

Behavioural Economics and Public Support for Carbon Pricing: A Revenue Recycling Scheme to Address the Political Economy of Carbon Taxation

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Even though carbon pricing is widely accepted as the most efficient policy instrument for climate change mitigation, it has been severely held back by a lack of public support. Building on research in behavioural sciences, we propose a revenue recycling scheme that aims to foster public support for carbon taxes. The scheme has two main strengths: (i) it may allow the implementation of carbon taxes with higher tax rates than those currently prevailing in most jurisdictions; (ii) it relies on a number of accessible technologies, and thus it can be implemented in a wide variety of settings, both in urban and rural areas of developing and developed countries.

I. INTRODUCTION

The ambitious goals set in the Paris Agreement to keep the increase in global average temperature well below 2°C require massive reductions in carbon emissions in the coming decades.¹ There is broad agreement among scholars and policy-makers that an effective and efficient carbon emissions mitigation strategy includes carbon pricing.² A recent joint statement by 27 Nobel Laureate economists finds that “a carbon tax offers the most cost-effective lever to reduce carbon emissions at the scale and speed that is necessary”.³ But despite this increasing consensus among

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¹ IPCC, “Global Warming of 1.5°C” (2018).

² A Baranzini et al, “Carbon Pricing in Climate Policy: Seven Reasons, Complementary Instruments, and Political Economy Considerations” (2017) Wiley Interdisciplinary Reviews: Climate Change 8.4; A Bowen, “The Case for Carbon Pricing: Policy Brief” (2011) The Grantham Research Institute on Climate Change and the Environment 1; J Stiglitz et al, “Report of the High-Level Commission on Carbon Prices” (Washington DC 2017); IPCC, *supra*, note 1.

³ AaVv, “Economists’ Statement on Carbon Dividends” *Wall Street Journal* (New York, 17 January 2019).

economists and despite the urgency of climate action, large parts of global carbon emissions remain unpriced, and the vast majority of carbon pricing schemes fall short of imposing carbon prices that conform to the levels required to deliver on the Paris Agreement.⁴

While various factors account for the too low prices applied to carbon emissions, a key element is the low level of public support for carbon pricing. A growing literature in economics, behavioural and political sciences studies the causes of this low level of support and provides policy options to address it.⁵ A large part of this research focuses on support for carbon taxes. These fiscal instruments are among the least popular but most efficient climate-related policies and are key in a least-cost strategy for mitigating carbon emissions in various sectors of the economy, also in comparison with non-tax forms of carbon pricing.⁶

This article contributes to the research on how to address too low levels of public support for carbon taxation in two ways. First, we propose a behaviourally informed revenue recycling scheme that may allow the implementation of carbon tax reforms with ambitious carbon price levels. Scholars and policymakers propose increasing public acceptance for carbon taxes by starting with low tax rates, to be gradually increased over time.⁷ This practice is, however, detrimental for the environment and probably also for social welfare. The scheme described below aims to obviate these problems by allowing policymakers to start pricing carbon at sufficiently high rates from the outset. Various technological solutions can support the implementation of this scheme, making it applicable both in urban and rural areas of developed and developing countries. The second contribution of this article is to identify strategies to increase public support for tax shifts. Although tax shifts can deliver a double-dividend (ie a simultaneous improvement of both the environment and the economy), they are among the least preferred options in the eyes of the public,⁸ and among the least used forms of carbon revenues globally.⁹ The strategies described in this article may help facilitate the use of tax shifts for climate change policy.

The remainder of this article is structured as follows: Section II briefly illustrates the need to improve public support for carbon taxes. Section III discusses key factors that hinder public support for carbon taxation. Section IV debates the pros and cons of phasing-in carbon taxes in a gradual manner. Building on the analysis proposed in Section III, Section V illustrates an innovative, behaviourally informed policy design that addresses low public support for carbon taxes, potentially enabling the implementation of carbon taxes with a Paris-compatible tax rate. This section

⁴ World Bank Group, “State and Trends of Carbon Pricing 2019” (Washington, DC, World Bank 2019).

⁵ S Carattini et al, “How To Make Carbon Taxes More Acceptable” (2017) www.lse.ac.uk/GranthamInstitute/publication/make-carbon-taxes-acceptable/; S Carattini et al, “Overcoming Public Resistance To Carbon Taxes” (2018) *Wiley Interdisciplinary Reviews: Climate Change* 9:5; D Klenert, “Making Carbon Pricing Work for Citizens” (2018) *Nature Climate Change* 8; B Rabe, “Can We Price Carbon?” (Cambridge, MIT Press 2018).

⁶ Carattini et al (2017), *supra*, note 5.

⁷ Carattini et al (2017), *supra*, note 5; Carattini et al (2018), *supra*, note 5; MA Pigato (ed), “Fiscal Policies for Development and Climate Action” (Washington, DC, World Bank 2019).

⁸ Carattini et al (2017), *supra*, note 5.

⁹ C Metivier and S Postic, “Carbon Pricing Across The World: How To Efficiently Spend Growing Revenues?” (2019) I4CE Policy Brief.

discusses also how the scheme could be implemented via a number of easily available technologies, making it feasible in both developed and developing countries. Section VI illustrates a complementary, behavioural informed strategy to increase the acceptability of tax-shifts. Section VII concludes.

II. THE NEED TO INCREASE PUBLIC SUPPORT FOR CARBON TAXES

Even though the number of jurisdictions that have implemented carbon pricing schemes has more than tripled in the last 10 years, reaching 57 in 2019, and even though 96 countries plan to use carbon pricing in their Nationally Determined Contributions under the Paris Agreement, to date only about 20% of global GHG emissions are covered by carbon pricing.¹⁰ Also, fewer than 10 jurisdictions apply a *nominal* carbon price above US\$ 35 per ton of carbon.¹¹ Even in jurisdictions that implemented carbon pricing above this level, exemptions may lower the *effective* carbon price applied.¹²

These price levels are far too low to deliver on the Paris Agreement, and are likely to be significantly below the social cost of carbon. Paris-compatible carbon prices are *at least* US\$ 40–80 per tonne of carbon by 2020, according to the High-Level Commission on Carbon Prices.¹³ Estimates of the social cost of carbon vary.¹⁴ US government agencies' estimates of the social cost of carbon emissions in 2020 range between US\$ 12 and US\$ 62 per tonne of carbon, depending on the applied discount rate (5% or 2.5% respectively).¹⁵ These estimates have been criticised based on arguments that tax rates should be set in line with the discounting of risks in the private market,¹⁶ but also in that case, the discount rate is likely close to 2.5%,¹⁷ and the efficient price level is therefore quite high. These estimates of efficient carbon taxes become even higher if low-probability high-cost climate events are added to the analysis,¹⁸ or when consideration is given to the existence of tipping points,¹⁹ the irreversibility of

¹⁰ World Bank Group, *supra*, note 4.

