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Environmental Policy in Good and Bad Times: The Countercyclical Effects of Carbon Taxes and Cap-and-Trade

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ABSTRACT

'Green recovery' is one of the key themes of the stimulus packages implemented around the world in response to the Covid-19-related economic downturn. Recent research points to the potential role of regulation that becomes less stringent during recessions (ie countercyclical regulation) as an instrument to stimulate a quicker recovery. When this argument is put in the context of a green recovery, two key questions arise: should we implement countercyclical environmental regulation? If yes, what environmental instruments are better suited to stimulate the economy in periods of economic downturn? This article addresses these questions by discussing the risks of countercyclical environmental regulation and comparing the countercyclical effects of two critical environmental instruments: carbon taxes and cap-and-trade. The article argues that policymakers should be cautious in implementing countercyclical environmental regulation because the benefits of this practice are uncertain and it entails various risks. The article also challenges the belief common among academics and policymakers that cap-and-trade is inherently more countercyclical than carbon taxes by showing that whether this is true depends on the design of these instruments and other contingent factors.

Keywords: Carbon tax versus cap-and-trade, Countercyclical environmental regulation, Law & macroeconomics, Linking cap-and-trade

1. INTRODUCTION

There has been an overwhelming literature on instrument choice in environmental policy[1] and an equally impressive literature has addressed the choice between cap-and-trade and

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1 One of the basics is Neil Gunningham, Darren Sinclair and Peter Grabosky, *Smart Regulation: Designing Environmental Policy* (Clarendon Press 1998). See also Lawrence H Goulder and Ian WH Parry, 'Instrument Choice in Environmental Policy' (2008) 2 Rev of Environmental Economics and Policy 152.

carbon taxes.[2] Most of this literature focuses on the advantages and disadvantages of various environmental policy instruments based on criteria such as environmental effectiveness, administrative complexity, efficiency and equity.[3] More recently, research also compares environmental instruments based on their ability to stabilise the economy during economic recessions.[4] Research in this area is gaining policy relevance in various jurisdictions—including the EU—as interest rates get closer to the zero lower bound and policymakers look at alternative instruments to mitigate the negative consequences of recessions while aiming at green growth.[5] Research on the stabilising effects of environmental policies has grown in parallel with legal scholarship that, along these lines, argues that smart legal instruments should be adapted in periods of economic downturn, thus stimulating the economy to recover.[6] This literature, largely initiated by Yair Listokin after the economic crisis of 2008, goes under the name 'law & macroeconomics'.[7] Our article aims to contribute to both these (related) streams of research.

On the one hand, we add to the academic debate on law and macroeconomics by analysing some of the dangers of adapting the stringency of environmental regulation to business cycles. Recent research has pointed out that regulations could be suspended or scaled back during downturns and made more ambitious during periods of economic growth to help stabilise the economy.[8] We contribute to this research by highlighting some risks related to this practice. In particular, we argue that adapting the stringency of environmental regulation to stabilise the economy can pose risks of reduced long-term green investments, regulatory back-sliding, and reduced innovativeness and competitiveness of regulated entities. While previous research has highlighted some of the risks of countercyclical regulation,[9] our analysis provides additional reasons for being careful with this practice.

On the other hand, we contribute to the debate on the choice between cap-and-trade and carbon taxes by challenging a belief held in academic scholarship[10] and policy circles[11] according to which cap-and-trade is inherently more countercyclical than carbon taxes. In other words, according to this common belief, a cap-and-trade regime would be better able to deal with the consequences of economic crises than carbon taxes. The simple economic reasoning underlying this belief is that under cap-and-trade in an economic downturn, the price of allowances would go down, providing relief to regulated entities. Instead, tax rates tend to not decrease during periods of recession, thereby making carbon taxes less countercyclical than cap-and-trade. This

2 See eg Ian WH Parry and William A Pizer, 'Emission Trading Versus CO2 Taxes Versus Standards' (Issue Brief 5, Resources for the Future 2007) 80–86; Goulder and Parry, ibid; Reuven Avi-Yonah and David Uhlmann, 'Combating Global Climate Change: Why a Carbon Tax is a Better Response to Global Warming Than Cap and Trade' (2009) 28 Stan Envtl LJ 3; Lawrence H Goulder and Andrew R Schein, 'Carbon Taxes Versus Cap and Trade: A Critical Review' (2013) 4(3) Climate Change Economics 1350010-1.

3 ibid.

4 For instance, on the comparison between cap-and-trade and carbon taxes see Barbara Annicchiarico and Fabio Di Dio, 'Environmental Policy and Macroeconomic Dynamics in a New Keynesian Model' (2015) 69 J of Environmental Economics and Management 1; Baran Doda, 'How To Price Carbon in Good Times … and Bad!' (2016) 7 Climate Change 135.

5 For instance the EU has put forward a recovery plan from the Covid-19 related economic crisis with a strong focus on addressing climate change European Commission, Recovery Plan for Europe, <https://ec.europa.eu/info/strategy/recovery-plan-europe_en> accessed 22 February 2022.

6 See generally Yair Listokin, *Law and Macroeconomics: Legal Remedies to Recessions* (Harvard University Press 2019).

7 Yair Listokin, 'Equity, Efficiency, and Stability: The Importance of Macroeconomics for Evaluating Income Tax Policy' (2012) 29 Yale J on Regulation 45.

8 Jonathan S Masur and Eric A Posner, 'Should Regulation Be Countercyclical?' (2017) 34 Yale J on Reg 857, 867–73.

9 ibid.

10 See in that respect especially Annicchiarico and Di Dio (n 4).

11 Alexander Eden and others, 'Benefits of Emissions Trading: Taking Stock of the Impacts of Emissions Trading Systems Worldwide' (International Carbon Action Partnership, August 2018); VividEconomics, 'The Future of Carbon Pricing in the UK' (Final Report prepared for the Committee on Climate Change, VividEconomics, August 2019).

could thus be an argument in favour of the use of a cap-and-trade regime. In this article, we challenge this common belief on three grounds.

First, while in a simple design cap-and-trade—such as those implemented in the EU emission trading scheme (ETS) until the recent reforms—can indeed be more countercyclical than carbon taxes, the reality is that nowadays many cap-and-trade systems include mechanisms that insulate allowance prices from macroeconomic fluctuations. Meanwhile, various jurisdictions have implemented or have discussed the implementation of carbon taxes that are designed to automatically or semi-automatically adjust the tax rate to greenhouse gas (GHG) emissions released. These trends challenge the assumed economic stabilising advantage of cap-and-trade over carbon taxes. Second, substantial research emphasises how variables other than the business cycles can affect the price of allowances under cap-and-trade. Thus, it cannot be assumed that the price of allowances will go down during recessions, and indeed the Covid-19 experience shows that the opposite can be true. For instance, the price of allowances has increased substantially in the major cap-and-trade systems around the world during the economic recession in 2020, including allowance prices in the EU ETS, the California ETS, and the Regional Greenhouse Gas Initiative (RGGI).[12] Third, we argue that linking cap-and-trade systems, a policy increasingly attracting the interest of various jurisdictions,[13] can reduce the countercyclical nature of cap-and-trade and, in some situations, could make these instruments even more pro-cyclical than carbon taxes.

Overall, the analysis highlights the existence of challenges to the implementation of countercyclical environmental regulation, as some of the factors that influence the stringency of environmental policies are not easily understood and controlled by policymakers.

