

Political challenges of introducing environmental tax reforms in developing countries

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The Paris Agreement requires mitigation efforts from both developed and developing economies. This paper discusses political economy challenges to the implementation of environmental tax reforms in developing economies. It examines policy setbacks in both developed and developing countries, which share numerous features, in particular, in that in either case policymakers did not follow the common principles for a relatively smooth reform as highlighted in the literature. The paper reiterates the importance of such principles and invites multilateral agencies to consider ways to contribute to fund compensatory measures when such reforms would otherwise be implemented without them, raising the risk of potential setbacks.

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1. INTRODUCTION

Climate change is one of the most important issues of this century. Over the last few years, important progress has been made in reducing global greenhouse gas emissions with respect to a counterfactual of no action, leading some of the most worrying climate scenarios to become increasingly less likely (Hausfather and Peters 2020). The same cooperative forces that led to the Paris Agreement are currently leading economies to commit to additional climate mitigation efforts, while starting the process of turning pledges into policies (Carattini 2015; Peters et al. 2017; Carattini, Levin, and Tavoni 2019; Figueres 2020; Carattini and Löschel 2021). The latest session of the Conference of Parties (COP26), which took place in late 2021 in Glasgow, Scotland, further contributed to close the gap between where we are headed in terms of global temperature increase and where we should be according to climate scientists (Climate Action Tracker 2021; Masood and Tollefson 2021), i.e. limiting global warming within 1.5°C above pre-industrial levels (IPCC 2018).

However, important sources of resistance remain, as also highlighted during COP26. Setting ambition so to limit temperature increases within 1.5°C above pre-industrial levels is only one part of the process. Another part consists in realizing the promised emissions cuts through actual policies, ideally in the most cost-effective way, while accounting for within- and between-country inequalities.

Economists agree that carbon pricing represents the most cost-effective tool to address climate change, to be used in combination with other, complementary instruments, especially as carbon prices are gradually ramped up and schemes extend their coverage (Goulder and Parry 2008; Aldy et al. 2010; Aldy and Stavins 2012; Baranzini et al. 2017). Carbon pricing has been expanding very rapidly over the last few years, with coverage and prices increasing steadily (World Bank 2021). An important debate exists among economists on whether prices should be set based on a pragmatic, cost-effectiveness approach (e.g. Stiglitz et al. 2017; Stern and Stiglitz 2021) or a more purist approach defined by the social cost of carbon, whatever it may be (e.g. Aldy et al. 2021). Either way, economists agree that the price should be strictly positive. Hence, economies subsidizing fossil fuels should first phase those subsidies out, and then introduce a positive carbon price. Such expectations apply not only to developed economies, but also to developing economies. Indeed, unlike under the Kyoto Protocol, the Paris Agreement is designed in a way that all signatories are expected to contribute to reduce greenhouse gas emissions, even if in heterogeneous ways, according to common but differentiated responsibilities.

Very much in the same spirit of Bataille et al. (2018), the International Monetary Fund has recently advocated for a global minimum carbon price, where the minimum carbon price differs across countries depending on their income level. For instance, countries could agree to set a USD 75 per ton of CO₂ carbon price by 2030 for advanced economies, a USD 50 per ton of CO₂ carbon price for higher-income emerging economies, and a USD 25 per ton of CO₂ carbon price for lower-income emerging economies (Parry, Black, and Roaf 2021). Such deviation from the ideal of a uniform global carbon tax would immediately account for global inequalities and would bring together the bottom-up spirit of the Paris Agreement with some of the benefits of harmonizing carbon prices as put forward by many economists (e.g. Hoel 1992; Weitzman 2014; Nordhaus 2015; Cramton et al. 2017; Carattini, Kallbekken, and Orlov 2019). The approach advocated by the International Monetary Fund could represent an intermediary step while countries agree on ways to use carbon tax revenues to address global inequalities under a uniform carbon price (Carattini, Kallbekken, and Orlov 2019).

Hence, an important challenge for this decade is represented by the implementation and coordination of carbon pricing policies. This paper focuses specifically on the political economy of such reforms in developing economies. While climate policy setbacks in developed economies have received substantial media attention, such as the Yellow Vest movement in France, important unrest has followed environmental tax reforms also in developing economies, potentially making their policymakers wary of implementing such reforms. This paper argues that, be it in developed or developing economies, such setbacks have mainly been the result of unsatisfactory policy design and communication. A set of common principles have been identified in the literature to help implementing environmental tax reforms in the smoothest possible way, inferring mostly from developed economies. That is, if followed, they tend to increase public support and the likelihood of reforms being implemented and not reverted soon after, ideally surviving changes in government even in a very polarized world. These common principles are shown in this paper to also apply to developing economies, including in the context of fossil fuel subsidies' phase out. Unfortunately, policymakers have not always followed them, although setbacks are outliers in a context of more than 22% of global greenhouse gas emissions currently covered by a carbon price over more than 60 jurisdictions (World Bank 2021), including in developing and emerging economies such as Chile, Colombia, and Mexico.

Such common principles are summarized in Carattini, Carvalho, and Fankhauser (2018), based on a set of regularities or stylized facts identified across methodologies in the large and growing literature on public support for Pigouvian taxes. These stylized facts are obtained from a wide range of studies, using various methodologies, such as lab experiments, discrete choice experiments, survey experiments, regular surveys, and analyses of actual voting behavior. These stylized facts point to the crucial role of proper design and effective communication. Covering in detail these stylized facts, and the underlying literature from which they emerge, is beyond the scope of this paper. Carattini, Carvalho, and Fankhauser (2018) cover some 40 studies by at least twice as many different authors. Hence, the current study should be considered complementary to Carattini, Carvalho, and Fankhauser (2018), which acts as a companion paper. Conversely, the current study updates the knowledge in Carattini, Carvalho, and Fankhauser (2018), extending also the scope of the analysis to reforms in developing economies.¹ Policymakers interested in the practical aspects of implementing

¹ The main rationale for the review of the literature in Carattini, Carvalho, and Fankhauser (2018) was twofold. First, some disappointment with the earlier review by Drews and van den Bergh (2016), which focused mostly on characteristics of the population that are beyond the control of policymakers, or factors that policymakers would anyway like to foster if they could. Second, to allow new scholars to enter this research area at a relatively low cost and immediately contribute to the frontier in the literature. Indeed, while replication studies definitely have a purpose in science, one can still observe quite a bit of unintentional “reinventing the wheel” in this space, with authors still claiming in the early 2020s that “relatively little is known about when and why people find energy policies acceptable” (Zawadzki, Vrieling, and van der Werff 2022), despite the large literature covering the topic. As a result, the literature has expanded more in terms of quantity than quality. Yet, several studies did contribute to affect priors since the review of Carattini, Carvalho, and Fankhauser (2018) and are covered in this study. Two additional studies are mentioned in this footnote. Lang, Weir, and Pearson-Merkowitz (2021) show that citizens in Rhode Island who are made aware of the Regional Greenhouse Gas Initiative (RGGI) are more likely to support such policy. While such finding is largely interpreted as status-quo bias in the paper, it also seems very consistent with the stylized fact that people tend to expect much larger drawbacks from climate policy than there actually are in reality. When realizing that RGGI has not been the cause of any catastrophic economic damage, they may perceive the scheme more favorably. The importance of communicating effectively also *ex post* is discussed in Carattini, Carvalho, and Fankhauser (2018). Bechtel, Scheve, and van Lieshout (2020), on their end, fix the cost that households would face monthly with either a rising or constant schedule. Hence, by shutting down the channel through which people may overestimate costs (and underestimate benefits), the authors unsurprisingly no longer find more support for a rising

carbon pricing may also further consider the studies by Marshall et al. (2018) and Partnership for Market Readiness (2021).

In a nutshell, the common principles in Carattini, Carvalho, and Fankhauser (2018) can be summarized as follows. Beforehand, the general public may tend to underestimate the benefits of Pigouvian taxes, such as reductions in emissions and improvements in local air quality (i.e. local co-benefits), and overestimate drawbacks, such as job losses. Public support increases once a policy is enacted and people can experience it. Also, beforehand people may be more opposed to large tax changes than more moderate ones. Hence, phasing in Pigouvian taxes over time, that is, starting with a relatively low tax rate and increasing it gradually as people become more accustomed with the tax, may improve political feasibility. When a policy's benefits are not immediately observable, as in the case of carbon taxes rather than congestion charges or taxes on garbage, communicating such benefits may be important. The general public may also tend to prefer progressive policies, which are generally considered as fair. However, beforehand, the general public, and potentially also grassroots movements, may be unable to distinguish progressive from regressive designs, unless they are informed about a policy's potential effects. Such information may also affect preferences over revenue use. Progressive redistribution modes may become more appealing when the general public expects Pigouvian taxes to achieve their environmental goal directly, through their incentive effect, leading to lower demand for earmarking for environmental purposes. Hence, effective communication strategies can help address information asymmetries, potentially paving the way for the implementation of effective and progressive carbon tax schemes, such as when revenues are redistributed uniformly to the population as carbon dividends. While addressing inequalities is not the role of Pigouvian taxes, in line with the old Tinbergen rule, the general public may expect policymakers not to exacerbate them further, in a context of already rising social disparities. Public support is crucial also after a policy is implemented and so are effective communication strategies, which may not increase trust in the government, but can increase trust in a given policy. Implementing a policy with a good design that is well understood by the general public may allow policymakers to increase stringency over time, possibly leading to more abatement than a scheme with less stringency but with revenues earmarked for environmental purposes. Further, in the case of carbon pricing, higher carbon prices domestically may also contribute to higher carbon prices abroad, through international climate policy coordination.