¹¹ World Bank Group, *supra*, note 4.

¹² For instance, important exemptions apply to emissions from the international maritime transport sector. For a discussion of this problem and of potential regional solutions, see G. Dominioni et al., "Regional Carbon Pricing for International Maritime Transport: Challenges and Opportunities for Global Geographical Coverage" (The World Bank, 2018).

¹³ Stiglitz et al, *supra*, note 2.

¹⁴ P Howard and J Schwartz, "Think Global: International Reciprocity as Justification for a Global Social Cost of Carbon" (2017) *Columbia Journal of Environmental Law* 24; WD Nordhaus, "Revisiting the Social Cost of Carbon" (2017) 114 *Proceedings of the National Academy of Sciences* 7.

¹⁵ Environmental Protection Agency, "EPA Fact Sheet – Social Cost Of Carbon" (EPA 2016).

¹⁶ WD Nordhaus, "'The Stern Review' On the Economics of Climate Change" (National Bureau of Economic Research 2006) 12741.

¹⁷ S Giglio et al, "Climate Change and Long-Run Discount Rates: Evidence from Real Estate" (2015) NBER Working Paper No 21767.

¹⁸ ML Weitzman, "On Modeling and Interpreting the Economics of Catastrophic Climate Change" (2009) 91 *The Review of Economics and Statistics* 1.

¹⁹ M Faure and P Fenn, "Retroactive Liability and the Insurability of Long-Tail Risks" (1999) 19(4) *International Review of Law and Economics* 487; TS Lontzek et al, "Stochastic Integrated Assessment of Climate Tipping Points Indicates the Need for Strict Climate Policy" (2015) 5 *Nature Climate Change* 441; N Stern, "Stern Review: The Economics of Climate Change" (London, HM Treasury 2006).

climate damages,²⁰ and the concentration of those damages on the poorest.²¹ As a result of all these considerations, the efficient tax rate to be achieved is very likely to be significantly higher than prices applied in most jurisdictions.

Multiple factors can account for this suboptimal pricing of carbon emissions. For instance, the public-good nature of climate change can lead countries to underinvest in mitigation policies. But even where political ambition is high, opposition from vested interests and the general public can hinder sufficiently ambitious climate action. In this article, we will briefly touch upon the role of vested interests, and focus mostly on the low level of public support for carbon pricing.

Public opposition to carbon pricing is surprising, because carefully designed carbon pricing schemes can favour large segments of current and future generations, as they mitigate climate change and generate various economic co-benefits.²² For instance, they improve air quality,²³ firm level productivity;²⁴ the ability to generate domestic resources in countries with a large informal sector (ie grey economy);²⁵ and reduce traffic accidents, if applied to the road transport sector.²⁶ Net benefits can also derive from the careful use of the revenues generated by the carbon tax, for instance, when carbon tax revenues are used to reduce the rates of pre-existing taxes,²⁷ such as in British Columbia where such a policy led to net increases in economic growth,²⁸ and decreases in income inequality²⁹ and rural-urban divides.³⁰

Carbon pricing can be implemented either via taxation or emission trading schemes (ETS). In this article, we focus on carbon taxes because they are less used in policy, and more opposed by the public compared to many other instruments for climate change mitigation.³¹ Also, carbon taxes and ETS are not perfect substitutes. The price signal under a carbon tax is more stable than under an ETS, and therefore the abatement incentives under the two measures can differ, even if they apply the same long-term average price to carbon emissions. Transaction costs make emissions trading a less appealing policy measure than carbon taxation for sectors of the

²⁰ E Neumayer, “A Missed Opportunity: The Stern Review On Climate Change Fails to Tackle the Issue Of Non-Substitutable Loss Of Natural Capital” (2007) 17(3–4) *Global Environmental Change* 297.

²¹ D Anthoff et al, “Equity Weighting and the Marginal Damage Costs of Climate Change” (2009) 68(3) *Ecological Economics* 836.

²² Baranzini et al, *supra*, note 2; Pigato, *supra*, note 7.

²³ I Parry et al, “How Much Carbon Pricing Is in Countries’ Own Interests? The Critical Role of Co-Benefits” (2015) 6(4) *Climate Change Economics* 1.

²⁴ A Coste et al, “Staying Competitive: Productivity Effects of Environmental Taxes” in *Fiscal Policies for Development and Climate Action* (Washington DC, World Bank Group 2019).

²⁵ A Bento et al, “Environmental Policy in the Presence of an Informal Sector” (2018) *Journal of Environmental Economics and Management* 90.

²⁶ P Burke and N Shuhe, “Gasoline Prices and Road Fatalities: International Evidence” (2015) 53(3) *Economic Inquiry* 1437.

²⁷ Pigato, *supra*, note 7.

²⁸ S Elgie and J McClay, “BC’s Carbon Tax Shift: Results” (*Sustainable Prosperity*, 2013) 1–10.

²⁹ M Beck et al, “Carbon Tax and Revenue Recycling: Impacts On Households in British Columbia” (2015) *Resource and Energy Economics* 41.

³⁰ M Beck et al, “A Rural Myth? Sources and Implications of the Perceived Unfairness of Carbon Taxes in Rural Communities” (2016) *Ecological Economics* 124.

³¹ Carattini et al (2018), *supra*, note 5.

economy where emissions are released by a large number of small entities.³² Thus, even in presence of possible carbon pricing alternatives, it is valuable to address specific problems faced by carbon taxation.