Our article will proceed as follows: after this introduction, we first provide a general outline of the value of economic stability in relation to environmental policy (2.1) and discuss potential downsides of suspending or scaling back environmental regulation to stimulate the economy during recessions (2.2). We then briefly sketch key differences between simple forms of carbon taxes and cap-and-trade (3.1) and provide basic insights into why cap-and-trade may be more countercyclical than carbon taxes in the simple design form (3.2). Section 3 also argues that this only works if strict conditions are met, and then provides some refinements. We show that in reality, hybrid regimes have become the norm and in that particular situation, the greater countercyclical effects of cap-and-trade become questionable (3.2.1). Moreover, the fluctuations in the price of carbon in cap-and-trade systems show that they, in practice, are not *always* more countercyclical than carbon taxes and there are various factors that determine these trends (3.2.2). Finally, we also indicate that linking cap-and-trade systems can make these instruments pro-cyclical (3.2.3). Section 4 concludes by drawing some policy implications from our analysis.

2. ECONOMIC STABILITY AND ENVIRONMENTAL POLICY

This section first introduces the concept of countercyclical regulation and distinguishes options available to make regulation countercyclical (Sub-Section 2.1). Subsequently, the section discusses the risks of implementing regulation that adapts to the business cycle and argues that this

12 Allowance Price Explorer <https://icapcarbonaction.com/en/ets-prices> accessed 12 November 2021.

13 On the linking agreement between the EU ETS and the Swiss ETS see 'Linking of Switzerland to the EU Emissions Trading System – Entry Into Force on 1 January 2020' (*Council of the EU*, 9 December 2019) <https://www.consilium.europa.eu/en/press/press-releases/2019/12/09/linking-of-switzerland-to-the-eu-emissions-trading-system-entry-into-force-on-1-january-2020/> accessed 12 November 2021. On the link between the California ETS and the Quebec ETS see 'Programme Linkage: Cap-and-Trade Programme' (*California Air Resources Board*) <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-linkage> accessed 12 November 2021.

regulatory approach presents additional risks when implemented with regards to environmental regulation (Sub-Section 2.2).

2.1 Keynes and Countercyclical Regulation

The starting point for analysing the relationship between government intervention and macroeconomics is still today the work of Keynes. According to Keynes, desired expenditure should equal production, the former being the sum of consumption, investments, and government spending.[14] The Keynesian Multiplier tells us that a reduction in expenditure will reduce output by more than the initial change in expenditure.[15] To illustrate, imagine that the outbreak of a disease, such as Covid-19, suddenly reduces consumption in an economy, and, as a result, businesses' stocks grow. Businesses may then react by cutting production, and also by laying off some of their employees. The newly unemployed people may reduce their consumption, leading to an ensuing reduction in production and employment. This spiral continues until expenditure and production are again in equilibrium. As this example illustrates, the initial change in expenditure yields a larger change in output (ie the initial change is multiplied).

Policy A is said to stabilise the economy more than B when the former reduces the multiplier effect more than the latter. The value of policy A is, therefore, to cause a greater reduction in the negative consequences of recessions. Therefore, taking this as a starting point, the question arises of whether policies can generally be devised to counter this Keynesian Multiplier effect during periods of recession.

Recent research has recognised that regulation can be used as a macroeconomic policy tool[16] just like monetary and fiscal policy.[17] This literature argues that regulation should be designed so that it is countercyclical. Countercyclical regulation has the following characteristics: (1) it releases pressure on regulated entities during times of economic recession as a result of which unemployment is avoided, domestic consumption remains at a reasonable level and the economy can make a rapid restart, (2) pressure on regulated entities is increased during periods of economic growth to counterbalance the effects of less stringent regulation during periods of economic downturns, (3) the average pressure on regulated entities in periods of economic growth and recession is equal to the pressure that would be imposed by regulation that is not countercyclical.

Countercyclical regulation can be distinguished in two broad categories: regulation that acts as an automatic stabiliser and regulation that acts as non-automatic stabiliser. The latter are regulations that do not adapt automatically to business cycles and, instead, require policymakers to take action to help in stabilising the economy. Examples of such actions discussed in the literature include: (1) suspending the application of a regulation, (2) amending an existing regulation to make it less stringent (ie scaling back regulation),[18] or (3) lower/suspend the enforcement of a regulation to reduce pressure on regulated entities.[19] The alternative type of regulation is regulation that, instead, does not require the intervention of policymakers to become more countercyclical.[20] As such, these instruments are referred to as 'automatic stabilizers'.

14 Listokin (n 7).

15 ibid.

16 Listokin, *Law and Macroeconomics* (n 6) 81–102.

17 Masur and Posner (n 8) 860.

18 The difference between suspending a regulation and scaling it back is that in the latter scenario, the regulation is replaced with a less stringent one, while it is merely suspended in the former.

19 The literature also indicates that macroeconomic policy should not necessarily take the form of formal regulation suspension. It could also consist of withholding inspections or other enforcement actions without formally changing the regulation. It is referred to as regulatory forbearance. See Masur and Posner (n 8) 867–68.

20 ibid 865–67.

Automatic stabilisers are generally considered better instruments than non-automatic ones for at least two reasons. First, automatic stabilisers tend to be superior instruments in terms of their timing. Economic recessions can occur quickly and policymakers may require time to adjust regulation; during a crisis, this time can impose severe costs on society.[21] Secondly, during times of crisis, there is a danger of using discretionary powers for ad hoc policy under pressure from interest groups, and so automatic stabilisers are to be preferred as they do not require government intervention.

Based on the distinctions discussed in this section, the next section elaborates on some of the risks of adopting *environmental* regulation that becomes less stringent during periods of economic recession and more stringent during periods of economic growth.

Before starting this analysis, it is important to discuss the relevance of countercyclical environmental regulation for the stabilisation of the economy. The economic impact of environmental regulation varies across countries, and so, the potential role of countercyclical environmental regulation for stabilising the economy will also vary from jurisdiction to jurisdiction. A recent World Bank study conducted in 75 (high-, middle-, and low-income) countries indicates that environmental taxes accounted for between 0 and 5% of GDP (median 2%) in the period 1994–2018.[22] To put this into perspective, in the same countries in the same period, personal income taxes accounted for 5% of GDP in most jurisdictions.[23] Personal income taxes are seen as important instruments to stabilise the economy.[24] While this study indicates that environmental taxes are less economically relevant than personal income taxes in many jurisdictions, we need to reckon that environmental taxes are only one type of environmental policy in place in many jurisdictions. The role of environmental policy to stabilise the economy could be much larger if other types of instruments are included in the picture.

2.2 Adjusting Environmental Regulation to the Business Cycle

There is some discussion of the potential countercyclical effects of particular environmental regulation in the literature.[25] In legal scholarship, it has been highlighted that suspending or scaling back some regulations, automatically or not, or their enforcement could generate cost savings for regulated entities in times of economic downturns, potentially helping to stabilise the economy.[26] The same literature has highlighted the potential risks related to these practices, such as the risk of increasing pollution and various situations where suspending regulations may not help to stimulate the economy, such as when the costs of complying with the regulation are sunk or when suspending the economy leads to the layoff of workers involved in complying with the regulation.[27] Overall, this research suggests that suspending or scaling back environmental regulation (or its enforcement) could be a policy approach to be used in a relatively narrow set of circumstances.[28] In this section, we discuss four additional risks of countercyclical environmental regulation. These risks, which have been overlooked in the law and macroeconomics literature, are: reduced long-term investments in green assets, lost innovation, and lost competitiveness, regulatory backsliding.

21 Masur and Posner (n 8) 865–67.

22 Dirk Heine and Christian Schoder, *The Role of Environmental Tax Reform in Responding to the COVID-19 Crisis* (forthcoming 2022) World Bank Group.

23 ibid.

24 Listokin (n 7) 53.

25 For a recent overview of the literature, see Barbara Annicchiarico and others, 'Business Cycles and Environmental Policy: Literature Review and Policy Implications' (2021 NBER Working Paper Series 29032), 15–23 <https://www.nber.org/papers/w29032> accessed 12 November 2021.

26 Masur and Posner (n 8) 868.

27 ibid 867–73.

28 ibid abstract.