Finally, this paper examines whether the COVID-19 pandemic created a context that exempts policymakers from following those common principles. It is argued that such common principles are still valid and not following them carries the same risks as before. While it is true that at the beginning of the pandemic some economists called for using stimulus packages to redirect the economy towards a cleaner mode of production and consumption (e.g. Hepburn et al. 2020), as they did at the time of the Great Recession (e.g. Bowen et al. 2009), at the end of the day policymakers "rescuing" their economies following the COVID-19 outbreak seemed more concerned in preserving the current economic structure while addressing the urgent health crisis than to envision a better future. The European Union's Green Deal was already in the works before the pandemic started. In the United States, demand for a Green New Deal also preceded the pandemic and while the latter might have made its implementation easier, only light versions of the original policy packages could be implemented. Overall, crisis, including the COVID-19 pandemic, do not necessarily provide a better context to implement radical reforms in areas unrelated to the crisis' origin and main sector of impact

schedule. That is, the contribution of both studies to the literature seems to be to largely confirm previous priors.

(e.g. finance, health). Those reforms are more likely to succeed in good times rather than in bad times. Furthermore, as mentioned, reforms should be gradual, not radical.

The paper proceeds as follows. Section 2 covers some important lessons from developed economies' mistakes, which mostly result from not following the abovementioned common principles. It is argued that while policy successes in developed economies may not be very informative to policymakers in developing economies, mistakes can be. Section 3 covers developed economies' own mistakes. Section 4 covers the COVID-19 pandemic and whether it changed the political economy landscape. Section 5 succinctly concludes.

2. LESSONS FROM DEVELOPED ECONOMIES' MISTAKES

A common argument in policy circles is that it is hard for lessons from developed economies to travel, in the sense of being externally valid, to developing economies, given the important variation in institutional settings, among other factors. This argument generally refers to policy successes in developed economies and their applicability to developing economies. Indeed, among the more than 60 jurisdictions around the world having implemented a carbon price, and even more having implemented an environmental tax reform more in general, successful examples abound, at least as long as one does not let the perfect be the enemy of the good. Policies may also improve over time, if given the chance. For instance, the Swedish carbon tax used to be seen as a common example of a scheme with very generous exemptions and exceptions, but it is largely no more.

One may or may not agree with the argument that policy successes in developed economies carry little value for policymakers in developing economies, especially given that development can be measured along a continuum. Either way, it is much less clear that it is as hard for developing economies to learn from developed economies' mistakes. Hence, this section covers some recent policy developments in developed economies that provide some suggestions of what not to do when implementing an environmental tax reform. The rationale for this section is twofold. First, there are many more examples of environmental tax reforms, most of them successful, in developed economies, with more research covering them as well, than in developing economies. Second, as it will become clear in the next section, there are important analogies between policy failures, or just setbacks or correctible downsides, in developed economies and in developing economies.

This section focuses on four major policy developments in developed economies, putting them in context. First, the Yellow Vest movement of 2018 and 2019. Second, the rejection of two carbon tax proposals by voters in Washington state, in 2016 and 2018. Third, the implementation of a carbon tax in Canada in 2019. The latter was arguably a success, but with obvious room for improvement, which is the focus of this section. Fourth, the rejection of an energy tax at the ballots in Switzerland in 2015, with more than 90% of the votes against.

The Yellow Vest movement

In 2018 and 2019, very large demonstrations took place in France, initially motivated by rising fuel prices driven by the French carbon tax and its steep escalator. France has been defined by some commentators as an economy where strikes and street protests are rather common and an intrinsic

component of its political system (Wilson 1994). Unlike previous protests,² which also lasted for weeks and were also (albeit possibly not equally) violent, the Yellow Vest movement received more support in rural areas, thus covering a wider geographical portion of the country (and partly expanding to other countries as well). The main trigger of the protests, whose main symbol is the yellow vest that car drivers are required to wear in France in case of a road accident, was as mentioned the increase in energy prices driven by the French carbon tax. The carbon tax was first implemented in 2014, starting at the very low level of €7 per ton of CO₂. However, the carbon tax also included a very steep tax escalator, which arguably goes well beyond the idea of “gradual implementation” recommended by Carattini, Carvalho, and Fankhauser (2018).³ Indeed, the French carbon tax increased to €14.50 in 2015 and €22 in 2016. Once former President François Hollande passed the baton to current President Emmanuel Macron, two major changes occurred. First, President Macron passed legislation to abolish the “solidarity tax on wealth,” replacing it with a tax on real estate. To recoup the lost revenues, he turned to the carbon tax. Second, and related to the previous point, the already steep tax escalator became even steeper. In 2018, at the outset of the protests, the tax rate was at €44.60 per ton of CO₂ and supposed to reach €65.20 in 2020 and €86.20 in 2022.

Hence, when the Yellow Vest protests started, France had the fifth highest carbon price in the world (World Bank and Ecofys 2018), when only a few years back it had none. Currently, the tax rate is still frozen

² A labor reform by President Emmanuel Macron triggered months of protests between 2017 and 2018; months of protests also happened for instance between 2007 and 2009 because of reforms in the higher education system and in 2006, again because of labor reforms, while a three-week period of riots in 2005 led to the burning of many cars and public buildings.

³ There are, of course, some potential drawbacks of gradual implementation as well, which are dutifully reported in Carattini, Carvalho, and Fankhauser (2018) and further extended in Dominioni and Heine (2019). The main concern that Dominioni and Heine (2019) seem to have with gradual implementation is the potential for delayed mitigation that it could cause. However, whether there may be delayed mitigation depends on the counterfactual. If one compares a successfully implemented tax that starts low and increases over time with a successfully implemented tax that already starts high, then opting for the former option implies delayed mitigation, absent complementary policies. However, the literature on public support for carbon taxes generally acknowledges the fact that success is not guaranteed and may depend on the specific scheme’s design (and communication). Here, the argument is that setbacks are especially harmful for a clean transition, in particular to the extent that they may be contagious to other countries. The Yellow Vest movement received widespread media attention, as did the ballot rejections in Washington state, which are covered in what follows. While such setbacks can be rationalized, as done here, in ways that should not lead policymakers to dismiss carbon pricing, they led many commentators around the world, as also mentioned in what follows, to become even more dubitative of the political case for carbon pricing. Hence, while a counterfactual does not exist, one may make the case that the world might have been better off had France chosen a more gradual approach, especially given its regressive design, leading to higher emissions in France, but potentially lower emissions elsewhere through a faster development of carbon pricing. Eventually, emissions might have also been lower in France as well, given that its carbon tax rate is currently frozen, albeit at a high level. In general, schemes based on a gradual implementation have been able to regularly increase stringency, with the notable exception of the carbon price floor to the European Union Emissions Trading System in the United Kingdom. During the process, important abatements can still be achieved, as for instance Knittel (2019) shows for a hypothetical moderate carbon tax in the United States. Finally, Dominioni and Heine (2019) are also concerned by the possible emergence of a Green Paradox (e.g. Sinn 2008; Gerlagh 2011; Sinn 2012), but evidence in this sense is rather scant, especially for its strongest version (see Di Maria, Lange, and van der Werf 2014). If anything, one may expect agents to anticipate further policy tightening and avoid investing in assets that may later become stranded (Baldwin, Cai, and Kuralbayeva 2020). Gradualism, indeed, mechanically addresses transition risk, although macroprudential policies can also alleviate such risk so that policies may start with a higher ambition (cf. Diluiso et al. 2021 and Carattini, Heutel, and Melkadze 2021; see Annicchiarico et al. 2021 for a review).

at €44.60 per ton of CO₂, well within the range of prices provided by Stiglitz et al. (2017), as also reported in World Bank (2021).