III. FACTORS HINDERING PUBLIC SUPPORT FOR CARBON TAXES

Various factors account for the low levels of support for carbon taxes among the public, which are reviewed below.³³

*Perceived distributional impacts.*³⁴ Depending on the structure of the instrument and the conditions prevailing in each jurisdiction, carbon taxes can be either progressive or regressive.³⁵ People tend to support non-regressive taxes,³⁶ and carbon taxes are often perceived as regressive.³⁷ Research indicates that people sometimes perceive carbon taxes as regressive, even when they had a progressive impact.³⁸ The public may fear the potential negative impacts of carbon taxes on the competitiveness of national industries and employment. These effects are possible, but instruments exist to address them.³⁹

Discounting benefits more than costs. Most benefits from carbon taxes, such as reduced emissions, cleaner air, and reduced traffic, occur in the medium to long term. Conversely, energy prices increase rapidly after the tax is introduced. Therefore, individuals will discount a larger proportion of the benefits than the costs of carbon tax reforms.⁴⁰ This relatively larger discounting of future benefits can result in a significant reduction of support for carbon pricing measures.

This effect can be particularly severe among the more indigent segments of the population and in countries with higher poverty rates.⁴¹ Discount rates tend to be higher among the poor.⁴² Liquidity constraints, reduced access to the formal credit market, and higher stress leads individuals that live in poverty to be more impatient than the more wealthy.⁴³ Consistently, empirical studies find higher discount rates in

³² *ibid.*

³³ Carattini et al (2017), *supra*, note 5; Klenert, *supra*, note 5; Pigato, *supra*, note 7.

³⁴ Carattini et al (2018), *supra*, note 5.

³⁵ Baranzini et al, *supra*, note 2; IMF, *Fiscal Policies for Paris Climate Strategies—from Principle to Practice*, Policy Paper No 19/010 (2019).

³⁶ Baranzini et al, *supra*, note 2; EZ Gevrek and A Uyduranoglu, “Public Preferences For Carbon Tax Attributes” (2015) *Ecological Economics* 118; S Kallbekken and H Sælen, “Public Acceptance For Environmental Taxes: Self-Interest, Environmental and Distributional Concerns” (2011) 39(5) *Energy Policy* 2966.

³⁷ Carattini et al (2017), *supra*, note 5; Gevrek and Uyduranoglu, *supra*, note 36; B Murray and N Rivers, “British Columbia’s Revenue-Neutral Carbon Tax: A Review of the Latest “Grand Experiment” in Environmental Policy” (2015) *Energy Policy* 86.

³⁸ Beck, *supra*, note 30.

³⁹ Pigato, *supra*, note 7.

⁴⁰ *ibid.*

⁴¹ *ibid.*

⁴² J Haushofer and E Fehr, “On the Psychology of Poverty” (2014) 344:6186 *Science* 862–867.

⁴³ Haushofer and Fehr, *supra*, note 42.

developing countries.⁴⁴ To the extent that differences in discount rates between income groups imply greater impatience over benefits from carbon taxes in poorer countries, passing carbon tax reforms may be more problematic in these contexts than in developed economies.

Scepticism over benefits. Many individuals and companies perceive carbon taxes as revenue-generating measures and ignore their environmental effects.⁴⁵ Also, many are sceptical of the environmental effectiveness of carbon taxes,⁴⁶ despite the evidence that points in the opposite direction.⁴⁷ Relatedly, carbon taxes are often perceived as being less environmentally efficacious than alternative measures such as subsidies for public transport or regulations.⁴⁸

Perceived personal costs. People may perceive the personal cost of carbon taxes to be too high,⁴⁹ as shown by numerous surveys and experiments conducted across various countries.⁵⁰ The costs of environmental taxes are often more salient (eg energy price increases) than their benefits (eg reduced air pollution), and, therefore, the public might be more attentive towards the costs than towards the benefits of tax reforms.⁵¹

Measure design. The perceived costs and benefits of carbon taxes also depend on the design of the measure. For instance, people tend to be less sceptical of the environmental effectiveness of carbon taxes when revenues are earmarked to finance green projects.⁵² Research indicates that tax shifts tend to be popular among economists, but are among the least preferred form of revenue use by the public.⁵³ Reducing labour or income taxes can increase GDP and welfare. For instance, reducing labour taxes can incentivise the supply of labour. Despite the evidence indicating that – under the right circumstances – tax shifts can deliver an economic dividend, people are often sceptical of the economic benefits of this revenue use. Many see tax shifts as pointless transfers of resources from one place to another and as a diversion from the principle that revenues should be spent where they are raised. People also fail to see the connection between environmental taxation and labour taxation. Thus, large segments of the population may not understand, be aware of, or not believe that well-designed environmental taxes can generate climate and welfare benefits.

⁴⁴ JC Cardenas and J Carpenter, “Behavioural Development Economics: Lessons From Field Labs In The Developing World” (2008) 44(3) *Journal of Development Studies* 337; E Duflo et al, “Nudging Farmers to Use Fertilizer: Theory and Experimental Evidence from Kenya” (2011) 101(6) *American Economic Review*; T Tanaka et al, “Risk and Time Preferences: Linking Experimental and Household Survey Data from Vietnam” (2010) 100(1) *The American Economic Review* 2350.

⁴⁵ S Dresner et al, “Social and Political Responses to Ecological Tax Reform in Europe: An Introduction to the Special Issue” (2006) 34(8) *Energy Policy* 895.

⁴⁶ S Kallbekken et al, “Do You Not Like Pigou, Or Do You Not Understand Him? Tax Aversion and Revenue Recycling In The Lab” (2011) 62(1) *Journal of Environmental Economics and Management* 53.

⁴⁷ J Andersson, “Cars, Carbon Taxes and CO2 Emissions” (2017), available at <www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2017/03/Working-paper-212-Andersson_update_March2017.pdf>.

⁴⁸ L Steg et al, “Why Are Energy Policies Acceptable and Effective?” (2006) 38(1) *Environment and Behavior*.

⁴⁹ Carattini et al (2018), *supra*, note 5.

⁵⁰ A Alberini et al “Policy v Individual Heterogeneity in the Benefits of Climate Change Mitigation: Evidence from a Stated-Preference Survey” (2018) *Energy Policy* 121.

⁵¹ E Dal Bó et al, “The Demand for Bad Policy when Voters Underappreciate Equilibrium Effects” (2018) 85(2) *The Review of Economic Studies* 964.