The environmental dangers of regulation that adapts to the business cycle goes beyond the short-term increases in pollution highlighted in the existing literature.[29] Unpredictable environmental regulation can make the business case for polluters to invest in long-term green technologies less strong.[30] Thus, regulation that adjusts to the business cycle can undermine pollution reduction in the long term also. Uncertain environmental regulations could be particularly damaging in areas of environmental policy where long-term investments are crucial to achieve desirable environmental outcomes, such as climate change policy. Energy-related infrastructural investments often payoff only in years or decades[31] and a predictable regulatory environment can help businesses which have to make long-term choices on their fuel use and related technological investments. Thus, countercyclical environmental regulation poses environmental risks both in the short and the long term.

Another risk of countercyclical environmental regulation is that the potential regulatory incentives to create or adopt new technologies, products, or systems may be undermined. It has been an important achievement of the work of Michael Porter to show that compliance with well-designed environmental regulation can force companies to innovate to be able to comply with that regulation.[32] It has been called the 'weak version' of the Porter Hypothesis.[33]

Decades of research on the weak version of the Porter hypothesis confirm that well-designed regulation can drive innovation.[34] As theorised by Porter and van der Linde, of the key characteristic of regulation that can yield competitiveness gains is the certainty of the regulatory environment.[35]

In contexts where the weak version of the Porter Hypothesis holds, unpredictable environmental regulation can cause a social cost in terms of *lost innovation*. Making environmental regulation countercyclical can increase regulatory uncertainty in at least two ways. First, since it is often difficult to predict future economic trends,[36] making regulation dependent on macroeconomic conditions reduces the predictability of regulatory stringency. Second, as we will explain below, implementing countercyclical regulation can be challenging—potentially resulting in regulatory backsliding. Risks of potential failures to implement countercyclical regulation are another factor that increases uncertainty for regulated entities on the stringency of the regulatory environment in which they operate.

29 Masur and Posner quote the example of a water pollution regulation that is expected to save a number of lives and, if suspended, would increase deaths (Masur and Posner (n 8) 871). Notice, that this is a scenario not far from reality: during the Covid-19 pandemic environmental enforcement efforts were deliberately slowed down in various jurisdictions, and especially the USA, resulting in more pollution (see Rebecca Bratspies and others, 'Environmental Law, Disrupted by Covid-19' (2021) 51 Env't L Rep 10509). For instance, the US Environmental Protection Agency (EPA) has been reported declaring a more lenient approach on fining businesses that violate certain requirements on environmental monitoring and reporting during the pandemic (Laura Sanicola and Valerie Volcovici, 'Trump Administration Eases Environmental Enforcement During Outbreak' *Reuters* <https://www.reuters.com/article/us-health-coronavirus-usa-epa-idUSKBN21D3DI> accessed 12 November 2021). The additional pollution released during periods when the regulation is made more lenient, is an important factor to consider in the choice of whether or not to make environmental regulation countercyclical. Of course, for some types of pollutants, it might well be that the additional environmental harm during periods of economic recession is counter-balanced by lower environmental harm during periods of economic boom (compared to a counterfactual scenario where regulation is not countercyclical).

30 Gregory F Nemet, Arnulf Grubler and Daniel M Kammen, 'Countercyclical Energy and Climate Policy for the US' (2016) 7 Climate Change 5.

31 ibid.

32 See Michael E Porter, 'America's Green Strategy' (1991) 264 Scientific American 168; Michael E Porter and Claas van der Linde, 'Toward a New Conception of the Environment-competitiveness Relationship' (1995) 9(4) J of Economic Perspectives 97–118.

33 Shuai Shao and others, 'Environmental Regulation and Enterprise Innovation: A Review' (2020) 29 Business Strategy and the Environment 1465.

34 Stefan Ambec and others, 'The Porter Hypothesis at 20: Can Environmental Regulation Enhance Innovation and Competitiveness' (2013) 7 Rev of Environmental–Economic Policy 2; Shao and others, ibid.

35 Porter and van der Linde (n 31) 110.

36 Evidence suggests that it is difficult to forecast economic recessions: Zidong An, João Tovar Jalles and Prakash Loungani. 'How Well Do Economists Forecast Recessions?' (2018) 21(2) International Finance 100.

Please note that the *lost innovation* cost is not the same as the harm from higher pollution discussed above. Green innovation, as all innovation, can have value beyond the reductions in pollution achieved by the adoption of the innovation itself. This is because there can be positive spillovers from green innovation, which can reach beyond green innovation (eg a new material created by a company in the attempt to reduce pollution might subsequently be used to improve the safety of a device).

Another version of the Porter Hypothesis (the strong version) holds that there are circumstances where innovation induced by environmental regulation increases the competitiveness of regulated entities, meaning that the benefits to the company of innovation more than offset the costs of complying with the regulation.[37] A potential way in which regulation can increase the competitiveness of regulated companies is by making the latter realise opportunities to reduce the consumption of energy from fossil fuels while reducing costs.[38] As with innovation, predictable environmental regulation is more likely to yield competitiveness benefits than unpredictable one.[39]

In contexts where the strong version of the Porter Hypothesis applies, making regulation countercyclical may reduce regulated entities' competitiveness due to the greater regulatory uncertainty that countercyclical regulation creates. While evidence for the strong version of the Porter Hypothesis is mixed, more recent research provides stronger support for it.[40] Overall, research suggests that whether the strong version of the Porter Hypothesis holds may depend on various factors, including, for instance, the type of regulation (market based measures tend to perform better than command-and-control regulation), the patent regulation in place in a jurisdiction, and the availability of adequate training opportunities for companies to take advantage of low-hanging fruits.[41]

Another long-term risk of suspending or scaling back environmental regulation is regulatory backsliding. If regulators suspend environmental regulations in the time of recessions, a new status quo is created where environmental constraints on regulated entities are less stringent. It is well-known that *ceteris paribus* people prefer the status quo over alternative states of the world (so-called status quo bias),[42] and this also applies to environmental policies.[43] Thus, the new reality may provide a fertile ground for vested interests to maintain lower environmental standards beyond what is needed to let the economy breathe: for instance, beyond the time of the economic downturn. In other words, if suspending or scaling down environmental regulation during recessions creates a new status quo in the public's mind, vested interests that gain from lower environmental standards may be more successful in stirring public opposition to higher ambitions in environmental action. When the implementation of countercyclical environmental regulation results in regulatory backsliding, the environmental harms of lenient environmental regulation will add to those related to potential losses in innovation and competitiveness discussed above (Porter hypothesis). The risks of regulatory backsliding are likely to be higher when the regulation is suspended or scaled back than when enforcement is merely suspended

37 Ambec and others (n 33).

38 The size of, and explanations for, these profitable abatements are debated in the literature. For a recent review of the research on the energy efficiency gap, see Todd D Gerarden, Richard G Newell and Robert N Stavins, 'Assessing the Energy-efficiency Gap' (2017) 55 J of Economic Literature 1486. On negative costs mitigation opportunities, see also Kenneth Gillingham and James H Stock, 'The Cost of Reducing Greenhouse Gas Emissions' (2018) 32(4) J of Economic Perspectives 53.

39 Ambec and others (n 33); Leena Lankoski, 'Linkages between Environmental Policy and Competitiveness' *OECD Environment Working Papers* 13 (2010).

40 Ambec and others (n 33).

41 ibid.

42 Daniel Kahneman, Jack L Knetsch and Richard H Thaler, 'Anomalies: The Endowment Effect, Loss Aversion, and Status Quo Bias' (1991) 5 J of Economic Perspectives 193.

43 Corey Lang, Michael Weir and Shanna Pearson-Merkowitz, 'Status Quo Bias and Public Policy: Evidence in the Context of Carbon Mitigation' (2021) 16(5) Environmental Research Letters 054076.

or when the stringency of the regulation is automatically adjusted to the business cycle (with no need for regulatory intervention).