A study published at the beginning of 2019 by Carattini, Kallbekken, and Orlov already identified the unfortunate design of the French environmental tax reform as the main driver of the Yellow Vest protests: “So the design of a carbon-pricing scheme is crucial. French President Emmanuel Macron’s fuel tax is seen as unfair. Price rises are sharp and the revenues are not given back to citizens, so the French petrol levy hits low-income and rural households hardest” (p. 290).

A recent study by Mehleb, Kallis, and Zografos (2021) confirms the initial assessment by Carattini, Kallbekken, and Orlov (2019). Using discourse analysis, the authors also conclude that members of the Yellow Vest movement are not especially opposed to climate action, or even carbon taxes, but opposed the specific design that France put forward. The authors undertook some 30 interviews during the course of 2019, at and around Yellow Vest gatherings.

Another recent study by Douenne and Fabre (2021) shows that French citizens would not support any further, abrupt increase in the carbon tax even if revenues would be redistributed as carbon dividends. Note that the scenario considered by Douenne and Fabre (2021) implies almost doubling the existing carbon tax, as they analyze public support for an increase in the order of €50 per ton of CO₂. Douenne and Fabre (2021) show that part of the opposition is driven by widespread misunderstanding of carbon dividends, confirming the importance of information asymmetries as highlighted in Carattini, Carvalho, and Fankhauser (2018). However, in general, the wariness of French citizens should not surprise given their previous experience and, as mentioned, the current carbon tax falls well within the range of prices provided by Stiglitz et al. (2017). That is, France’s already relatively high carbon price (and substantial coverage, in relative comparison, see World Bank 2021) implies that France may not represent the main front where scholars of public support should concentrate their efforts. The implementation of a uniform carbon price for the European Union, as suggested by French and German economists (Council of Economic Analysis and German Council of Economic Experts 2019), as well as of carbon tax adjustments, will likely improve the popularity of a carbon tax increase among French voters sometime in the future, assuming a reasonable policy design.

Further, while it may be tempting for scholars working on public support to over-emphasize the importance of the Yellow Vest movement to make their studies look even more policy relevant (which should actually not be needed if addressing an important question in this space), it is clear that the French example represents an extreme case for developed economies, where unfortunate communication and policy design coincided, with the government implementing a very regressive tax reform, using tax revenues from the carbon tax to fund a regressive policy change (i.e. abolishing the progressive solidarity tax), instead of using them to compensate for the carbon tax’s own regressivity (for instance by making it progressive with carbon dividends, as studied in Douenne and Fabre 2021). That is, if anything, the Yellow Vest movement reminded policymakers of the importance of following at least some basic recommendations from the literature on public support for carbon taxes, which were already largely known at that time.

Around the same time, carbon taxes suffered another important setback. Two ballot proposals to implement a carbon tax in Washington state were rejected in 2016 and 2018 at 59.3% and 56.56%. These rejections received widespread media coverage and, along the protests of the Yellow Vest movement, contributed to the impression of some commentators that carbon taxes were “politically toxic,” regardless of the important expansion that carbon pricing had been experiencing (and still is).⁴

While the rejections of these two ballot proposals certainly represented an important setback to the expansion of carbon pricing in the United States, and, as in the case of the Yellow Vest movement, the experience of Washington state provides important lessons, such setbacks should be put in context before one may be tempted to generalize.

In 2016, Initiative 732 (I-732) was on the ballot box.⁵ The carbon tax under I-732 had the following design: a tax rate starting in 2016 at USD 15 per ton of CO₂, increasing to USD 25 in 2018, and then raising by 3.5% (above inflation) until USD 100 per ton of CO₂ (in real 2016 dollars). Revenues would have been used, mostly, to reduce the state’s sales tax, from 6.5% to 5.5%. The idea was indeed to mimic British Columbia’s carbon tax, which, when introduced in 2008, used revenues to reduce distortionary taxes on income (Murray and Rivers 2015). Since Washington state does not have an income tax, the most obvious alternative for the policy brokers behind I-732, including “stand-up economist” Yoram Bauman, was to reduce the sales tax, also to address, even if only in part, potential concerns about regressivity. Also with this goal, a portion of the revenues would have been used to match the Federal Earning Income Tax Credit at 25%. Finally, another portion of the revenues would have been used to remove the state’s business and occupation tax for manufacturers (as high as 0.48%).

I-732 successfully raised the about 250,000 signatures needed to be successful in Washington state. Since the legislature declined the option to pass I-732 directly or suggest an alternative, I-732 was on the 2016 ballot. I-732 was supported by the Citizens' Climate Lobby, Audubon Washington, minor environmental groups, as well as local Democratic party chapters and the renewable industry. It was opposed by local chambers of commerce and carbon-intensive industries. Besides the usual suspects, it was surprisingly (at first) opposed by the most influential environmental groups (including the Sierra Club), the state’s Democratic party, as well as other progressive groups such as organizations defending labor and social justice interests.

I-732 was on the ballot on November 8, 2016 and rejected at 59%, with the opposition by environmentalists and progressives being crucial for the defeat (Anderson 2018).

⁴ Some examples are “Forget the carbon tax for now” in *The New York Times* (<https://www.nytimes.com/2018/12/27/opinion/carbon-tax-climate-change.html>, last accessed, June 23, 2021), “The problem with putting a price on the end of the world”, also in *The New York Times* (<https://www.nytimes.com/interactive/2019/04/09/magazine/climate-change-politics-economics.html>, last accessed, June 23, 2021), “The Trouble with Carbon Pricing” by political scientists Matto Mildenberger and Leah Stokes (<http://bostonreview.net/science-nature-politics/matto-mildenberger-leah-c-stokes-trouble-carbon-pricing>, last accessed, June 23, 2021), or “It’s Time to Abandon Carbon Pricing” by political scientist Jessica Green (<https://jacobinmag.com/2019/09/carbon-pricing-green-new-deal-fossil-fuel-environment>, last accessed, June 23, 2021).

⁵ The description of both initiatives follow from Carattini and Sen (2019).

Two main takeaways follow from the rejection of I-732. The first takeaway carries important external validity. As shown in previous research, which was already circulating at the time, it may be hard to communicate to voters that the government is actually implementing a new tax to reduce an existing one (see Carattini, Carvalho, and Fankhauser 2018 for more details). The closest example to the case of I-732 is represented by the attempt by the Green Liberal Party of Switzerland, covered in detail below, to eliminate the value added tax and replace its revenues with a tax on non-renewable energy, which was rejected at 92% in 2015.⁶ Environmental organizations would have preferred revenues to be allocated to environmental and social projects.

The second lesson carries much less external validity and should be kept in mind when commentators refer to the case of Washington state and are possibly tempted to generalize to other contexts. As reported in Anderson (2018), personal issues between members of the environmental organizations and the policy brokers behind I-732 contributed to the lack of support to I-732 from many environmentalists, who eventually opted to sink I-732 and put forward their own proposal. Hence, Bauman, who received substantial publicity from his attempt to pass a carbon tax in Washington state, has the merit of both launching the initiative as well as contributing to its defeat, by failing to build a wide alliance supporting it. In this way he might have also contributed to a general setback for carbon taxes in the United States, but to that outcome environmental organizations and several commentators (as mentioned above) arguably contributed as well.

Following the rejection of I-732, environmental organizations launched Initiative 1631 (I-1631) in March 2018. In terms of policy stringency, the design was similar to I-732. The tax rate would have started at USD 15 per ton of CO₂ in 2020 to then raise by USD 2 per year until reaching some statewide emissions goals to be defined by the legislature. The main difference with I-732 concerned the use of revenues. I-1631 was not designed to be revenue neutral and revenues would have been used for three main goals: a fund for clean air and clean energy; a fund promoting water quality and forest health, a fund for community-related investments. The carbon tax under I-1631 was labeled “fee,” consistently with state laws, but referred to as a carbon tax in the political debate. I-1631 was on the ballot on November 6, 2018. It was rejected at 57%.

