ETS. However, even though California could attempt to solve this dilemma by imposing an exchange rate on the price of EU ETS allowances, divergent notions of an acceptable carbon price will likely remain an obstacle to linking. Secondly, the EU does not include LULUCF offsets into its own ETS, however California does. Although the EU was open to linking with Australia, whose ETS included domestic LULUCF offsets, whether the EU will do so for California is contingent on the compromises reached over other design features.

From a legal perspective, it is unclear whether California, as a sub-national state, has the authority to negotiate and link with the EU. Much will depend on the consent of the US administration. With regards to political feasibility, California is unlikely to be in favour of linking with the EU, as this would lower its carbon price. This not only affects its fiscal revenue but other policy goals, like low-carbon innovation and domestic investment, may also be compromised. One way of addressing California's concerns is through structural reform of the EU ETS. However, this depends on whether such EU ETS reforms substantially lift the carbon price.

This thesis has shown that in theory, linking ETSs can deliver significant cost-efficiency gains for both parties. However, the case of California and the EU shows that, in practice, the political preferences and design choices of the linking partners are more important. This thesis has also shown that the distributional consequences can affect the decision to link. In the case of California, even if some compromise on price floors and LULUCF offsets can be found, it is still unlikely to link with the EU, given the potential negative impacts it would have on a domestic level. If the EU ETS is interested in linking in the future, it cannot assume other parties would be equally willing. As such, the EU

may need to offer additional incentives or consider incomplete linkages, which can deliver some of the benefits of direct linking, whilst also maintaining political preferences and regulatory control. Such linkages might include unilateral links, or sector-based offset and allowance links. By doing so, this could provide a good starting point for California and the EU, with the potential for further expansion as political preferences and their respective ETSs evolve.

Section IV.A Further Research

This thesis has outlined some obstacles to linking the EU ETS with the CAT. However, it has also identified three areas for further research. Firstly, although a quantity-based mechanism could be aligned with a price-based mechanism, it is unclear how this would work in practice. Secondly, as California is linked to Quebec, and is part of the WCI, the challenges of linking the EU ETS with multiple sub-national schemes and/or another regional scheme must also be considered. Given the prevalence of regional ETSs, like the Regional Greenhouse Gas Initiative and China's sub-national ETSs, this question is of particular relevance when considering the future direction of linking. Finally, it has also highlighted the importance of political preferences and the domestic impact of linking. Although additional incentives and incomplete linkages have been suggested as alternatives to facilitate linking, the exact nature of such incentives and links are unclear. Therefore, further research is recommended.

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Annex A: List of existing and planned ETSs

Source: Haug et al., 2014

1. EU (+Norway, Liechtenstein and Iceland) (*in force, linking discussions with Switzerland underway*)
2. Switzerland (*in force, linking discussions with EU underway*)
3. Kazakhstan (*in force*)
4. Russia (*under consideration*)
5. Turkey (*under consideration*)
6. Ukraine (*under consideration*)
7. Regional Greenhouse Gas Initiative (*in force*)
8. Western Climate Initiative
    a. California (*in force, linked to Quebec*)
    b. Quebec (*in force, linked to California*)
    c. British Colombia (*under consideration*)
    d. Manitoba (*under consideration*)
    e. Ontario (*under consideration*)
9. Brazil (*under consideration*)
    a. Rio de Janeiro (*under consideration*)
    b. Sao Paolo (*under consideration*)
10. Chile (*under consideration*)
11. Mexico (*under consideration*)
12. Tokyo (*in force*)
13. Republic of Korea (*scheduled*)
14. China (*in force*)
    a. Beijing (*in force*)
    b. Guangdong (*in force*)
    c. Shanghai (*in force*)
    d. Shenzhen (*in force*)
    e. Tianjin (*in force*)
    f. Chongqing (*scheduled*)
    g. Hubei (*scheduled*)
    h. Hangzhou (*under consideration)*
15. Japan (*under consideration*)
16. Thailand (*under consideration*)
17. Australia (*in force, likely dismantled*)
18. New Zealand (*in force*)

Annex B: Climate and Energy policies in the EU and California

EU	California[19]
Transport: Low Carbon Fuel Standard: • Reduce GHG intensity of fuels used in vehicles by up to 10% by 2020 • Biofuel sustainability targets for transport fuels and also takes into account indirect land use 2009: Mandatory introduction of sulfur-free fuels to increase air quality	Transport: GHG emission standards for passenger vehicles (Assembly Bill 1493, 2002): • Reduce new car emissions by 30% as of 2016 Low Carbon Fuel Standard (California Code of Regulations, Art 4(7), s 95480): • Performance standards for fuel producers and importers as of 2011. 10% carbon intensity reduction of the full life cycle of transport fuels by 2020 (Executive Order S-1-07, 2007). Alternative and Renewable Fuel and Technology Programme • Public funding to clean fuel/vehicle projects
Renewables: • 20% use of renewables in energy consumption by 2020 (27% by 2030) • 20% increase in energy efficiency	Renewables: Renewable Energy Portfolio Standard: • Requires utilities to use 33% renewable energy by 2020.
Sustainability EU Sustainable Development Strategy (2006) • EU sustainable development integration strategy for: industry, aquaculture, economic policy, transport, global poverty & external relations • Green public procurement	Sustainability • Requires each region to have a sustainable commitment strategy that focuses on transport, land use and housing to meet GHG reduction targets set by the CARB.

Source: Haug et al., 2014; Hsia-Kiung et al., 2014; CARB, 2011; EC, 2008; EC, 2014c; California Public Utilities Commission, 2013.

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[19] For a more comprehensive list of California's climate policies, see Brewer, 2011.