To sum up, recent scholarship in law and macroeconomics has discussed the pros and cons of countercyclical regulation. This research suggests that this practice has the potential advantage of stabilising the economy but also presents costs and uncertain benefits, and thus should be used only in a narrow set of circumstances. In this section, we have highlighted additional disadvantages of countercyclical environmental regulation. In particular, we pointed to the risks of hindering long-term green investments and inducing regulatory backsliding, as well as to the potential costs of lost innovation and competitiveness. Overall, this analysis suggests that policymakers should be very careful in implementing countercyclical environmental regulations, especially when regulatory adjustments to the business cycle are not automatic.

3. CARBON TAXES VERSUS CAP-AND-TRADE AND THEIR ECONOMIC STABILISING EFFECTS

In the previous section, we have discussed the benefits and some of the problems of countercyclical environmental regulation. We now move to the question of how this literature affects instrument choice in environmental policy and more particularly to the analysis of the countercyclical effects of two key types of environmental instruments: carbon taxes and cap-and-trade. However, before addressing that crucial issue, we will first briefly recall the literature indicating the most important differences between simple forms of carbon taxes and cap-and-trade.

3.1 Simple Forms of Carbon Tax versus Cap-and-Trade: An Introduction

Environmental taxation is historically the first instrument that was suggested to remedy environmental externalities. It goes back to the classic work of Pigou[44] suggesting that pollution can be reduced to socially desirable levels by increasing a firm's marginal private costs by means of a tax to reflect the marginal costs to society. Emission trading goes back to the work of Dales, who suggested determining emission limits per actor and allowing actors to trade the allotted emission permits on the market.[45] Both instruments have particular conditions under which they work and consequently important differences. Yet, they also have one important feature in common, especially compared to the command and control type of government regulation, being that both systems impose a price on carbon without mandating the achievement of a certain emission mitigation target on individual regulated entities, or energy efficiency target, or the adoption of particular technologies. Instead, both types of instruments merely put a price on carbon emissions and allow individual regulated entities to reduce emissions as they prefer.[46] In that sense, both systems are considered economic or incentive-based. However, how both instruments work has also important differences that have been well documented in the literature.[47]

The most basic difference between both instruments is that a tax is a price-based mechanism and cap-and-trade is a quantity instrument.[48] An environmental tax determines a particular price for carbon emission (eg a ton of carbon), but it is unknown how operators will react to that

44 AC Pigou, *A Study in Public Finance* (MacMillan 1928).

45 John H Dales, *Pollution, Property and Prices: An Essay in Policy* (University of Toronto Press 1968).

46 For a literature review, see Jody Freeman and Charles D Kolstad (eds), *Moving to Markets in Environmental Regulation: Lessons from 20 Years of Experience* (OUP 2007); Richard B Stewart, 'Instrument Choice' in Daniel Bodansky, Jutta Brunnée and Ellen Hey (eds), *The Oxford Handbook of International Environmental Law* (Oxford University Press 2008); Michael G Faure and Roy A Partain, *Environmental Law and Economics: Theory and Practice* (CUP 2019).

47 Parry and Pizer (n 2); Goulder and Schein (n 2); Gary M Lucas Jr, 'Behavioral Public Choice and the Carbon Tax' (2017) Utah L Rev 116; Erik Haites, 'Carbon Taxes and Greenhouse Gas Emissions Trading Systems: What Have We Learned?' (2018) 18 Climate Policy 955.

48 Martin L Weitzman, 'Prices Versus Quantities' (1974) 41 Rev of Economic Studies 477; Goulder and Schein (n 2) 17.

price. In other words, under a carbon tax, the price is fixed, but the emissions are uncertain.[49] The reverse is, in fact, the case with simple forms of cap-and-trade. Cap-and-trade fixes the maximum amount of emissions, but it is not certain how much operators will pay for an allowance as that depends on the market. Therefore, the difference could simply be summarised as follows: taxes fix the price to be paid for emissions, but as it is uncertain how operators will react to that, there is uncertainty concerning their effect on emission reduction. A carbon tax can, as such, not automatically guarantee that emissions will be kept within a particular limit.[50] A cap-and-trade system does control the maximum quantity of emissions, but as the market determines the price to be paid, there may be price volatility.[51] Hence, there is in essence, a trade-off between price and emissions certainty: a carbon tax can provide more price certainty; and cap-and-trade more certainty for emission reductions.[52]

There are other differences in the design discussed in the literature as well. For example, carbon taxes may raise revenue for the government, whereas that is in principle not the case with cap-and-trade (unless allowances are sold for a fixed price or auctioned).[53] There is equally a difference as far as political acceptability is concerned. Taxes often find strong opposition from the industry and the public.[54] It was a point already made in 1975 by Nobel Prize Winner Buchanan, explaining why so little use was made of environmental taxation.[55] As of today, many jurisdictions have implemented carbon taxes, but cap-and-trade is often less subject to political resistance.[56] This may also explain, at least partially, why today carbon taxes cover only 5.5% of global GHG emissions, while ETSs cover about 16.1% of global GHG emissions.[57]

Notwithstanding these principal differences between both systems, in practice, as we will explain below, the differences may not always be that significant as many carbon pricing instruments have evolved into hybrid regimes (see subsection 3.2.1).

3.2 The Countercyclical Effects of Carbon Tax versus Cap-and-Trade

In the previous section, we sketched the main differences between carbon taxes and cap-and-trade briefly as they have been described in the literature. Most of the research comparing these two instruments focuses on their environmental effectiveness, efficiency, and political feasibility, ignoring the effects of both instruments on economic stabilisation.[58] It is only recently that scholars have also started looking at the relative merits of carbon taxes and cap-and-trade in good and bad times.

The few scholars that consider the stabilising effects of cap-and-trade and carbon taxes tend to enumerate the countercyclical properties of cap-and-trade as one of the advantages of this instrument.[59] The intuition behind this belief is that when the economy is booming, emissions

49 Goulder and Schein (n 2) 12. See also Parry and Pizer (n 2).

50 Goulder and Schein (n 2) 16.

51 ibid 16–17; Parry and Pizer (n 2) 83.

52 Parry and Pizer (n 2) 83–84.

53 ibid 80.

54 On political resistance to carbon taxes, see Stefano Carattini, Maria Carvalho and Sam Fankhauser, 'Overcoming Public Resistance to Carbon Taxes' (2018) 9(5) Wiley Interdisciplinary Reviews: Climate Change e531 <https://doi.org/10.1002/wcc.531> accessed 12 November 2021; David Klenert and others, 'Making Carbon Pricing Work For Citizens' (2018) 8(8) Nature Climate Change 669; Barry G Rabe, *Can We Price Carbon?* (MIT Press 2018); Goran Dominioni and Dirk Heine, 'Behavioural Economics and Public Support for Carbon Pricing: A Revenue Recycling Scheme to Address the Political Economy of Carbon Taxation' (2019) 10 EJRR 554.

55 James Buchanan and Gordon Tullock, 'Polluters' Profits and Political Response: Direct Controls Versus Taxes' (1975) 65 American Economic Rev 139.

56 Dominioni and Heine (n 53).

57 World Bank, Carbon Pricing Dashboard, 2022, <https://carbonpricingdashboard.worldbank.org/map_data> accessed 4 March 2022.

58 For instance see Avi-Yonah and Uhlmann (n 2); Goulder and Schein (n 2); Goulder and Parry (n 1); Parry and Pizer (n 2).