Two main takeaways follow from the rejection of I-1631. The first takeaway carries important external validity and is as follows. While research on public support for carbon taxes (see again Carattini, Carvalho, and Fankhauser 2018) generally shows a preference for earmarking revenues for environmental purposes, in particular when no information is provided on the economic,

⁶ British Columbia did manage to introduce a revenue-neutral carbon tax in 2008, but not through a referendum, although the carbon tax was an important topic during the following elections. Voters of British Columbia, however, did not want to change government during a recession and the carbon tax remained despite the efforts of the “axe the tax” movement, with the carbon tax’s popularity then increasing over time (Murray and Rivers 2015). Several reasons may explain the increase in popularity. First, people experienced the policy functioning, in line with the causal evidence in Carattini, Baranzini, and Lalive (2018) for pricing garbage by the bag, the experimental evidence for an abstract Pigouvian tax in Cherry, Kallbekken, and Kroll (2014), and the anecdotal evidence from the congestion charges in Sweden in Schuitema, Steg, and Forward (2010) and Andersson and Nässén (2016). Second, the government of British Columbia invested particular efforts in making sure that citizens would have regularly been informed about how revenue increases due to the carbon tax would have been met with other tax reductions. Third, the state of the economy improved, which may act as a confounder in the non-causal setting of Murray and Rivers (2015).

environmental, and distributional effects of all design options, academic studies including options to earmark revenues for environmental purposes usually do not provide much details on how the money will be actually spent, i.e. what environmental projects will eventually be supported. The example of I-1631 shows that, in practice, it is important to have clear ideas on how to use the large amount of revenues that a carbon tax can generate to fund environmental (and social) goals. In the case of I-1631, voters might have had the impression that revenues were used to fund some environmentalists' darlings, but not necessarily to advance the state transition towards a cleaner economy. Further, allocating revenues from the carbon tax to several goals might have induced even more confusion or mistrust.

The second lesson is that it may be unwise to sink one imperfect policy proposal in the attempt to pass better (or supposedly so) legislation. The rejection of I-1631, and the fact that the United States still has not passed legislation aimed at implementing a nationwide carbon price, points to the extent of the political miscalculations by the environmentalists who did not support I-732, regardless of whether such environmentalists stand by their decision not to back Bauman's proposal.⁷ It is also important, for commentators, not to treat I-732 and I-1631 as two independent observations in their anecdotal evidence. One can suspect that the outcome of I-732 would have been different had voters known that I-1631 would have failed. Hence, the local political aspects of I-732 and I-1631 need to be considered when drawing lessons from Washington state. Further, the likelihood of two close ballots on carbon taxes is arguably rather small in other contexts. These two close ballots, in combination with the strategic mistakes realized by the proponents of I-732 and I-1631, provided a unique opportunity to the fossil fuel industry for a historical rebuke of carbon taxes, with the potential of delaying substantially the implementation of a nationwide carbon tax (again, with the contribution of several commentators). The proponents of I-1631 might have indeed been surprised by the fact that its opponents spent more than USD 32 million to ensure a defeat.

When it comes to strategic moves by environmentalists, another analogy with Switzerland applies. In June 2021, the Swiss Parliament voted in favor of a revised version of the Swiss CO₂ Act, the country's main piece of legislation on climate change for the last two decades. The new policy proposal aimed at introducing a wide range of policy instruments further contributing to tackling greenhouse gas emissions in the country, including a potential increase (from a maximum of CHF 120 to CHF 210 per ton of CO₂) in the tax rate of the current carbon tax on heating fuels, already one of the highest in the world (World Bank 2021), as well as higher costs for gas, and a new tax on airline flights.⁸

Two opposing groups raised enough signatures to have Swiss citizens voting on the revised CO₂ Act as part of a referendum. The first group was represented mostly by members of the right-wing Swiss People's Party, putting forward arguments about the costs of the reform, its effectiveness or lack thereof (also given the relative weight of Switzerland as an emitter of greenhouse gases), and its supposed regressive effects. More surprisingly, but perhaps not so much so given the experience of

⁷ For an application of the common principles discussed in Carattini, Carvalho, and Fankhauser (2018) to the United States, see Stavins (2020). For an analysis of how much could be achieved with a moderate carbon tax in the United States, see again Knittel (2019).

⁸ As of November 2021, one Swiss franc (CHF) corresponds to about 1.1 United States dollars (USD).

Washington state, the second group was represented by environmentalists, who were unhappy with the policy package's ambition, as well as its distributional effects.⁹

The revised CO₂ Act was narrowly defeated with 51.59% of the votes against, with some heterogeneity across cantons, the Swiss equivalent of provinces or states in other federalist systems such as Canada and the United States, respectively.

The Canadian federal carbon tax

In April 2019, Canada implemented a federal carbon tax, covering all provinces that had not introduced a carbon tax on their own, under the Greenhouse Gas Pollution Pricing Act. According to the World Bank (World Bank 2021), the current tax rate is USD 32 per ton of CO₂. The tax rate is expected to increase every year by about USD 12 per ton of CO₂ until reaching USD 135 per ton of CO₂ in 2030, if all goes according to plan.

Revenues from the carbon tax are collected at the province level and redistributed back to the citizens of such province as carbon dividends, except for a fraction that is used to cover the (relatively low) administrative costs of running the scheme. Hence, since 2019, the Canadian federal carbon tax represents the best real-world model of a carbon tax and dividend.¹⁰ Until then, only Switzerland, since 2008, had been using carbon dividends to redistribute the revenues of its carbon tax on heating fuels, but only for a portion of the revenues.

According to PBO (2019), the Canadian carbon tax is highly progressive, making large fractions of the lowest income deciles financially better off. Also, redistributing revenues to the province of origin first and then to citizens contributes to address, at least partly, the issue of horizontal inequality. Further, given the distribution of emissions by income deciles in Canadian society, the Canadian carbon tax makes about 70% of the population financially better off. Hence, assuming full information about the carbon tax, the median voter should have a positive willingness to pay not to tackle climate change (at least via a carbon tax) to oppose it.

As Switzerland did, Canada had to figure out a way to redistribute revenues back to the population. Switzerland opted for an administratively very simple solution. Since all Swiss citizens have to sign up for a private health insurance, the redistribution occurs through the monthly health insurance bills, as a “discount” on the bill. Hence, the Swiss government needs to deal with only a limited number of insurance companies, rather than millions of households. However, since this redistribution is not

⁹ See the following sources (available also in German and Italian):

https://www.admin.ch/dam/gov/fr/Dokumentation/Abstimmungen/JUNI2021/Abstimmungsbroschuere_13-06-2021_fr_UA.pdf.download.pdf/Abstimmungsbroschuere_13-06-2021_fr_UA.pdf (last accessed, June 23, 2021); <https://loico2-ratee.ch> (last accessed, June 23, 2021); and <https://www.ecologie-sociale.ch/fr/> (last accessed, June 23, 2021).

¹⁰ Note that, besides the issue of transparency mentioned in this section, carbon dividends in Canada are not backdated, which may however be necessary in other contexts wherein households are especially budget constrained, likely much more so than their government (see Marron and Maag 2018; Dominioni and Heine 2019 for a discussion). Such adjustments may further increase the relative popularity of carbon dividends, although obviously they may not make carbon dividends a panacea for opposition to carbon taxes, as, according to Mildenerger et al. (2022a), other scholars have claimed, referring in particular to the concurrent studies by Carattini, Carvalho, and Fankhauser (2018) and Klenert et al. (2018).

especially salient, with monthly dividends being relatively small and their origin being explained in fine print, in a survey administered in a Swiss canton only 40% of respondents are found to know about the existence of the carbon tax (Baranzini and Carattini 2017) while in a nationwide survey only about 25% of respondents are found to know about the redistribution mode (INFRAS 2015), a finding further confirmed in Mildenerger et al. (2022b).¹¹ In the approach to the abovementioned June 2021 referendum on the revised Swiss CO₂ Act, the Swiss government attempted to explain to citizens how much they could expect to receive as refund and how they would have received it, but did not try to make the system more salient.

Canada opted for a relatively more salient solution. Canadians are expected to file for taxes once a year. When they did so in 2019, they would have started with a credit against any taxes that they should pay, which is the carbon dividend. Importantly, one should not assume that the carbon dividend is in any way related to income or represents an income tax rebate only because it is redistributed through the tax system. As per its definition, the carbon dividend is the same for all Canadian residents in the same province among provinces subject to the carbon tax and the tax system only allows its redistribution in an administratively simple way.

In October 2019, only a few months after the implementation of the carbon tax and the distribution of the first carbon dividend, Justin Trudeau was reelected as Canadian Prime Minister. While his coalition might have suffered an important loss in terms of seats and popular vote, one should note that the Green Party received a record-high level of votes.

While the carbon tax was heavily criticized by the Conservative Party of Canada and provinces led by their premiers tried, unsuccessfully, to challenge its constitutionality in front of the Canadian Supreme Court, recent research shows that the carbon tax enjoyed moderate support even before its implementation. Further, support for the federal carbon tax generally increased after its implementation, with only an (expected) dip in public support at the very beginning of the COVID-19 outbreak. This evidence comes from a study by Mildenerger et al. (2022b), who follow a panel of Canadian citizens, with a number of “new entries” to which to compare the multiple responses from the panel, from February 2019 to April 2020. Hence, the authors include both a period before the implementation of the carbon tax (but already after its announcement) and several periods after, including before and after the first dividend was redistributed in the spring of 2019 and before and after the 2019 elections.