⁵² Carattini et al, “Green Taxes in a Post-Paris World: Are Millions of Nays Inevitable?” (2017) 68(1) *Environmental and Resource Economics* 97; Klenert, *supra*, note 5.

⁵³ *ibid.*

Rational ignorance. Rational ignorance is another cause of public disinformation about the benefits of carbon taxes.⁵⁴ The aggregated benefits from carbon pricing can be large, but they are divided among many people. Conversely, the costs of carbon taxes tend to be more concentrated on restricted groups, for instance, the energy-intensive sectors of the economy. This different distribution of benefits and losses in society often implies that the interest of losers to block carbon taxes is stronger than the interest of net beneficiaries.⁵⁵ The smaller group size of losers equally allows them to more effectively organise to have their voice heard in the policy process.⁵⁶ The public belief that interest group are particularly effective in steering the policy agenda may further discourage investments in education about carbon taxes.

Worldviews. Worldviews are socially constructed tendencies that influence how people understand reality.⁵⁷ These orientations have been shown to affect the public acceptance of carbon taxes,⁵⁸ and of experts' views on climate change.⁵⁹

Trust in the government. Citizens may oppose carbon taxes also because they have little trust in the government.⁶⁰ Citizens may fear that they will not benefit from the use of revenues, for instance, because an inefficient public administration may absorb or waste them.⁶¹

Risk aversion. When jointly considered, this literature indicates that, for many individuals, the payoffs of carbon taxes seem uncertain. This uncertainty may trigger opposition among risk-averse individuals.⁶² Risk aversion is, therefore, another limit to carbon tax reforms. Research in economics and psychology suggests that risk aversion can be a stronger limit to carbon tax reforms in developing countries than in developed ones.⁶³ Relative and absolute risk aversion may both fall in the income or wealth of individuals.⁶⁴ Also, liquidity constraints and negative emotional states are often correlated with, and increase, risk aversion.⁶⁵

⁵⁴ Pigato, supra, note 7.

⁵⁵ GJ Stigler, "The Theory of Economic Regulation" (1971) 2(1) The Bell Journal of Economics and Management Science 3; MJ Trebilcock, *Dealing with Losers: the Political Economy of Policy Transitions* (Oxford University Press 2014).

⁵⁶ M Olson, *Logic of Collective Action: Public Goods and the Theory of Groups* (Harvard University Press 1965); S Peltzman, *The Economic Theory of Regulation after a Decade of Deregulation* (Brookings Papers on Economic Activity. Microeconomics, Washington DC 1989); Stigler, supra, note 55.

⁵⁷ TL Cherry et al, "Accepting Market Failure: Cultural Worldviews and The Opposition To Corrective Environmental Policies" (2017) Journal of Environmental Economics and Management 85.

⁵⁸ *ibid.*

⁵⁹ D Kahan et al, "Cultural Cognition of Scientific Consensus" (2011) 14(2) Journal of Risk Research 147.

⁶⁰ PJ Clinch et al, "Environmental and Wider Implications of Political Impediments To Environmental Tax Reform" (2006) 34(8) Energy Policy 960; Dresner et al, supra, note 45; Klenert, supra, note 5; Pigato, supra, note 7.

⁶¹ AM Rivlin, "The Continuing Search for a Popular Tax" (1989) 79(2) The American Economic Review 113.

⁶² Pigato, supra, note 7.

⁶³ Pigato, supra, note 7.

⁶⁴ L Guiso and M Paiella, "Risk Aversion, Wealth, and Background Risk" (2008) 6(6) Journal of the European Economic Association 1109; F Heinemann, "Measuring Risk Aversion and the Wealth Effect" in J Cox and G Harrison (eds), *Research in Experimental Economics* (Bingley, JAI Press 2008); AO Hopland et al, "Income And Choice Under Risk" (2016) Journal of Behavioral and Experimental Finance 12; X Liu et al, "Does Relative Risk Aversion Vary with Wealth? Evidence from Households' Portfolio Choice Data" (2016) Journal of Economic Dynamics and Control 69, available at <papers.ssrn.com/sol3/papers.cfm?abstract_id=2033427>.

⁶⁵ Haushofer and Fehr, supra, note 42.

IV. PHASING-IN CARBON TAXES AS A POLICY RESPONSE

Academics and policy-makers argue that phasing-in carbon pricing can help increase public support for it,⁶⁶ and many jurisdictions introduce carbon pricing gradually.⁶⁷ Below we discuss the pros and cons of this practice.

1. The case for gradual phase-in of carbon taxes

It is widely believed that starting with low tax rates helps in obtaining public support for carbon pricing.⁶⁸ This belief can be grounded in the following considerations.

First, increasing the tax rate slowly and implementing trial periods allows citizens to learn about carbon taxes before major adjustments are made. Research indicates that aversion towards carbon taxes decreases after the introduction of a low-rate carbon tax, as the public learns more about the costs and benefits of the measure.⁶⁹ There is then a case for phasing in carbon taxes with low rates, to trigger this learning process, and only then ramp up the tax rate towards efficient or Paris-compatible levels.

Second, phasing-in carbon taxes gradually can create and reinforce social norms that support environmental taxation. Social norms are rules “governing an individual’s behavior that third parties other than state agents diffusely enforce by means of social sanction”.⁷⁰ Norms emerge when a sufficiently large proportion of individuals endorses an opinion or a behaviour. Introducing an environmental tax may send a signal that society values making polluters pay. To the extent that even a tax rate below the social cost of carbon conveys the message that other members of society support making polluters pay, a gradual phasing-in of environmental taxes may help first develop the pro-environmental values in society which are needed to subsequently scale up the policy without too much public resistance.

Third, introducing a carbon tax with a phase-in period reduces the adjustment cost incurred by polluting entities, which then have fewer reasons to oppose the reform. For instance, even a tax rate below the social cost of carbon may discourage pollution-intensive companies from further investing in polluting capital, while allowing them to carry on the production with existing assets.

Despite these potential benefits, starting with low tax rates has also drawbacks.

2. The case for high upfront tax rates

Starting with low carbon pricing levels can be problematic, regardless of whether the policy aim is social welfare maximisation or reaching a determined mitigation target.