59 Carolyn Fischer and Michael Springborn, 'Emissions Targets and the Real Business Cycle: Intensity Targets Versus Caps or Taxes' (2011) 62 J of Environmental Economics and Management 352; Masur and Posner (n 8) 857.

will naturally increase, thus raising the price for allowances. Conversely, when economic conditions are poor, emissions will naturally decrease, lowering the price of allowances and thus providing relief to firms.[60] Simple forms of cap-and-trade can therefore be considered automatic stabilisers, desirable from a macroeconomic perspective.[61]

Some recent economic crises seem to confirm the countercyclical effect of cap-and-trade. For example, after the 2008 economic recession, the price of the allowances of the EU ETS plummeted substantially and remained low until the end of 2017.[62] Many commentators see the reduced demand for allowances, due to the drop in output and the related emissions, united with a fixed supply of allowances, as the key cause of low carbon prices.[63] Empirical research confirms that the drop in gross domestic product (GDP) was a major factor that reduced price levels.[64] Empirical research equally confirms that cap-and-trade systems tend to act as automatic stabilisers.[65] The same macroeconomic advantages would not apply to a taxation system because the tax rate in simple forms of carbon taxes does not vary depending on the economic cycle.

This idea that cap-and-trade can have a stronger automatic stabilising effect than carbon taxes has support at the policy level. For example, the International Carbon Action Partnership (ICAP), which is an international forum accounting for 32 country members and five observer countries that have implemented or are planning to implement ETSs, describes cap-and-trade 'as a "breathing" instrument that provides countercyclical economic feedback and promotes stability'.[66] Similarly, VividEconomics lists 'counter-cyclical price development' as a key advantage of a stand-alone cap-and-trade over a carbon tax in a report commissioned by the UK Committee on Climate Change to address climate change after Brexit.[67]

However, the idea that cap-and-trade are a stronger economic stabiliser than carbon taxes only works if particular conditions are met. As we will argue below, this advantage of the cap-and-trade system may no longer work in particular conditions closer to how carbon pricing is applied in reality. In sub-section 3.2.1, we argue first that today all the main cap-and-trade systems in the world include price control mechanisms (PCMs) and other price stabilising mechanisms, and analyse the stabilising effects of these mechanisms. The analysis reveals that when cap-and-trade systems are designed to include these mechanisms, their stabilising effects become closer to those of simple carbon taxes. Furthermore, building on existing policy experience with carbon taxes, we discuss options to design carbon taxes that are structured to automatically or semi-automatically adjust the tax rate on emission reductions due to changes in economic activity. In sub-section 3.2.2, we discuss why many cap-and-trade systems have experienced increasing allowance prices in the period 2020–2021, despite the severe economic downturn caused by the Covid-19 pandemic.[68] These price increases indicate that recessions are not always associated with a decrease in cap-and-trade allowance prices. Lastly, in sub-section 3.2.3, we discuss how linking cap-and-trade systems reduces the connection between macroeconomic performance and allowance prices within a jurisdiction. In extreme cases, linking may even make cap-and-trade allowance prices pro-cyclical.

Overall, there are two main take-aways from this analysis. First, it is incorrect to assume that cap-and-trade systems *always* stabilise the economy more than carbon taxes. The relative

60 Masur and Posner (n 8) 884.
61 ibid 865–66.
62 'Allowance Price Explorer' (n 11).
63 Doda (n 4); Sascha Knollenberg and Luca Taschini, 'Emissions Trading Systems with Cap Adjustments' (2016) 80 J of Environmental Economics and Management 20.
64 Doda (n 4).
65 Annicchiarico and Di Dio (n 4).
66 Eden and others (n 10).
67 VividEconomics (n 10).
68 Global CO_2 emissions decreased by 7% from 2019 to 2020, but that did, surprisingly, not imply that the price for allowances also decreased. See Annicchiarico and others (n 24) 2.

countercyclical effects of the two instruments depend on their specific design and other contingent factors. Secondly, and relatedly, designing countercyclical environmental regulation poses challenges that go beyond those discussed in Section 2. In particular, these challenges include: (1) the need to address competing aims of environmental regulation may reduce options to implement countercyclical regulation, (2) it is sometimes difficult to predict and control the economic stabilising properties of environmental instruments.

3.2.1 The countercyclical effects of more sophisticated regimes

In recent years, many jurisdictions have introduced, or are discussing the introduction of, more sophisticated regimes of carbon pricing, meaning cap-and-trade which includes PCMs and other stabilising mechanisms and carbon taxes that can react to changes in emissions or other macroeconomic factors within a jurisdiction. This section analyses the stabilising properties of these mechanisms and draws lessons for the implementation of countercyclical environmental regulation.

As of today, all the major cap-and-trade systems in the world include PCMs. Most PCMs are price-based, meaning that the price ceiling (or floor) is triggered when the price of allowances reaches an upper (or lower) threshold.[69] The exception is the EU ETS Market Stability Reserve, under which allowances are injected or withdrawn from the market depending on the quantity of allowances in circulation.[70] PCMs have been introduced primarily to ensure that cap-and-trade allowance prices remain within ranges that are perceived to be desirable ie:[71] (1) not too low compared to those needed to deliver targeted emissions reductions, (2) not too high to become politically unsustainable, and (3) more predictable for entities subject to the regulation.

Some of these PCMs are automatically triggered by changes in allowance prices, meaning that regulators do not have discretion on whether the PCM is triggered. For instance, once a price threshold is passed in the California ETS, the California Air Resource Board is obliged to auction new allowances at pre-established prices six weeks after the threshold prices were breached for the first time.[72] Similarly, the Fixed Price Option in the New Zealand ETS forces the regulator to sell allowances at a specific price when the threshold price is reached in the market.[73] Other PCMs are not automatic, as authorities have discretion on whether to activate these mechanisms. For instance, at the sub-national level, Chinese authorities have significant discretion regarding whether to activate PCMs in the sub-national Chinese ETSs.[74]

PCMs make the price of allowances less related to macroeconomic conditions and reduce the countercyclical effects of cap-and-trade compared to simple forms. For instance, in presence of a 'hard' carbon price floor[75] allowance prices in primary and secondary markets cannot go below a certain threshold even during a severe economic recession.

Besides PCMs, there are other features of cap-and-trade instruments that can help to insulate cap-and-trade allowances prices from macroeconomic fluctuations. These are: banking, borrowing and the acceptance of offsets. When banking is allowed, regulated entities can utilise

69 Giulio Galdi and others, 'Emissions Trading Systems with Different Price Control Mechanisms: Implications for Linking' (Research Report by FSR Climate for the Carbon Market Policy Dialogue, European University Institute 2020) <https://doi.org/10.2870/509206> accessed 12 November 2021.

70 ibid.

71 ibid.

72 VividEconomics (n 10).

73 ibid.

74 ibid. See further on the Chinese ETS, Huizhen Chen, 'Towards a Market-Based Climate Regime in China? A Legal Perspective on the Design and Implementation of Greenhouse Gas Emissions Trading' (DPhil thesis, Uitgeverij BOXPress 2015) <https://doi.org/10.26481/dis.20151021hc> accessed 12 November 2021.

75 Carbon price floors can be distinguished in 'hard' and 'soft'. Under a soft price floor allowances can not be auctioned below a certain price, but prices can temporarily fall below this price level in secondary markets. See William Acworth, Katrin Schambil and Tobias Bernstein, 'Market Stability Mechanisms in Emissions Trading Systems', International Carbon Action Partnership Secretariat February 2020, Berlin, Germany.

emission allowances not used in one compliance period in the subsequent compliance period.[76] By creating flexibility in the use of allowances, banking reduces the risk of low allowance prices in periods when the demand is low.[77] Borrowing instead allows regulated entities to antedate the use of allowances from future compliance periods to an earlier compliance period.[78] Borrowing reduces the risk of high allowance prices by making the supply more elastic, as entities are able to use future allowances when the price of these commodities increases.[79] Thus, both banking and borrowing can help to stabilise the price of allowances. To the extent that the demand of allowances is related to the business cycle, banking and borrowing make cap-and-trade systems less countercyclical. Similarly, the possibility to comply with cap-and-trade obligations with the use of offsets can reduce the responsiveness of allowance prices to changes in demand for allowances: when the price of allowances increases due to economic growth, the possibility to use offsets can mitigate prices.[80] Thus, the possibility to use offsets for compliance in a cap-and-trade system is another design option to reduce the economic stabilising effects of cap-and-trade.