While in the absence of a (already treated) control group the authors do not claim causality on their findings, the descriptive statistics that they provide, similarly to those in Murray and Rivers (2015), are rather encouraging, with support before the implementation of the carbon tax already just below 50% in Ontario (see Figure 1 in Mildenerger et al. 2022b), which, under a premier from the Conservative Party of Canada, had previously left a cap-and-trade scheme that it shared with Québec and the American state of California. This example may also suggest that policy reversals, when they happen, as in this case or in the case of Australia’s carbon tax (see Spash and Lo 2012), may not be driven by a drop in public support or a permanent state of very low public support, but rather by different administrations giving different weights to a jurisdiction’s various constituencies.

¹¹ For context, participation in the 2000 ballot on carbon taxes analyzed in Thalmann (2004) was at 43%, in the 2015 ballot analyzed in Carattini et al. (2017) at 42%, while in the 2021 at 59.7%.

In Mildenberger et al. (2022b), in all surveyed provinces except for Québec, public support was higher at the end of 2019, the last measurement before the onset of the COVID-19 pandemic, than it was at the beginning of the year, when the first wave was realized, in February 2019. Public support was generally higher in both provinces that were subject to the federal carbon tax and provinces that were subject to their own carbon tax schemes. While public support is substantially lower in provinces rich in fossil fuels such as Saskatchewan, fluctuating between 25% and 40%, the increase in public support during 2019 only, which the authors check is not just the artifact of experimenter effects, is in the order of 10%, implying one citizen over 10 changing her mind on the policy in a rather short amount of time.

However, the study by Mildenberger et al. (2022b) also documents considerable room for improvement, highlighting important lessons that may be relevant for other contexts as well. While the Canadian redistribution system is already much more transparent than its Swiss counterpart, substantial misperceptions may still affect its reception by part of the general public, with lessons in terms of need for more transparency and better communication.

In particular, Mildenberger et al. (2022b) test whether Canadian citizens are well informed about the carbon tax, in particular concerning the refund to which they are entitled (i.e. the size of the carbon dividend). Interviewed after the distribution of the first dividend, a substantial fraction of the population was not aware that they had received one, in particular among supporters of the Conservative Party of Canada. Mildenberger et al. (2022b) also test whether citizens can correctly estimate the carbon dividend that they should receive, but, unlike Douenne and Fabre (2021), do not analyze whether citizens can correctly predict the change in expenses, so to identify net gains or losses. The results by Mildenberger et al. (2022b) and Douenne and Fabre (2021) are, however, rather consistent, as Mildenberger et al. (2022b) find that citizens in the provinces subject to the federal carbon tax tend to underestimate, even by very substantial amounts, the amount of the carbon dividend. Mildenberger et al. (2022b) also find that political positioning may moderate to some extent the effectiveness of information provision, but not to the point of challenging its usefulness, as it was famously suggested in the case of climate science by Kahan et al. (2011). In this respect, their findings seem rather consistent with recent literature tackling other polarizing issues, where people do revise their beliefs when exposed to new information (e.g. Gerber, Karlan, and Bergan 2009; Pennycook et al. 2020; Levy 2021; Pennycook et al. 2021).

The Green Liberal Party of Switzerland's 2015 initiative

As analyzed in Carattini et al. (2017), in 2015, Swiss voters were asked to vote on a popular initiative aimed at replacing the value added tax with an energy tax on non-renewable sources of energy (i.e. a quasi carbon tax). The initiative was led by the Green Liberal Party of Switzerland. The stated goal was to promote renewable sources of energy and decrease Switzerland's dependence on imports of fossil fuels with a revenue neutral reform, which would have also reduced costs for firms related with the administratively burdensome value added tax. In 2015, and it is still the case today, Switzerland only had a carbon tax covering heating fuels, avoiding the more politically sensitive taxation of motor fuels. As analyzed in Thalmann (2004), Switzerland voted in 2000 on three carbon tax designs. All designs were rejected. One of them was rejected only with a 3.4% margin. Hence, when the Swiss

government introduced a carbon tax in 2008, it did only on heating fuels, avoiding the risk of a referendum, for instance led by the powerful mobility clubs.

A rejection with a 3.4% margin in 2000 could have also been seen as a cause for optimism. With the proper design, a carbon tax could be successful in a popular vote, one might have thought. The Green Liberal Party of Switzerland thought that they had identified such proper design. However, ahead of the vote only the Green Party of Switzerland supported the proposal. All other parties opposed it and so did the Swiss government. The main issue with the initiative's design was that, while the tax base of the value added tax tends to be constant over time, the tax base of a Pigouvian tax is expected to decrease over time, as agents change behavior. Hence, ensuring revenue neutrality would have meant increasing the tax rate substantially over time. The government expressed particular concern about this aspect, including potential implications in terms of competitiveness and distributional effects. A potential trebling of gas prices received widespread attention during the debate. The initiative was eventually rejected with 92% of the votes against.

Carattini et al. (2017) analyze in detail the drivers of such rejection using a survey of voters that is regularly administered in Switzerland after a vote (as also used by Thalmann 2004). Carattini et al. (2017) also find that, had citizens had the chance to determine how tax revenues should have been spent, only 13% would have chosen to reduce existing taxes.

Carattini et al. (2017) also use data from another survey, designed by the authors and also administered shortly after the vote. With it, they analyze public support for alternative carbon tax designs. Respondents in this survey, a discrete choice experiment combining various tax rates and uses of revenues, were previously informed about the effects of each design that they were asked to evaluate, on measures such as CO₂ emission reductions, changes in gas prices, changes in purchasing power for the average citizen, and changes in purchasing power for low-income households. These effects had been estimated with a computable general equilibrium model for the Swiss economy.

Carattini et al. (2017) find that a proposal with the same use of revenues as the one put forward by the Green Liberal Party of Switzerland, namely using revenues to reduce the value added tax, but with a lower tax rate, would have received more support than what observed in the ballot. In general, for any use of revenues, lower carbon tax rates tend to receive more support in the study, a finding consistent with the rest of the literature, as documented in Carattini, Carvalho, and Fankhauser (2018). The Green Liberal Party of Switzerland's initiative could have implied an extremely high carbon tax rate, possibly in the order of USD 300 per ton of CO₂. A carbon tax rate in the order of USD 100 per ton of CO₂, still relatively high, might have received 25% higher support. Hence, starting with a lower tax rate could have led to substantially more public support, even if possibly not enough to pass the majority threshold. Yet, for a given tax rate, the highest public support would have been achieved with a progressive redistribution mode, including through carbon dividends. Recall that respondents in the discrete choice experiment were informed about the economic, environmental, and distributional effects of the carbon tax designs that they were asked to evaluate. As mentioned, absent any information provision, the general public may underestimate benefits such as emission reductions and overestimate drawbacks of carbon taxes such as economic costs. Not providing information on distributional effects may lead the general public to consider a carbon tax with revenues redistributed through carbon dividends as regressive rather than progressive, as later shown in Douenne and Fabre (2021).

3. LESSONS FROM DEVELOPING ECONOMIES' MISTAKES

Of course, developing economies can also learn from other developing economies, and even more so when it comes to mistakes. In particular, it may be tempting, especially in presence of tight budgetary constraints, to engage in an environmental tax reform to compensate for falling revenues or excessive expenses in other domains. The economic rationale is solid. Instead of increasing taxes on labor or capital – taxing goods – one would tax pollution – taxing “bads,” which is the budget-constrained analogy to an environmental tax reform reducing taxes on labor and capital and increasing them on pollution, which under some circumstances can potentially lead to a “double dividend,” i.e. lower pollution and more economic growth, as discussed for instance in Goulder (1995) and as shown in a recent empirical analysis for British Columbia’s carbon tax (see Yamazaki 2017).

An applied microeconomist would argue that an increase in pollution taxes instead of an increase in labor or capital taxes may also provide a “double dividend,” against the counterfactual.¹² That is, an increase in pollution taxes may lead to smaller losses in gross domestic product than it would otherwise be the case if the same revenues were to be raised through taxes on goods such as labor or capital. Importantly, the assumption here is that countries engaged in this type of budget-constrained environmental tax reform do not have the possibility to issue additional debt at reasonable rates, so that the main counterfactual is raising revenues in ways other than through taxes on pollution (or cutting expenses in potentially sensible domains such as education or health).

However, the political economy is likely to be very different when the reform is revenue neutral, the standard case, and when the reform has instead the goal of raising new revenues to fill budgetary gaps, when issuing additional debt is no longer a viable option.

It should be noted that developing economies could very well implement an environmental tax reform that is entirely revenue neutral. However, the analysis in the current section is motivated by the need for many developing economies to rebalance their public finances following the COVID-19 pandemic, which is not yet over at the time of writing.