First, when the policy aim is increasing social welfare and the initial tax rate is lower than optimal, subsequent adjustments might need to be more aggressive.⁷¹ Many proposals reflect this pattern of adjustments. The initial tax rate is set lower than

⁶⁶ Carattini et al (2018), *supra*, note 5; Pigato, *supra*, note 7.

⁶⁷ World Bank Group, *supra*, note 4.

⁶⁸ Carattini et al (2017), *supra*, note 5; Carattini et al (2018), *supra*, note 5.

⁶⁹ Carattini et al (2017), *supra*, note 5; Cherry et al, *supra*, note 56.

⁷⁰ RC Ellickson, “The Market for Social Norms” (2001) 3(1) *American Law and Economics Review* 1.

⁷¹ RC Williams III, “Environmental Taxation” in A Auerbach and K Smetters (eds), *The Economics of Tax Policy* (Oxford, Oxford University Press 2017).

the social cost of carbon and increases between 4–5% in real terms, or is even updated at a higher speed.⁷² A potential problem that arises when the tax rate starts low and increases at a fast pace is that this may incentivise the fossil fuel industry to extract and burn more fossil fuels in the period where the tax rate is still low.⁷³ This negative effect could occur when the tax rate increases at a rate that is consistently higher than the interest rate.⁷⁴ Evidence of these inefficiencies is, however, mixed.⁷⁵

Second, real-life experience with carbon taxes show that after the initial introduction of a low carbon price, it is sometimes difficult to follow up with the planned tax rate increases.⁷⁶ Many countries struggle even with keeping the real value of their environmental tax rates stable, for instance by failing to update tax rates for inflation.⁷⁷ Adjusting carbon prices beyond inflation can be even more challenging. A possible solution to this problem is fixing into the law that establishes the carbon tax the trajectory for increasing the tax rate over time.⁷⁸ British Columbia, Canada, France, and Switzerland have implemented this strategy.⁷⁹ While probably helpful, this strategy is not bulletproof, as shown by the UK's experience with its Carbon Price Floor (CPF).⁸⁰ The CPF was first introduced in 2013, and the intention was to increase it every year until 2020, up to £30 per tonne. In 2014, competitiveness concerns and the will to avoid price increases for consumers led the UK Government to cap the CPF at £18 until 2020. This price freeze was subsequently extended to 2021. Similarly, following the Gilets Jaunes protests in France, the French government announced a change in the scheduled increase in the rate of the French carbon tax. The tax rate was initially projected to increase by 23 percent in 2019, but it is now set at 2018 levels, and it is likely to remain to these levels, at least in the short term.⁸¹

Third, implementing low tax rates may undermine the incentives of citizens to gather information about the reform, strengthening the hand of interest groups that want to block the reform. Vested interests are better positioned to influence governments' action when their activity remains far from the eyes of the public. A low carbon tax rate may fail to attract sufficient attention among the public on the environmental tax reform because the public may expect that the personal costs of carbon pricing are lower than those of learning about this policy. As a result, citizens may decide to remain rationally ignorant about the reform, strengthening the action of interest groups that oppose the reform or aim to minimise its impact on their interests, for instance, by lobbying for exemptions.

⁷² Williams, *supra*, note 71.

⁷³ H-W Sinn, "Public Policies Against Global Warming: A Supply Side Approach" (2008) 15(4) *International Tax and Public Finance* 360.

⁷⁴ F van der Ploeg and C Withagen, "Global Warming and The Green Paradox: A Review of Adverse Effects of Climate Policies" (2015) 9(2) *Review of Environmental Economics and Policy* 285.

⁷⁵ N Bauer et al, "Divestment Prevails Over the Green Paradox When Anticipating Strong Future Climate Policies" (2018) 8 *Nature Climate Change* 130.

⁷⁶ OECD, "Taxing Energy Use 2018: Companion to the Taxing Energy Use Database" (OECD Publishing, Paris 2018).

⁷⁷ *ibid.*

⁷⁸ Carattini et al (2017), *supra*, note 5.

⁷⁹ Carattini et al (2017), *supra*, note 5; World Bank Group, *supra*, note 4.

⁸⁰ D Hirst, "Carbon Price Floor (CPF) And The Price Support Mechanism" (2018) House of Commons Library Briefing Paper 05927.

⁸¹ World Bank Group, *supra*, note 4.

V. INCREASING SUPPORT VIA REVENUE USE

Given the drawbacks of starting with low tax rates, this section uses behavioural economics to explore policy strategies that may allow the introduction of a carbon tax directly with the high tax rate needed to fully price the social cost of carbon and/or deliver the Paris Agreement.

1. Antedating cash transfers

Revenues from carbon pricing can: (i) be earmarked for infrastructure, green spending, or development (eg subsidise green innovation); (ii) be used to reduce public debt; (iii) be used to cut more distortive taxes (eg labour and income); or (iv) be distributed to the population via direct transfer schemes. Economically, it is likely that options (ii) or (iii) are best,⁸² but option (iv) may be politically most effective. If option (iv) is used, the political economy can be further improved by distributing revenues to the population via *antedated cash transfers*, ie transfers made before the tax incidence is felt by the public, possibly on the same day that the measure is implemented, with disbursements made on the basis of projections of revenue streams.⁸³

Distributing revenues via targeted cash transfers can address some political economy concern, especially those related to the potentially regressive impact of carbon taxation,⁸⁴ even when this effect is only perceived and does not correspond to reality. Sometimes distributing small fractions of revenues can make carbon pricing progressive. A carbon tax in France could be made progressive if 17 per cent carbon revenues are devoted to low-income households via cash transfers.⁸⁵ Less than 15 per cent of the revenues from a hypothetical US carbon tax would suffice to fully compensate the poorest 20 per cent of the US population.⁸⁶ The IMF estimates that a small fraction of carbon revenues from a hypothetical carbon tax of US\$ 35 per ton of carbon in 2030 could compensate the bottom quintile of the population in India.⁸⁷ Compensation via cash transfers could, therefore, help to obtain the support of the underprivileged and of the more affluent segments of the population that have a preference for non-regressive climate policies. This use of revenues is in line with the recent joint statement of 27 Nobel Laureate economists to implement a carbon tax in the US, which by recycling revenues to the public addresses both distributional concerns and fears of increasing the size of the government.⁸⁸ In this section, we argue that

⁸² Eg Pigato, *supra*, note 7.