While many cap-and-trade systems have become less countercyclical in recent years, it is also possible to design carbon taxes whose tax rate varies depending on the business cycle. Some jurisdictions have implemented or are discussing to implement carbon taxes that move in this direction. Below we discuss three examples of such carbon taxes.

A first example is the Swiss carbon tax whose tax rate may be adjusted relatively easily—ie without the need for approval by legislative bodies—to macroeconomic conditions. The Swiss carbon tax includes a semi-automatic adjustment to the amount of carbon emissions in the country. In particular, after the 2013 revision of the Swiss CO_2 Act, Switzerland set out mitigation targets that, if not respected, can trigger an adjustment of the tax rate upwards.[81] For example, in 2016, the Swiss government increased the tax rate by more than 30% without parliamentary approval because Switzerland had not met the scheduled mitigation targets.[82] Since carbon emissions tend to increase during periods of economic growth, the chances that Switzerland does not meet its mitigation targets are higher in periods of economic growth than during downturns. Hence, the semi-automatic increase of the carbon tax rate is more likely to occur during periods of economic growth, making the Swiss carbon tax more countercyclical than other carbon taxes which do not incorporate this semi-automatic adjustment mechanism. Thus, the Swiss carbon tax provides a model to design carbon taxes that better respond to the business cycle than traditional carbon taxes.

Another example is the Portuguese carbon tax, whose tax rate is tied to the average price of EU ETS allowances in the previous year.[83] To the extent that the price of allowances in the EU ETS follows the business cycle, for instance, with higher prices in periods of economic boom, the Portuguese carbon tax may also do so. There is an important caveat to this because the adjustment of the tax rate occurs only in the subsequent year, when the business cycle may have already changed. To address this issue it may be sufficient, for instance, to adjust the carbon tax rate based on more recent trends of EU ETS allowance prices (eg 2 months) to better reflect the current macroeconomic situation.

76 Claudia Kettner, Daniela Kletzan-Slamanig and Angela Köppl, 'ETCLIP-The Challenge of the European Carbon Market: Emission Trading, Carbon Leakage and Instruments to Stabilise the CO2 Price' (2011) The EU Emission Trading Scheme: Sectoral Allocation Patterns and the Effects of the Economic Crisis. No. 408. WIFO Working Papers.

77 ibid.

78 ibid.

79 ibid.

80 ibid.

81 Stefano Carattini, Maria Carvalho and Sam Fankhauser, 'How TO Make Carbon Taxes More Acceptable' (Grantham Research Institute on Climate Change and the Environment, and Centre for Climate Change Economics and Policy, LSE 2017).

82 ibid.

83 World Bank, Carbon Pricing Dashboard, 2022, available at: <https://carbonpricingdashboard.worldbank.org/map_data> accessed 8 March 2022.

Lastly, other governments are considering linking the tax rate of their domestic carbon tax to external factors. For instance, the French Council of Economic Analysis—an institution that advises the French Prime Minister—has suggested adjusting the tax rate of the French carbon tax to oil prices.[84] In particular, the carbon tax rate would decrease (increase) when oil prices increase (decrease).[85] This proposal was discussed in the aftermath of the 2018 Yellow Vest protests against an increase in the French carbon tax rate during a period of increasing oil prices. The relationship between economic growth and oil prices is complex;[86] however, there are situations where changes based on oil prices would make the carbon tax more countercyclical than regular carbon taxes. For example, shocks to oil supply can increase oil prices and negatively affect economies. In this situation, reducing the tax rate in response to the oil price increase can help to stabilise the economy. Thus, the mechanism suggested by the French Council of Economic Analysis illustrates another case of a carbon tax that—if implemented—could have a more stabilising effect on the economy than conventional carbon taxes, at least in some circumstances. Of course, there could also be situations where a carbon tax that adjusts the tax rate to changes in oil prices is more pro-cyclical than traditional carbon taxes. For instance, if a shock in the demand for commodities reduces oil prices while negatively affecting the economy, the automatic increase in the tax rate would make the carbon tax more pro-cyclical than traditional ones.

In sum, this sub-section has highlighted two parallel trends in the design of carbon pricing instruments around the world. On the one hand, many of the largest cap-and-trade systems currently in operation include PCMs and other price stabilising mechanisms. On the other, there are a number of carbon taxes whose tax rates can vary automatically or semi-automatically depending on the economic cycle. Some of these carbon taxes—such as the Swiss carbon tax—may represent a blueprint for the implementation of carbon taxes in other jurisdictions. An analysis of the stabilising properties of these more sophisticated carbon pricing regimes reveals two main lessons. First, cap-and-trade schemes with PCMs or other price stabilising mechanisms are less countercyclical than more traditional cap-and-trade systems. Similarly, more sophisticated carbon taxes can stabilise the economy more than traditional carbon taxes—at least in some circumstances. This is for example the case with the non-linear carbon tax in Switzerland. Taking this into account highlights that the emergence of more sophisticated carbon pricing regimes makes the stabilising properties of cap-and-trade and carbon taxes more similar. In addition, the analysis shows that it can be challenging to design countercyclical environmental regulation because of the competing goals that environmental policies aim to achieve. As highlighted in this section, these include for instance, the need to guarantee that carbon prices remain within certain price ranges in cap-and-trade regimes and the need to ensure that energy prices do not become too high to threaten the survival of the environmental regulations (as with the proposed French carbon tax).

3.2.2 Drivers of allowance prices beyond macroeconomic fluctuations: the covid-19 experience

This section discusses price variations in cap-and-trade and carbon tax systems in around the world during the Covid-19 related recession. The analysis reveals that, contrary to the 2008 economic recession, in 2020 the price of allowances in most of the main cap-and-trade system has increased significantly. Various factors may account for these trends. The section draws lessons

84 Dominique Bureau, Fanny Henriet and Katheline Schubert, 'Pour Le Climat: Une Taxe Juste, Pas Juste Une Taxe' (Les Notes Du Conseil D'analyse Économique, No 50, 2019).

85 This carbon tax design is discussed also in Nemet, Grubler and Kammen (n 29).

86 Rudra P Pradhan, Mak B Arvin and Atanu Goshray, 'The Dynamics of Economic Growth, Oil Prices, Stock Market Depth, and Other Macroeconomic Variables: Evidence From the G-20 Countries' (2015) 39 International Rev of Financial Analysis 84.

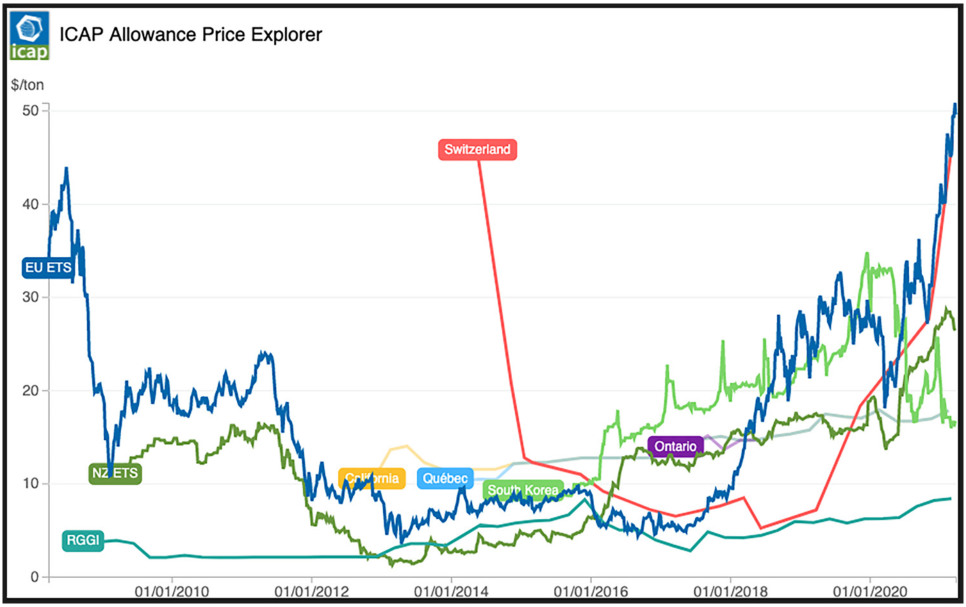

Figure 1 Cap-and-trade allowance prices 2008–2021(source: ICAP, 2021).

from this experience for the implementation of countercyclical environmental policies and for the choice between cap-and-trade and carbon taxes.