Unfortunately, there is much less research on public support for environmental tax reforms in developing economies than there is for environmental tax reforms in developed economies. Hopefully, future research will contribute to fill this gap. For the time being, following the available literature, this section focuses on two reforms where attempts were made to reduce fossil fuel subsidies, in Ecuador and Nigeria, and two reforms aimed at introducing substantially higher fuel taxes, in India and Iran. All these reforms were implemented in times of crisis and received substantial pushback. Hence, this section infers from a sample of prominent policy failures in developing economies. One should, however, not discount all the recent successes, no matter how marginal, achieved in developing economies with the list of countries pricing carbon growing substantially, to currently include Argentina, Chile, Colombia, Mexico, and South Africa, among other planned and ongoing schemes. While carbon prices in emerging economies tend to be relatively low, marginal abatement costs are also much lower than in developed economies. Further, once a carbon pricing scheme in place, it is much easier to ramp it up, gradually, and reach levels compatible with ambitious international

¹² In this respect, it is plausible to assume that the importance of informal markets may also influence the extent of the double dividend. This observation may be especially relevant for developing economies.

coordination, for instance as recently suggested by the International Monetary Fund (Parry, Black, and Roaf 2021). Finally, the protests that followed in Chile an increase in the cost of public transportation (see Díaz Pabón and Palacio Ludeña 2021) suggest that, as in the case of the Yellow Vest movement, also in the case of developing economies protests are not driven by an opposition to climate action, but rather by the immediate effects on people's purchasing power.

Similar lessons also appear in Atansah et al. (2017), to which this paper refers in the case of Iran and Nigeria. Atansah et al. (2017) highlight four major lessons from the experiences of developed economies, which align very well with the lessons, driven from the experiences of developed economies, in Carattini, Carvalho, and Fankhauser (2018). First, communicating effectively about the reform. Second, implementing the reform gradually. Third, providing cash payments to compensate for the adverse effects that such reforms may generate. Fourth, implementing such reforms in expansionary periods. In general, all around the world climate policies are much more likely to be implemented during expansions (Fankhauser, Gennaioli, and Collins 2016).

The main take-away from this section is very similar to that of the previous section, as both sections invite policymakers to try to put some thought in how they design and communicate their environmental tax reforms, which should in general be implemented gradually while allowing people to adjust behavior.¹³ From an environmental perspective, the intuition is, as mentioned, that a gradually implemented environmental tax reform can achieve more than one that suffers setbacks and policy reversals, given also how policy setbacks in one jurisdiction can also lead other jurisdictions to postpone action, often because of over-reaction, as in the case of the Yellow Vest movement.

In short, this section offers a cautionary tale, which, however, focuses on grossly flawed reforms and should not concern the implementation of well-designed tax reforms. For the latter, the recommendation remains to proceed, of course always with caution, communicating in the best possible way the merits of the scheme with the general public, as described in Carattini, Carvalho, and Fankhauser (2018).

Ecuador

In 2019, the government of Ecuador decided to tackle large public debt and unsustainable deficits with austerity measures. Austerity measures have caused protests in many countries even in recent history, regardless of any link with environmental tax reforms, such as in Greece or Spain (see for instance Rüdiger and Karyotis 2014). Hence, it is not clear what the counterfactual to the Ecuadorian case would have been, had other austerity measures been implemented compared to the ones examined in this section.

However, the policy design in Ecuador is interesting per se. What the government of Ecuador did, as part of its austerity package, was reducing fossil fuel subsidies, in essence negative taxes on fossil fuels. The economic argument for phasing out fossil fuel subsidies is generally very strong (e.g. Coady et al.

¹³ Of course, one should expect some resistance also in presence of gradual reforms, as when implementing carbon taxes, because of the power of private interests, as described in Victor (2009), and more broadly in Inchauste and Victor (2017), and because even with effective communication strategies some citizens may fail to understand the poor economics of subsidies, in the same way that they may underestimate the relative benefits of carbon taxes, and may end up demanding bad policy, as shown in Dal Bó, Dal Bó, and Eyster (2018).

2017), as a pre-condition to then phasing in positive fuel taxes, although in some cases one may need to proceed simultaneously with phasing out subsidies and introducing taxes to avoid that dirtier inputs such as coal replace previously subsidized oil and natural gas (Jewell et al. 2018).

That being said, the Ecuadorian implementation is very questionable, despite the good intentions. The government reform led to the doubling of diesel prices and a 30% increase in gas prices. These are huge increases that can pose serious financial issues to many, if not most families. The measures introduced by the government could hardly fare well with the general public, as they largely go against the main common principles in Carattini, Carvalho, and Fankhauser (2018). Protests ensued.

The government tried to partly address the potential adverse effects of their reform by providing cash payments in the order of about USD 15 per month to some 300,000 families. While the counterfactual is unknown, i.e. to what extent public support might have been even lower and protests even more massive absent such cash payments, there can be several reasons why the cash payments did not suffice to placate the general public's concerns.

First of all, the extent of cash payments, which was relatively limited. Second, the role of horizontal inequality. While low-income households tend to spend a smaller amount, in absolute terms, on energy goods than more affluent households, there may still be substantial variation among low- and middle-income households in terms of energy expenditures. Third, cash payments targeted to some groups might have raised questions of fairness (see also Díaz Pabón and Palacio Ludeña 2021), especially given that cash payments to every household (i.e. carbon dividends from fossil fuel subsidy phase-out) would have also led in all likelihood to a progressive reform.¹⁴ Of course, the issue is that the reform was implemented as an austerity measure, so the government could not afford to use all the funds saved from fossil fuel subsidies to provide cash payments to the population. Hence, it faced a choice, in terms of whom to compensate and by how much. The government's choice concerning cash payments does not appear unreasonable, but the huge price hikes less so.

Finally, the involvement of the International Monetary Fund in the demand for and in the design of austerity measures likely did not contribute to making the reform any more acceptable.

Eventually the government of Ecuador was forced to backtrack and reconsider these austerity measures.

Nigeria

In 2012, Nigeria also implemented an important reform of its fossil fuel subsidies, leading to an almost overnight increase in gas prices, which doubled both in the formal and informal markets. Again, as in the case of Ecuador, such a large change in gas prices led to massive protests, resulting in the "Occupy Nigeria" movement.

As reported in Atansah et al. (2017), the reform was motivated by the increase in international oil prices, which made fossil fuel subsidies more expensive, given a fixed, regulated price paid by Nigerian consumers, and the economy's reliance on imports of gasoline despite being an oil producer.

¹⁴ For an analysis of the distributional effects of fossil fuel subsidies, see Coady, Flamini, and Sears (2015).

As in the case of Ecuador, some efforts, visibly insufficient, were introduced to facilitate the transition, for instance with funding for public transportation. While over the medium run investments in public transportation may provide households with an alternative to private transportation, such investments do little in the immediate term to address households' financial issues due to rising fuel prices.

Again as in the case of Ecuador, the change in fossil fuel subsidies was eventually reconsidered. Hence, fossil fuel subsidies largely remained, despite their inefficiency, high fiscal cost, regressivity, and the pervasive corruption documented by Atansah et al. (2017).

India

Starting from 2018, with highs (including in 2021) and lows in the extent of the general public' mobilization, the Indian government has often faced street protests due to higher fuel taxes, which have been used to fund welfare programs. Under previous administrations, Indian citizens were often used to see fuel taxes being adjusted depending on international oil prices and currency changes, a reasonable approach to maintain predictable fuel prices, including with the goal of reaching pre-established climate goals, but at the expense of predictable tax revenues. With the current administration prioritizing the latter, people's purchasing power has become more volatile, which is the main reason behind the protests.

While it is hard to infer from protests, even when large, on the popularity or unpopularity of a given measure, as in politics well-organized minorities can often punch well above their weight (as already described in Olson 1965), the protests observed in India over fuel prices need to be taken into account as a potential factor when implementing ambitious carbon taxes in India. Carattini, Kallbekken, and Orlov (2019) find large support in favor of a global carbon tax among Indian citizens for various recycling options, although none of the options considered in the study would favor only a specific group of the population as it may be the case with welfare programs. The global carbon tax rate considered in Carattini, Kallbekken, and Orlov (2019) range between USD 40 and USD 80 per ton of CO₂ (following Stiglitz et al. 2017), thus above the USD 25 per ton of CO₂ suggested by the International Monetary fund for lower-income emerging economies such as India (as discussed in reference to Parry, Black, and Roaf 2021).

Iran

In Iran, gas prices are regulated and the price paid at the pump depends on cumulative consumption during the same month. Hence, Iran in a way provides an example of how thresholds could be used for carbon taxes, as advocated for instance by Pezzey and Jotzo (2013).

In 2019 and 2020, large protests took place in Iran, including the so-called "bloody November" of 2019, when gas prices increased in the order of 50% to 200%, during a period of already high inflation and brewing resentment.