⁸³ Pigato, *supra*, note 7.

⁸⁴ Carattini et al (2018), *supra*, note 5.

⁸⁵ A Berry, "The Distributional Effects Of A Carbon Tax And Its Impact On Fuel Poverty: A Microsimulation Study In The French Context" (2019) *Energy Policy* 124.

⁸⁶ A Mathur and AC Morris, "Distributional Effects Of A Carbon Tax In Broader US Fiscal Reform" (2014) *Energy Policy* 66.

⁸⁷ IMF, *supra*, note 35.

⁸⁸ As of 27 May 2019, more than 3,554 US economists, including 27 Nobel laureates, and 4 former chairs of the Federal Reserve, have signed a petition in favour of a carbon tax for the US, with revenues recycled via cash transfers to households. Note that this statement does not specify whether transfers should be antedated. See <www.clcouncil.org/economists-statement/>.

antedated cash transfers are likely to address several other factors that reduce public support for carbon taxes.

First, distributing cash before people start feeling the tax incidence could reduce opposition due to risk aversion. Many benefits of carbon pricing can appear to be uncertain for the public. The public may fear that the government may not follow through with any promises of reimbursing citizens for the carbon tax burden via cash transfers, for instance as revenues might instead get lost to corruption, inefficient government administration, or the influence of interest groups. Others may be sceptical of the climate mitigation effects and the co-benefits of carbon pricing. Low general trust in the government further fuels these fears. Expected payoffs from reform become more certain for transfer recipients after the distribution takes place. When the distribution of cash is antedated, payoffs become more certain at an earlier stage than if revenues were disbursed after collection. More certain payoffs will reduce opposition due to risk-aversion.⁸⁹

Second, anticipating compensation can address opposition due to discounting.⁹⁰ Since a more substantial proportion of the benefits than of the costs of environmental taxation are spread out over time, discounting makes carbon tax reforms less appealing to the population. Ex-ante transfers can reverse this pattern. This effect is further amplified if, as it is sometimes the case, delayed financial gains are discounted more than delayed losses.⁹¹ Also, concrete benefits tend to be discounted less than more abstract ones.⁹² Arguably, a cash transfer is a less abstract gain than the health benefits that may derive from, for instance, earmarking revenues for additional climate-related expenditures.

Third, timing the distribution of compensation payments to coincide with the onset of the environmental tax, ie distributing revenues *on the first day* the tax is applied, helps to communicate the logic of a fiscal shift, as this practice would highlight the link between the increased fiscal pressure and the distribution of benefits. This policy could, therefore, enable a mixed use of revenues, part of which is destined for cash transfers and the remainder for reducing pre-existing taxes. A mixed use of revenues could ease the political economy of carbon tax reforms, for instance, when it allows reducing payroll taxes or to implement competitiveness policies that could reduce citizens' fear of the tax impact on the economy.

2. Incentivising popular support for carbon taxes: the role of the endowment effect

The previous section discussed various political economy benefits of antedating cash transfers. Here we discuss the additional benefits that could derive from a specific mode of distributing revenues. Building on literature on the endowment effect, we

⁸⁹ Pigato, *supra*, note 7.

⁹⁰ *ibid.*

⁹¹ DJ Hardisty and EU Weber, "Discounting Future Green: Money Versus The Environment" (2009) 138(3) *Journal of Experimental Psychology: General* 329.

⁹² KM Lempert and EA Phelps, "The Malleability of Intertemporal Choice" (2016) 20(1) *Trends in Cognitive Science* 64.

argue that transfer recipients are likely to support a carbon tax reform more if cash transfers are distributed electronically before the measure is implemented – not simply before the tax incidence is felt – on visible accounts that are frozen until the day of the tax increase. This sequencing could increase the value that citizens attribute to the cash transfer, and thus enhance support for the reform.

A large body of evidence indicates that everything else being equal, individuals tend to attach a higher value to items to which they feel entitled. This phenomenon is referred to as the endowment effect. While competing explanations exist for the endowment effect, the most supported in the literature is loss aversion.⁹³

Research on loss aversion highlights that a change in wealth of size “X” is perceived as a less severe event, meaning that the drop in utility is lower, when it is seen as a foregone gain than when the same amount of change is seen as an incurred loss. Whether people see the change in wealth as a loss or as a gain depends on their reference point (eg the status quo), which can be changed by acting on people’s expectations. Increasing the expectation of obtaining something can produce a sense of endowment.⁹⁴ Allocating money ex-ante on visible bank accounts can increase people’s expectation of receiving the cash transfer, and thus increase the value attached to the payment, fostering support for the reform.

Research indicates that other psychological mechanisms could also make people value antedated electronic cash transfers more highly. Some authors propose that the endowment effect is due to psychological proximity.⁹⁵ Arguably, compensation recipients may feel closer to the cash transfer when they see it credited to their bank accounts compared to when authorities merely announce compensation. Others suggest that the endowment effect is due to saliency.⁹⁶ The visual display of compensation enhances its saliency and therefore it may also foster a feeling of endowment.

Regardless of which of these mechanisms is at play, once citizens assign a high value to cash transfers, they will give more support to the tax reform. This greater interest in the reform could also incentivise citizens to educate themselves about the costs and benefits of carbon taxation (ie address rational ignorance), with potential spillovers in support of future environmental tax reforms. Also, once a large fraction of citizens supports the carbon tax, it will be more difficult for vested interests to block the reform. Therefore, triggering an endowment effect among compensation recipients can be a crucial factor in successfully implementing carbon tax reforms.

Experience from energy subsidy reforms supports this conclusion, as antedated cash transfers have been used to the past to catalyse public support for these reforms.⁹⁷

⁹³ KM Marzilli Ericson and A Fuster, “The Endowment Effect” (2014) 6(1) *Annual Review of Economics* 555.

⁹⁴ KM Marzilli Ericson and A Fuster, “Expectations As Endowments: Evidence On Reference-Dependent Preferences From Exchange and Valuation Experiments” (2011) 126(4) *The Quarterly Journal of Economics* 1897; B Köszegi and M Rabin, “Reference-Dependent Risk Attitudes” (2007) 97(4) *The American Economic Review* 1047.

⁹⁵ J Reb and T Connolly, “Possession, Feelings Of Ownership, and The Endowment Effect” (2007) 2(2) *Judgment and Decision Making* 107.