Research has identified many factors, apart from economic activity, that determine cap-and-trade allowance prices. These include, for instance, exogenous changes in coal and gas prices, weather (eg cold weather increases energy consumption for heating), interactions with other instruments (eg the deployment of renewable energy can reduce emissions and therefore also allowance prices), regulatory changes and political announcements (eg to increase or withdraw subsidies to fossil fuel consumption), and financial speculation.[87] There are still many unknowns on the relative importance of each factor.[88]

Existing scholarship identifies a reduction in economic output as the main driver of low prices in the post-2008 EU ETS market.[89] This corresponds to the basic insight that, in an economic downturn, the output will decrease as a result of which the demand for allowances will decrease as well, thus lowering prices. However, this does not imply that economic recessions always result in reduced allowance prices. If anything, the Covid-19 pandemic and the ensuing economic downturn seem to testify to the opposite. As shown in Figure 1, the allowance prices of the major cap-and-trade systems have increased, often substantially, since Covid-19 restrictions have negatively affected the economy of many countries.

Of all the major cap-and-trade systems around the world, from March 2020, the moment at which major economic restrictions were imposed in many countries, to March 2021 allowance prices have increased substantially in the EU ETS (from 34 to 51 USD per ton of carbon), the New Zealand ETS (from 18 to 27 USD per ton of carbon), RGGI (from 7 to 9 USD per ton of

87 Marina Friedrich and others, 'From Fundamentals to Financial Assets: The Evolution of Understanding Price Formation in the EU ETS' (Working Paper, 23 April 2020) <http://hdl.handle.net/10419/216726> accessed 12 November 2021.
88 Christian Flachsland and others, 'How to Avoid History Repeating Itself: The Case For an EU Emissions Trading System (EU ETS) Price Floor Revisited' (2020) 20 Climate Policy 133, 133–42; Friedrich and others, (n 86).
89 Nicolas Koch and others, 'Causes of the EU ETS Price Drop: Recession, CDM, Renewable Policies or a Bit of Everything?—New Evidence' (2014) 73 Energy Policy 676.

carbon), the California and Quebec linked markets (from 14 to 17 USD per ton of carbon).[90] The exception is the South Korea ETS, where allowance prices dropped significantly (from 23 to 17 USD per ton of carbon).[91] In the same period, many of these economies contracted significantly. For instance, the real GDP in the EU (27 countries) fell by 5.9% in 2020,[92] and in the same period the Californian economy contracted by 2.8%.[93] For comparison, the price of EU ETS allowances (the only major ETS market active in 2008) dropped from about 25 USD per ton of carbon in October 2008 to about 15 USD per ton of carbon in November 2009[94] and the economy contracted by about 4.3% in 2009.[95] Thus, although the economic downturn in 2020 has been much stronger in the EU than during the 2008 crisis, EU ETS allowance prices have increased in the last year. The price for an EU ETS allowances hit a record of about 89 USD per ton of carbon in 2021.[96]

What are the causes of the post-Covid-19 trends? Uncertainty exists, but research points to multiple factors that could explain the recent increase in allowance prices. With regard to the EU ETS, some research suggests that the Market Stability Reserve is being effective at keeping prices high, despite the crisis,[97] even though some authors question whether the instrument can perform this well if the recession persists in the long term.[98] However, analysts also see other factors contributing to the increased allowance prices, including the increased ambition to decarbonise the EU economy that EU institutions and many European Member States have embraced in recent times and the increased participation of actors that do not have compliance obligations in the EU ETS.[99] The role of price control mechanisms and increased policy ambition in many countries that have implemented cap-and-trade could also explain the increase of allowance prices in other major cap-and-trade systems.[100] For instance, net-zero legislation has been implemented or is under discussion in New Zealand and the UK, while California and some RGGI states have set similar mitigation goals via executive orders.[101]

Between 2020 and 2021, the tax rate of some carbon taxes have also increased. These include, for instance, the Latvia carbon tax rate (from 10.47 USD to 14.1 USD), the Canada federal backstop carbon pricing scheme tax rate (from 23.88 USD to 31.83 USD), and the Ireland carbon tax rate (from 30.54 USD to 39.35 USD).[102] It is difficult to know whether carbon taxes or cap-and-trade have helped stabilising the economy more during the Covid-19 related recession. This is also because cap-and-trade and carbon taxes often apply to different sectors, and macroeconomic shocks propagate differently depending on the industry hit.[103] Only empirical research could clarify this. However, there are some jurisdictions with a cap-and-trade system where the

90 'Allowance Price Explorer' (n 11).
91 ibid.
92 'Real GDP Growth Rate – Volume' <https://ec.europa.eu/eurostat/databrowser/view/tec00115/default/table?lang=en> accessed 12 November 2021.
93 'Annual Percent Change of the Real GDP in California From 2000 to 2020 <https://www.statista.com/statistics/306775/california-gdp-growth/> accessed 12 November 2021.
94 'Allowance Price Explorer' (n 11).
95 'GDP Growth (Annual %) – European Union' <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?locations=EU> accessed 12 November 2021.
96 'Allowance Price Explorer' (n 11).
97 Reyer Gerlagh, Roweno JRK Heijmans and Knut Einar Rosendahl, 'COVID-19 Tests the Market Stability Reserve' 2020 76 Environmental and Resource Economics 855; Valeriya Azarova and Mathias Mier, 'Market Stability Reserve Under Exogenous Shock: The Case of COVID-19 Pandemic' (2021) 283 Applied Energy 116351.
98 ibid.
99 Jos Delbeke and Peter Vis, 'Keeping Faith in Higher Carbon Prices as a Driver of Change' (STG Policy Brief 2021/04, European University Institute March 2021).
100 International Carbon Action Partnership (n 77).
101 ibid.
102 World Bank, 'State and Trends of Carbon Pricing 2021' (2021), World Bank Group, Washington DC.
103 Daron Acemoglu, Ufuk Akcigit and William Kerr, 'Networks and the Macroeconomy: An Empirical Exploration' *NBER Macroeconomics Annual* (2016) 30 (1) 273–335; Daron Acemoğlu and others. 'Networks and macroeconomic shocks' (VoxEU, 30, January, 2016) <https://voxeu.org/article/networks-and-macroeconomic-shocks> accessed 23 February 2022.

price of allowances increased significantly during the Covid-19 economic crisis, while the tax rate of the domestic carbon tax has remained stable in the same period, such as Poland.[104] This example suggests that the common belief according to which cap-and-trade is a 'breath instrument' compared to carbon taxes may not hold in all circumstances.

Overall, there are two main takeaways from the analysis presented in this section. First, there are many factors that determine allowance prices in cap-and-trade, beyond macroeconomic fluctuations and PCMs. The Covid-19 related recession has shown that in many cap-and-trade systems around the world allowance prices can increase significantly during an economic downturn. Thus, the common belief that cap-and-trade allowance prices decrease during recessions may not hold in all circumstances. Secondly, one can not assume that cap-and-trade instruments stabilise the economy more than carbon taxes. This may hold in some circumstances but not in others, depending both on the design of the instrument and contingent factors. Some of the contingent factors are not easily controllable by regulators (eg the weather), which may therefore have limited control over the relative (automatic) stabilising effects of carbon taxes and cap-and-trade. Thirdly, and relatedly, the analysis presented in this section highlights the challenge of implementing countercyclical environmental policies, as the behaviour of some of these policies is sometimes difficult to understand and control.