In particular, the reform implied that Iranian citizens would no longer enjoy a price per liter of gas of USD 0.80 for the first 250 liters, but had now to pay USD 1.35 for the first 60 liters, and USD 2.70 thereafter, hence the increase in the order of 50% to 200%.

The reform in principle aimed at funding transfers to the population, but might have been perceived differently by the general public in an economy where many people mistrust the government in the public management of resources.

However, Iran had previously been relatively successful at reforming fossil fuel subsidy schemes. As reported in Atansah et al. (2017), starting from 2010 Iran partly reformed its fossil fuel subsidy scheme through the Targeted Subsidies Reform Act. The reform had been years in the making and was implemented when macroeconomic conditions seemed favorable, in a very gradual and prudent way and with generous, backdated cash transfers as compensatory measures to the population (while other compensatory measures addressed the private sector). Backdating of cash transfers was implemented as follows. Cash payments were distributed to citizens on frozen bank accounts before the reform was implemented, and were then unfrozen once the reform passed (Guillaume, Zytek, and Reza Farzin 2011). In this way, policymakers addressed directly the fact that Iranian citizens might have mistrusted the government in its promise to provide cash payments in conjunction with the reform.

The first phase of the reform was implemented without major accidents. When the economic landscape became less favorable to such reform, plans to further phase out subsidies were reconsidered. Yet, the changes implemented under the first phase of the reform could be maintained. The second phase was eventually implemented in 2014 after a change in government and with inflation decreasing the planned generosity of cash payments.

4. THE COVID-19 PANDEMIC

The COVID-19 outbreak has, arguably, changed the political economy of carbon taxes along several dimensions, seven of which are outlined in what follows. None of them, however, is likely to have made the common principles around which this paper is organized out of date.

First, recessionary forces have reminded to the general public the importance of economic development and stability, so that the cost, true or perceived, of any climate policy package will likely weigh more heavily in people's considerations. In the Swiss media it has been debated, for instance, whether the same ballot proposal on the new CO₂ Law would have been successful had it been on the ballot box before the COVID-19 pandemic. While that is just speculation, it reflects the general observation that the COVID-19 crisis has heightened the focus on private costs and possible threats to the economy. In general, in periods of recession climate change tends to receive less importance in the public opinion (Kahn and Kotchen 2011). The case of the COVID-19 crisis seems, however, to differ somehow from the Great Recession, which is the focus of Kahn and Kotchen (2011), since attention to climate change has recovered relatively fast, as it is the case for the United States, or has remained relatively flat, as shown by Evensen et al. (2021) for the United Kingdom (comparing April 2019 and June 2020). Still, it may be possible that while concern about climate change has not drastically changed, sensitivity to the cost of climate policy has. Further, there is no counterfactual to which to compare, i.e. it may be that attention to climate change would have been much higher at this point had the COVID-19 crisis not occurred.

Second, people's perceptions and preferences for a clean environment might have changed by experiencing (or re-experiencing) improved air quality during the periods of lockdown, as suggested by the analysis of clean air as an experience good (e.g. Kahn, Sun, and Zheng 2020). Several studies document improved air quality in urban areas (e.g. Berman and Ebisu 2020; Brodeur, Cook, and Wright 2021; Zhang, Li, and Khanna 2021), even in the United States where the government relaxed environmental regulations during the pandemic, leading to overall worse air quality (Persico and Johnson 2020). Further, research linking air pollution with COVID-19 outcomes, in terms of correlations first (Wu et al. 2020) and causality then (Austin et al. 2020; Isphording and Pestel 2020; Persico and Johnson 2020), should have increased people's valuation of air quality, potentially increasing the effectiveness of communication strategies leveraging the important co-benefits of carbon taxes (e.g. Parry, Veung, and Heine 2015).¹⁵ Such communication strategies could also leverage the memories of many urban households of newly found blue skies, which could convey very well the benefits of living in a low-carbon society, before they fade away (in this respect, it is too early to assess whether there is any long-term effect of clean air as an experience good).

Third, the COVID-19 outbreak and related periods of economic turmoil might have increased the appetite for public intervention, as suggested for instance by polling data concerning support for interventions by the new administration in the United States to relaunch the economy with important spending plans.¹⁶ In general, the pandemic might have increased people's interest in tackling society's problems (Cappelen et al. 2021).¹⁷ In a much more consistent way than with the Great Recession, in the aftermath of the COVID-19 recession the need for recovery packages has been tied to the need for decarbonization (Hepburn et al. 2020; IMF 2020), even if these suggestions often remained unfulfilled. While in good times economists might have preferred "first-best" instruments such as carbon taxes rather than green spending policies (or industrial policy more in general), in bad times the idea of combining carbon taxation with spending policies may be more appealing.¹⁸ That is, conditional on the need for recovery packages, the rationale for a Green New Deal-like type of intervention becomes much stronger (Barbier 2010; 2019). Two main implications for the political economy of carbon taxes follow from the adoption of Green New Deals. First, carbon taxes may be implemented as part of a broader package, which may affect their political feasibility. However, as mentioned in the introductory paragraphs there is not much evidence of radical Green New Deals being implemented during the COVID-19 pandemic, let alone Green New Deals combined with carbon taxes. Second, Green New Deals may make low-carbon behaviors cheaper for citizens and firms, thus affecting the perceived cost of carbon taxes (as argued in Wagner et al. 2015). Such channel, however, would only facilitate the implementation of carbon taxes over the medium run.

¹⁵ However, it should be noted that policymakers around the world have not really embraced policies aimed at relaxing the trade-off between economic activity and public health by reducing air pollution or people's exposure to it, as advocated for instance by Austin et al. (2020), nor have, arguably, invested much effort in communicating to the general public about the links between local air pollution and COVID-19, or SARS (e.g. Cui et al. 2003), or influenza outcomes (Graff Zivin et al. 2020).

¹⁶ Several polls regularly measured the popularity of the American President around the time of such proposals and are aggregated by platforms such as FiveThirtyEight.com (last accessed, June 24, 2021).

¹⁷ Howarth et al. (2020), and in a similar way Klenert et al. (2020), call for a new social mandate ensuring that the (artificially) low-carbon economy observed during the initial months of the COVID-19 pandemic can last in the long run, and in which science plays a central role.

¹⁸ How to adjust carbon taxation to bad times, including in combination with green spending, is a separate area of research where many questions still remain unanswered, see Annicchiarico et al. (2021) for a research agenda.

As stressed in particular by the current government of the United States in promoting the Infrastructure Investment and Jobs Act, transitioning the economy towards cleaner modes of consumption and production also implies adapting the local infrastructure, which is generally considered a publicly provided public good. Spending on infrastructure may have an important payoff. For instance, research shows that it may be more cost-effective to subsidize charging stations than electric cars and address the network externality (“chicken-egg” problem) of electric cars (Li et al. 2017; Springel 2021). While some countries did consider plans to “spend big,” other countries, in particular when the macroeconomic rationale for large recovery plans was weaker, still invested resources to address pre-existing issues in their schemes supporting a green transition. For instance, Switzerland recently announced that it would address one of the long-lasting issues with its subsidy scheme for solar adoption, which imposed long waiting times to households and firms eligible for a subsidy before they could actually receive the money.¹⁹ As shown in Petrovich, Carattini, and Wüstenhagen (2021), the combination of time discounting and policy risk related to such waiting times could act as an important deterrent to residential investment in solar panels, thus decreasing the cost-effectiveness of the subsidy scheme. As a result, it did not make much sense for the Swiss government, which can borrow at very low interest rates, to on the one hand subsidize the adoption of solar energy, but on the other hand subject households to long waiting times until they could actually receive such subsidies. Hence the rationale for the reform, which, albeit small, brought liquidity to households, thus contributing to the economic recovery.

Overall, all these policies aimed at facilitating the transition to greener behaviors can directly affect the political economy of carbon taxation along the lines suggested by Wagner et al. (2015), whose main argument is that “policymakers are more likely to price carbon appropriately if it is cheaper to move onto a low-carbon path” (p. 27).

Fourth, the COVID-19 pandemic increased the number of citizens that have experimented with lump-sum transfers to the population. Prior to the pandemic the list already included several economies or regions, such as Iran, Macau, the American state of Alaska with its permanent fund, parts of India with pilot programs for basic income, several Latin American countries with their conditional cash transfers, or Chile when a toilet paper company had to compensate all adult citizens with cash payments in the context of an anti-trust case. However, the pandemic brought the important addition of the United States as a whole.²⁰ While until a few years ago there were questions in the policy arena (see Marron and Maag 2018) about how the federal administration could in practice implement a carbon tax and dividend as suggested by the Citizens’ Climate Lobby under HR 763, the CARES Act of 2020 (Coronavirus Aid, Relief, and Economic Security Act) and its 2021 counterpart have shown how relatively easy it is for the United States government to provide checks to citizens and residents, providing the infrastructure for future payments as well. While part of the population might not have been reached by the checks, because of ineligibility or because their existence or coordinates might not have known by the authorities, official statistics point to about 160 million

¹⁹ <https://www.admin.ch/gov/de/start/dokumentation/medienmitteilungen.msg-id-83470.html> (last accessed, June 24, 2021).