⁹⁶ Z Carmon and D Ariely, “Focusing On The Forgone: How Value Can Appear So Different To Buyers And Sellers” (2000) 27(3) *Journal of Consumer Research* 360.

⁹⁷ DM Guillaume et al, “Iran: The Chronicles Of The Subsidy Reform” (2011) *International Monetary Fund No 11-167*; Pigato, *supra*, note 7.

Field experiments also support this conclusion. Hossain and List⁹⁸ show that providing workers with provisional bonuses that can be taken away in case of underperformance can substantially increase effort compared to merely promising rewards where the performance threshold is achieved. Even though the monetary incentives under the two conditions (provisional/promised bonuses) are identical, paying bonuses upfront seems to change the reference point of the workers. This result has been found also with teachers' performance, measured in terms of students' achievement, suggesting that the effect of ex-ante payments is common to many domains.⁹⁹ This research indicates that carefully managed upfront cash transfers can be a powerful tool to nudge citizens towards supporting carbon tax reforms.

3. Implementing the scheme

The analysis proposed in the previous section suggests that the use of an anticipated electronic cash transfer may allow ambitious carbon tax reforms to be implemented. This section discusses the possibility of implementing this revenue recycling scheme in developed and developing countries.

In countries where financial inclusion is high, as in most developed countries, implementing the revenue recycling scheme should not present major obstacles. Governments would need to establish agreements with banks operating in their jurisdiction. In countries where the rate of financial inclusion is low, such as in some developing countries,¹⁰⁰ governments may need to make investments to reach segments of the population targeted by cash transfers, especially when the transfer targets underprivileged households or segments of the population that live in rural areas. Below, we show that technology offers various options to transfer cash electronically, some of which have also been implemented in rural areas of different developing countries. The availability of various options should enable the implementation of the revenue recycling scheme in a wide variety of settings.

Electronic delivery is a common feature of many social cash transfers in developing countries.¹⁰¹ There are three main technological solutions to transfer cash electronically:¹⁰² chip cards; magnetic stripe cards; mobile money.

Chip cards and magnetic stripe cards require recipients to cash compensation at designed pay points after being identified. Identification can occur via PIN or biometric identification systems (eg iris scans) for chip cards. For magnetic stripe cards, identification can occur via PIN or signature. The designed pay points can be of different types, such as ATM; post offices or PoS devices. Implementing the cash transfers via these technological solutions may thus require investing in infrastructures, such as ATMs, to enable the revenue recycling scheme to reach

⁹⁸ H Tanjim and JA List, "The Behaviorist Visits The Factory: Increasing Productivity Using Simple Framing Manipulations" (2012) 58(12) *Management Science* 2151.

⁹⁹ RG Fryer et al, "Enhancing The Efficacy Of Teacher Incentives Through Loss Aversion: A Field Experiment" (2012) National Bureau of Economic Research No w18237.

¹⁰⁰ IMF, "2017 Financial Access Survey: Tracking Access to Financial Services" (Washington DC 2017).

¹⁰¹ G Smith et al "New Technology Enhancing Humanitarian Cash and Voucher Programming" (CaLP 2011).

¹⁰² L Oberländer and M Brossmann, *Electronic Delivery Methods of Social Cash Transfers* (Eschborn, 2014).

segments of the population that would remain otherwise excluded. For instance, in 2010, the Iranian government expanded the ATM network in various regions of the country to enable a broader coverage of a cash transfer scheme.

Mobile money is an alternative possibility which requires governments to create accounts for recipients at mobile network operators. Each account is connected to a phone number and a PIN. The transfers can be accessed: (i) by providing the PIN to a mobile money agent, meaning a designed private entity that receives a fee for the service; (ii) directly via phone to make transfers to other accounts and buy goods and services.¹⁰³

The three systems perform differently vis-à-vis different selection criteria (eg security, implementation costs, feasibility, etc).¹⁰⁴ Different countries have adopted different solutions in the past. For instance, in 2008, the Dominican Republic reformed LPG subsidies and introduced electronic cash transfers destined for the least affluent 40 per cent of the population via chip cards.¹⁰⁵ Magnetic strip cards are regularly used in Brazil to transfer cash to more than 12 million households.¹⁰⁶ Yet, we believe that an option that is particularly worth exploring is mobile money.

During the last decade, mobile money has grown rapidly, especially in developing countries. Nowadays this electronic cash transfer mode is used in more than 90 countries, a large proportion of which are situated in the African region. In 2016, there were 277 million registered mobile money accounts and over 100 million active users in Sub-Saharan Africa.¹⁰⁷ In Kenya, registered mobile money accounts were slightly less than 35 million in 2016,¹⁰⁸ indicating that this technology has the potential to reach large segments of the population (more than one account per adult).¹⁰⁹ In Ivory Coast, there were 944 registered mobile money accounts per 1,000 adults in 2016.¹¹⁰ Recent data from the IMF's Financial Access Survey (FAS) show that in many African countries mobile money accounts have already outnumbered commercial bank accounts.¹¹¹ Also, these data show the existence of a negative correlation between registered mobile agents and ATMs in Africa, suggesting that mobile money can be a valuable substitute for more traditional electronic cash transfer modes. However, the diffusion of mobile money is far from being homogeneous among African countries. For instance, in Nigeria, only 1% of the adult population was an active user of mobile money in 2016.¹¹² In countries where mobile money is not widely used, policymakers should consider whether the conditions exist for the emergence of this technology.

¹⁰³ JC Aker et al, "Zap It to Me: The Short-Term Impacts of a Mobile Cash Transfer Program" (Washington DC 2011); Smith et al, *supra* note 99.

¹⁰⁴ Oberländer and Brossmann, *supra*, note 102.

¹⁰⁵ G Inchauste and DG Victor, *The Political Economy of Subsidy Reform* (Washington DC 2017).

¹⁰⁶ C Bold et al, *Social Cash Transfers and Financial Inclusion: Evidence from Four Countries* (CGAP 2012).

¹⁰⁷ GSMA, *State of the Industry Report on Mobile Money* (GSM Association 2017).

¹⁰⁸ IMF, *supra*, note 100.