3.2.3 Linking large and small cap-and-trade systems

Linking separate cap-and-trade systems of different jurisdictions has been propagated as beneficial as it can yield cost savings through reallocations of abatement efforts[105] and can reduce price volatility.[106] Some linking systems are already in places, such as the link between the EU ETS and the Switzerland ETS[107] and the link between the California ETS and the Quebec ETS,[108] but there is, especially in the economic literature, a lot of attention to the potential of linking various emission trading systems. There is, for example, an examination of the possibility to link the EU ETS with California's cap-and-trade programme[109] and there has also been an examination of the possibility to link the EU ETS with the China ETS.[110]

A link between two cap-and-trade systems may affect the stabilising properties of the linked systems. In a two-way link, the prices of allowances result from demand and supply in the two markets.[111] The larger market that results from the link is likely to reduce the volatility of allowance prices and increase the ability of the cap-and-trade systems to absorb exogenous shocks.[112] If the link reduces the reactivity of allowances to macroeconomic fluctuations, the system becomes less countercyclical.

Furthermore, the link could also make the cap-and-trade pro-cyclical in one of the linked jurisdictions in some circumstances. This is likely when one of the two markets is much smaller

104 World Bank, Carbon Pricing Dashboard, 2022, <https://carbonpricingdashboard.worldbank.org/> accessed 25 January 2022.

105 Goulder and Schein (n 2) 24.

106 Fitsum G Tiche, 'Linking Emission Trading Systems: A Law and Economics Analysis' (PhD thesis, University of Groningen 2017) 3640.

107 'Linking of Switzerland to the EU Emissions Trading System – Entry Into Force on 1 January 2020' (*Council of the EU*, 9 December 2019) <https://www.consilium.europa.eu/en/press/press-releases/2019/12/09/linking-of-switzerland-to-the-eu-emissions-trading-system-entry-into-force-on-1-january-2020/> accessed 8 March 2022.

108 'Programme Linkage: Cap-and-Trade Programme' (*California Air Resources Board*) <https://ww2.arb.ca.gov/our-work/programs/cap-and-trade-program/program-linkage> accessed 12 November 2021.

109 See Manolis Kotzampasakis and Edwin Woerdman, 'Linking the EU ETS with Californias's Cap-and-trade Programme: A Law and Economics Assessment' 2020 4(4) Central European Rev of Economics and Management 9-45.

110 See Yingying Zeng, 'Obstacles to Linking Emissions Trading Systems in the EU and China: A Comparative Law and Economics Perspective' (PhD thesis, University of Groningen 2018).

111 Matthew Ranson and Robert N Stavins, 'Linkage of Greenhouse Gas Emissions Trading Systems: Learning From Experience' 2016 16 Climate Policy 284.

112 Marissa Santikarn and others, 'A Guide to Linking Emissions Trading Systems' (International Carbon Action Partnership 2018) <https://icapcarbonaction.com/en/?option=com_attach&task=download&id=572> accessed 12 November 2021.

than the other one—so that the smaller market becomes a price-taker. This is currently the situation in the link between the EU ETS and the Swiss ETS, where the Swiss ETS is the price taker.[113] A similar situation could also occur if the EU ETS is linked with a UK ETS or the New Zealand ETS.

When one of the linked jurisdictions becomes a price taker, dissimilarities in the business cycle between the two jurisdictions may induce allowances to decrease during periods of economic growth in the smaller jurisdiction. Imagine, for instance, a link between the cap-and-trade systems of country BIG and country SMALL where ETS SMALL becomes a price-taker. Here, a reduction in economic activity in BIG may reduce the price of allowances also in SMALL, even though SMALL is experiencing a period of economic growth. But, of course, if sufficiently effective PCMs are in place in the linked ETS, the risks of pro-cyclical ETSs in SMALL can be reduced.

Two conclusions can be drawn from this discussion. First, jurisdictions that are considering whether to link their cap-and-trade systems should consider whether their economies are expected to follow similar business cycles in the foreseeable future and adopt PCMs that can reduce the risks of pro-cyclical carbon prices. Secondly, the increasing interest in linking cap-and-trade systems in various jurisdictions is likely to reduce the countercyclical properties of cap-and-trade and sometimes even make these instruments pro-cyclical compared to traditional carbon taxes. Thus, adding to what is discussed in sub-sections 3.2.1 and 3.2.2, the linking of cap-and-trade is another factor that makes it difficult to establish on paper whether cap-and-trade systems or carbon taxes are more countercyclical. Which of the two instruments stabilises the economy the most depends on its specific design and other contingent factors.

4. CONCLUSIONS

This article has pointed to the important literature which indicates that environmental regulation can also have macroeconomic effects. The basic normative tenet of that literature is that (environmental) regulation should be countercyclical to stimulate employment, and consumer demand, and thus the economy in times of recession. We have contributed to this literature by analysing some of the dangers of countercyclical regulation in the context of environmental policy. In particular, we have highlighted that varying the stringency of environmental regulation based on the business cycle poses risks of hindering long-term investments, regulatory relapse, reduced innovation, and potential reductions in competitiveness. Overall, the analysis suggests that policymakers should be careful in implementing countercyclical environmental regulation—a practice that has taken place in various jurisdictions during the Covid-19 pandemic, including the USA. The analysis also highlights that implementing countercyclical regulation can be challenging as the economic stabilising properties of environmental policies sometimes depend on contingent factors not easily controlled by policymakers.

Furthermore, we have analysed the countercyclical properties of two key instruments in environmental law and policy: cap-and-trade and carbon taxes. Existing research and policy debate tend to highlight the higher countercyclical nature of cap-and-trade over carbon taxes. The simple economic reasoning underlying this belief is that under cap-and-trade in an economic downturn, the price of allowances would go down, providing relief to regulated entities. Instead, tax rates tend to remain stable during periods of recession, thereby making carbon taxes less countercyclical than cap-and-trade. In this article, we challenge this common belief on three grounds. First, while in a simple design cap-and-trade can indeed be more countercyclical than carbon taxes, the reality is that hybrid regimes have emerged around the world,

113 Galdi and others (n 68).

which seriously reduce the advantage of cap-and-trade over carbon taxes. Secondly, substantial research highlights how variables other than the business cycles can affect the price of allowances under cap-and-trade. Thus, it cannot be assumed that the price of allowances will go down during recessions, and indeed the Covid-19 experience shows that the opposite can be true (ie the price of allowances can rise significantly even during recessions). Thirdly, linking cap-and-trade systems—a policy that is increasingly attracting the interest of various jurisdictions—can reduce the countercyclicality of cap-and-trade and, in some situations, could make these instruments even more pro-cyclical than carbon taxes.

The key points arising from this article are that: first, the potential benefits of countercyclical environmental regulation need to be carefully balanced against the potential costs, and it cannot be assumed that the former will always be higher than the latter. Secondly, policymakers interested in implementing countercyclical carbon pricing instruments should not assume that cap-and-trade will be more countercyclical than carbon taxes. Thirdly, which of these instruments will be more countercyclical may depend on their specific design and contingent factors. Fourthly, and relatedly, it can be difficult to understand and (automatically) control price variations of carbon pricing instruments. This poses additional challenges for the implementation of countercyclical environmental regulation. Fourthly, jurisdictions that are planning to link their cap-and-trade systems should consider whether their economies are expected to follow similar business cycles in the foreseeable future and adopt PCMs that can reduce the risks of pro-cyclical carbon prices.

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