²⁰ Another potential important addition is represented by Japan, which on November 19, 2021 announced plans to distribute cash payments to its population as well. The plan is to distribute the equivalent of USD 878 in cash payments to families for each child, as reported by international press agencies. For instance: https://www.upi.com/Top_News/World-News/2021/11/19/japan-Japan-stimulus/7291637351289/ (last accessed, November 19, 2021).

households having received a check in the United States in 2020.²¹ Further, the payments took place in a very salient way, with all payments, including those taking place electronically, being accompanied with a letter personally signed by the President, both in 2020 and 2021. Such very salient implementation, whose cost is now known to the federal administration, addresses some of the main concerns related to the Swiss and Canadian experiences. Relatedly, one may also hypothesize that the COVID-19 pandemic might have also influenced the general public's preference for progressive policies, since it has made very salient the influence of factors outside one's control in determining whether one is employed or jobless. However, research in this area so far does not lend much support to this hypothesis (Balasundharam and Dabla-Norris 2021; Cappelen et al. 2021).

Fifth, the COVID-19 pandemic, related recession, and muted demand for carbon-intensive traveling (see Gillingham et al. 2020 for an initial assessment) also affected, for some time until prices strongly rebounded, the resources available to the fossil fuel industry to lobby against climate policy. While it is too early to say whether the COVID-19 pandemic has had any impact on the industry's political influence, its vulnerability made especially salient its exposure to changes in consumption habits, leading investors, concerned about asset stranding, to reiterate their calls for a diversification of revenue sources. The investment management company Black Rock, which has been vocal about physical (Black Rock 2019) as well as transition risks (Black Rock 2021) related to climate change, for instance recently supported the activist investor group Engine No. 1 in its attempt, eventually successful, to secure three seats on the board of oil company Exxon, with the aim of leading the company to transition away from fossil fuels.

Sixth, budgetary restrictions and increasing debt are forcing many economies, also encouraged by multilateral agencies, to reduce their support to the fossil fuel industry, in particular in terms of subsidies. The fifth factor, the possibly reduced ability of the fossil fuel lobbies to exert their influence over policymaking, may also be contributing to such development. At the same time, budgetary restrictions and increasing debt are increasing the appeal of carbon taxes as new sources of revenues, especially in developing countries where an important informal economy exists limiting the ability of taxing income and wealth and where carbon taxes would still likely be progressive even if revenues were not to be redistributed back to the population (Sterner 2011).

However, as highlighted in the previous section, it is paramount that such reforms, even when driven by immediate budgetary constraints, are implemented gradually. Developed economies and coalitions such as the Friends of Fossil Fuel Subsidy Reform, which operate under the leadership of New Zealand (Skovgaard and van Asselt 2019), could play an important role in this respect. Essentially, they could provide the necessary funds to provide cash transfers to citizens, at least for a period, to contribute to remove fossil fuel subsidies in a smooth way. Such funds could be provided conditional on the fossil fuel subsidies being actually phased out. While such approach may sound utopian at first, it would build on the example of the European Union, the United Kingdom, and the United States funding South Africa's coal phaseout, as announced at the 26th session of the Conference of the Parties.

For the time being, several developing countries have already moved forward and implemented fossil fuel subsidy reforms during the COVID-19 pandemic, consistently with previous pandemics, which also

²¹ <https://home.treasury.gov/news/press-releases/sm1025> (last accessed, June 24, 2021).

seem to have increased the likelihood of tax reforms, although mostly in the realm of corporate, excise, and property taxation (Gupta and Jalles 2021). These include Cuba, Nigeria, Sudan, Tunisia, and Venezuela. That is, the list includes economies that in the past, as previously described, faced important resistance to such reforms.

However, it should be noted that such reforms were implemented in a period of very low energy prices, driven by the combination of the COVID-19 recession and a muted demand for travel. Low energy prices made even radical reforms look gradual, given the limited impact on people's purchasing power of fossil fuel subsidy phase-out when energy prices are (somehow artificially) low. Already in February 2021, commentators were wondering whether these reforms would resist the test of higher energy prices (Bassetti and Landau 2021), which we currently observe along with other inflationary pressures. After all, the Yellow Vest protests did not emerge when the French carbon tax was first implemented, but several years later, following several steep hikes in the tax rates, without any form of compensation (except for the wealthy affected by the "solidarity tax on wealth").

While, as mentioned, there are many reasons why the post-COVID world may look different, it would be wise for the international community to anticipate potential protests or temptations by political leaders to reverse course, while providing an incentive for all other economies still subsidizing fossil fuels to also proceed with their phase-out. While trade may be increasingly used to align incentives, with carbon border tax adjustments potentially accounting for negative carbon taxes as well as fossil fuel subsidies potentially being considered as cause for trade distortions (Skovgaard and van Asselt 2019), a superior solution may be to address the main rationale for fossil fuel subsidies, which is the inability of many world citizens to afford energy. While the international carbon dividends advocated by Carattini, Kallbekken, and Orlov (2019) may still look a bit utopic, one could argue that so was a global carbon price, until a few years ago. Increasing research is now devoted to global carbon pricing, which would allow leveling the playing field while potentially facilitating international climate negotiations (Weitzman 2014; Nordhaus 2015; D'Autume, Schubert, and Withagen 2016; Cramton et al. 2017), and policymakers, international organizations, and multilateral agencies are increasingly calling for it, especially following the very recent success with a minimum "global" corporate tax rate, a good example of how ex-ante potentially utopic academic concepts (see Piketty 2014) can become actual policy. Carattini, Kallbekken, and Orlov (2019) find that international carbon dividends with a global carbon tax in the order of USD 40 per ton of CO₂ would be around USD 189 per capita per year, while with a global carbon tax in the order of USD 80 per ton of CO₂ would be around USD 325 per capita per year. Hence, one can immediately conceive how international carbon dividends could not only reduce within- and between- country inequalities, but also reduce poverty. Impacts on inequalities and poverty are analyzed more explicitly in Budolfson et al. (2021). For instance, the authors state that "progressive revenue recycling reduces poverty in India from 3.2% to 1.3% of the population, or by nearly 30 million people when multiplied by India's projected 2030 population." Dominiononi and Heine (2019) discuss how the technological capacity exists in many developing countries to provide cash payments to the population, in the context of environmental tax reforms, in particular through mobile payments. A related stream of research analyzes the largely beneficial effects of unconditional cash payments on household outcomes over the short and medium run (e.g. Baird, McIntosh, and Özler 2011; Akee et al. 2013; Aizer et al. 2016).

In the meantime, as mentioned, developed economies, with the support of multilateral agencies and coalitions of countries, can still try to fill the gap and provide citizens with cash payments, or a close equivalent,

ensuring an equal treatment among countries with similar levels of development, with the goal of having no country still subsidizing fossil fuels, first, and all countries pricing carbon at some minimum level, then.

5. CONCLUSIONS

This paper discusses political economy challenges to the implementation of environmental tax reforms in developing economies. It identifies important analogies between policy setbacks in developed and developing countries, which remind of the necessity to follow a set of common principles, as identified in the literature, when implementing such environmental tax reforms. The paper also identifies several political economy dimensions that might have been affected by the COVID-19 pandemic and that researchers and policymakers alike need to monitor. However, there is no indication so far that implementing environmental tax reforms during a pandemic does not need to follow the abovementioned common principles.

Such common principles imply, among others, reducing the financial burden on households, such as with lump-sum transfers. This type of compensation may be harder to implement if the goal of the environmental tax reform is to close a budget gap. Hence, this paper argues that in this case international actors and policymakers should show caution before pushing for a reform that would be implemented without the necessary compensatory measures. Rather, they could try to find enough support among developed economies to contribute to fund such compensatory measures conditional on the reform being implemented, in the same way that several developed economies intend to fund South Africa's transition away from coal.

Yet, the ultimate goal remains addressing the main rationale for fossil fuel subsidies and low energy prices, which is the inability of important portions of society in many countries to afford energy. Curbing growing inequalities, both within and across countries, is then crucial. In future, the use of international carbon dividends would allow redistributing part or all revenues from a minimum or uniform global carbon price in a way that would not exacerbate within- or between-country inequalities, but rather contribute to address them as well as poverty.

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