¹⁰⁹ *ibid.*

¹¹⁰ *ibid.*

¹¹¹ *ibid.*

¹¹² Inter Media, "Nigeria Financial Inclusion Insights Survey" (2016).

Various experiences testify to the potential of using mobile money for development policy. For instance, since 2011 the NGO GiveDirectly provides cash transfers in Kenya via the mobile operator M-Pesa. Also in Kenya, M-Pesa was used in the program “Post-Election Violence Recovery” to transfer money to about 37,000 individuals.¹¹³ Similarly, Concern Worldwide put in place a social protection program to address the drought/food crisis that Niger suffered in 2009/2010 using mobile money.¹¹⁴ Mobile money was also used by several NGOs to transfer cash after the 2010 earthquake.¹¹⁵

There are already examples of institutionalised governmental uses of mobile money to transfer cash to large segments of the population. For instance, the governments of Afghanistan and Pakistan have started using mobile money to pay the salaries and pensions of civil servants.¹¹⁶

Taken together, these experiences suggest that, in a growing number of developing countries, mobile money may allow long-term cash transfers to be implemented, targeted to large segments of the population. This technology could also show beneficiaries that transfers are made ahead of carbon tax reforms. As discussed in the previous section, this sequencing could be a powerful tool to address political economy concerns.

More generally, the availability of multiple technical solutions, each of which may better apply in different contexts, suggests that the revenue recycling scheme described above can be replicated in a wide variety of jurisdictions.

VI. REVENUE MIXES: SMART TAX-SHIFTS

As discussed above, anticipating the distribution of cash transfers to the day on which carbon taxes are introduced may help communicate to the public the benefits of tax shifts. In this section, we discuss how policymakers could further improve the public acceptability of this revenue use.

The literature on double dividends indicates that tax-shifts are often the most efficient use of revenues and yet they are the least-favoured option among the public. One driver of this mismatch is probably that revenue-recycling is less salient to the public than alternative revenue uses such as direct cash transfers.¹¹⁷ A strategy that may help in addressing this problem is to devote revenues to cut existing taxes that are particularly visible to citizens and whose tax liability falls onto the group whose support is sought.

Taxes vary in their saliency.¹¹⁸ People are likely to perceive benefits from carbon taxation to be larger if governments cut taxes that are well known to the broad public, such as income taxes. These taxes often yield large revenues. Eliminating taxes that trigger low revenues can, however, reduce the administrative costs of the tax system.

¹¹³ Oberländer and Brossmann, *supra*, note 102.

¹¹⁴ Aker, *supra*, note 103.

¹¹⁵ Oberländer and Brossmann, *supra*, note 102.

¹¹⁶ MF, *supra*, note 100.

¹¹⁷ Similarly, Klenert, *supra*, note 5.

¹¹⁸ A Finkelstein, “E-Ztax: Tax Salience and Tax Rates” (2009) 124(3) *The Quarterly Journal of Economics* 969.

Thus, there might be tradeoffs between reducing administrative costs and easing the political economy of carbon taxation.

In a situation of financial distress, carbon taxes can be raised to substitute for the rise in pre-existing taxes. In such a situation, the carbon tax reduces or eliminates the need for raising the other tax; in other words, it reduces the other tax relative to how it would have risen. Economically, such a prevention of a rise in another tax can be the same as the use of a carbon tax for explicitly lowering a pre-existing tax. But politically these situations are not the same at all.

Explicitly reducing an existing tax may help in obtaining public support for carbon pricing compared to using carbon revenues for avoiding a tax increase.¹¹⁹ Existing taxes are arguably more salient to citizens than future tax increases, whether already scheduled in the law or simply debated in the political arena. Since households and businesses have direct experience with the burden imposed by existing taxes, reducing them brings a more tangible benefit than avoiding a future increase in the fiscal pressure. Thus, policymakers can improve the political economy of carbon taxes by using their revenues to explicitly cut existing taxes rather than avoiding raising pre-existing taxes.

Evidence indicates that the public is not likely to differentiate between the legal attribution of a tax liability and its economic incidence.¹²⁰ If revenues are used to reduce a tax that was previously payable by employers, the policy will more likely be seen as benefiting the owners of firms rather than benefiting workers. The revenues from environmental tax reforms may become more acceptable if revenues are used to reduce taxes for which the legal liability rests with the group whose support is sought – the economic incidence might be of secondary importance to the tax shift's political viability.

VII. CONCLUSIONS

Carbon pricing is widely recognised as a key policy to deliver global climate change mitigation targets.¹²¹ Catalysing and maintaining public support for carbon pricing is a decisive factor to implement carbon taxes. Research suggests that phasing-in carbon taxes can help building this support,¹²² and many schemes implemented to date adopt this strategy.¹²³ In this article, we argue that phasing-in carbon pricing too gradually is probably detrimental for the climate and for social welfare, and we explore an alternative strategy that may enable to implement ambitious tax rates, compatible with commitments under the Paris Agreement, from the outset of environmental tax reforms.

¹¹⁹ Pigato, *supra*, note 7.

¹²⁰ Dal Bó et al, *supra*, note 51; Sausgruber and Tyran, "Are we taxing ourselves? How deliberation and experience shape voting on taxes" (2011) *Journal of Public Economics* 95; Weber and Schram, "The Non-Equivalence of Labour Market Taxes: A Real-effort Experiment" (2017) 127 *Economic Journal* 604.

¹²¹ IMF, *supra*, note 35; IPCC, 2018 *supra*, note 3; World Bank Group, *supra*, note 4.

¹²² Carattini et al (2017), *supra*, note 5; Cherry et al, *supra*, note 57; Trebilcock, *supra*, note 55.

¹²³ World Bank Group, *supra*, note 4.

We propose a behaviourally informed revenue recycling scheme that aims to increase public support for environmental tax reforms. This scheme consists of antedating the distribution of electronic cash transfers into visible accounts before the tax increase is implemented. A number of relatively easily accessible technologies could support the implementation of this scheme. As a result, the scheme is feasible in many rural and urban areas of both developed and developing countries.

This article also discusses strategies to increase public support for tax shifts. This revenue use is popular among economists as it can deliver a double dividend. However, evidence indicates that tax shifts are among the least preferred revenue use options among the public. The strategies suggested in this article may help to implement tax shifts while maintaining public support for carbon pricing.