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COVID-19 and EU Climate Targets: going further with less?[1]

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Abstract

The COVID-19 crisis comes at a complex moment for European climate policy as it pivots from a 40% 2030 emissions reduction target to a European Green Deal that is in better alignment with long-term Paris Agreement goals. Here, the implications of the dramatic fall in economic output associated with the crisis are examined using a representative range of growth scenarios. With lower economic activity resulting from the COVID-19 crisis, existing policy measures could achieve the 40% target sooner than 2030. However, we find that even in the most severe economic scenario examined, this falls well short of the 50-55% emissions reduction target under the Green Deal. Maintaining the existing 40% target in 2030 with reduced policy measures on the other hand would move European climate policy away from the required path. This analysis indicates the feasibility of increased climate ambition in the wake of the pandemic and supports the Green Deal 50-55% targets in 2030.

Keywords: climate change policy; greenhouse gas emissions; economic recovery; COVID-19 economic effects; energy demand.

JEL classification: Q5, Q54, Q58, E6, Q43

Introduction

The current COVID-19 outbreak is more than a global health crisis and humanitarian emergency. In an attempt to contain the spread of the novel coronavirus, governments around the world have taken unilateral measures that range from temporary closure of educational institutions and international travel restrictions to a complete lockdown. As a result, streets are free of vehicles, flights are grounded, factories are closed and economic activities have slowed down. These measures are having dramatic effects on the global economy and on the wider environment.

The International Energy Agency, in its review of the first quarter in 2020, estimates an average of 25% decline in energy demand in countries in full lockdown and an average of 18% decrease in countries in partial lockdown [1]. Global energy demand is forecast to fall by 6% for the year, equivalent to the annual combined energy demand of the UK, Italy, France and Germany. Similarly, early results from NASA Earth Observatory show that the

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concentration of nitrous dioxide in the air in China and the fine particulate matter in New Delhi have dropped as a result of country-wide lockdowns [2]. With our dependence on fossil fuel-sourced energy, CO2 emissions are also expected to be 8% lower in 2020 than 2019. Subsequent years' emissions and the cumulative emissions to 2030 will depend on the speed and nature of the economic recovery and on policies by EU governments.

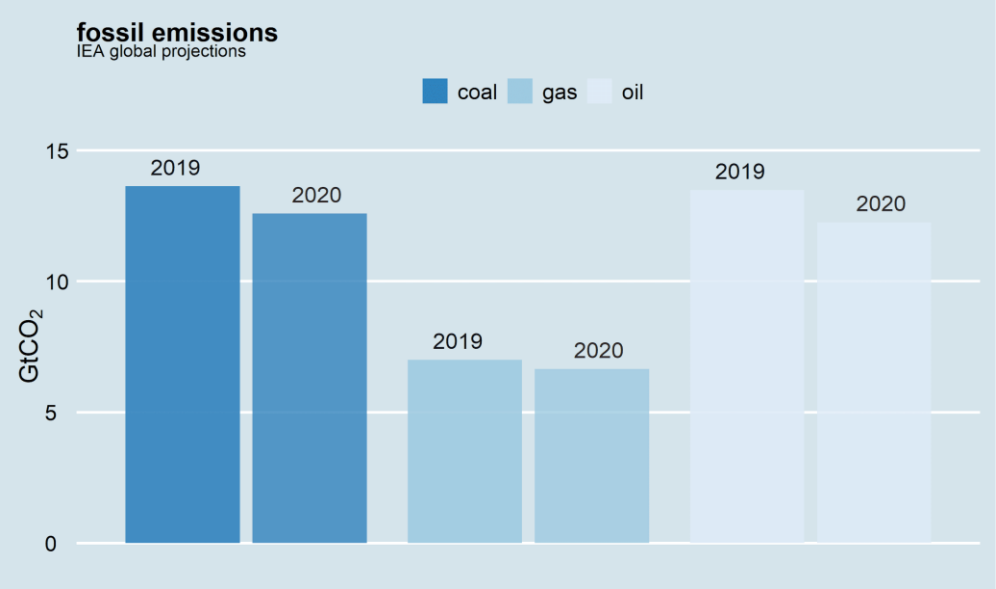

Figure 1. Global fossil fuel emissions. 2020 CO_2 emissions are projected to fall by 2.6Gt, a fall of nearly 8% relative to 2019 (IEA, 2020).

In this article, we probe the impact of the COVID-19 crisis on future climate policy. While the dramatic fall in emissions shown in Figure 1 may not be sustained in the longer term, drops of this magnitude may have consequences for existing climate change policies and in particular for the 2030 European Union emissions reduction targets.

The EU has a binding target of at least 40 percent reduction in greenhouse gas emissions by 2030, compared with the 1990 levels. A further tightening of this target to 50-55% was already under negotiation before the crisis as part of a Green Deal that would invest trillions into European member states to create a future sustainable EU economy. The more stringent target is necessary to achieve the promise made under international climate agreements to limit global warming to well below 2°C and pursue efforts to limit it to 1.5°C. Pre-covid, this new target was considered very challenging, especially for countries like Ireland with a poor track record on earlier targets.

Previous crises have varied in the extent of their impact on energy demand. The oil crisis in 1973, for example, led to a reduction in the global reliance on oil and slowed down the global growth of CO_2 emissions for several years. The impact of the 2008 financial crisis on global CO_2 emissions on the other hand was very short-lived; emissions quickly rebounded in 2010 [3, 4]. The COVID-19 economic downturn will again cause European CO_2 emissions to fall in the immediate future. Our research examines how these transformed economic scenarios will impact CO2 emissions and EU

climate targets. We assess whether more ambitious emissions mitigation targets might now be feasible; and if so, whether we should now change our approach to 2030 climate targets.

Crisis recovery scenarios

The impact of the COVID-19 pandemic on economic activity and hence CO_2 emissions will depend on how long the lockdown lasts and when and how the economy will recover. The effects are likely to be significant, greater by some margin than the 2008 financial crisis or the 1970s oil shocks [5]. International assessments of the economic impact of the pandemic have become progressively more pessimistic following the extension of containment measures round the globe. The European Commission recently forecast contraction of 7.75% in 2020 followed by rebound of 6.25% in 2021 while European Central Bank (ECB) economists now put 2020 Eurozone growth in the range -5% and -12% [6]. Standard and Poor's (S&P) forecast an output drop of -7.3% in 2020 with only a partial rebound in 2021, in line with similar numbers from the International Monetary Fund (IMF) [7]. S&P and others have highlighted further risk to the downside.

In an influential briefing, McKinsey [8] considered a matrix of scenarios depending on (1) how soon the virus is contained and (2) the success of measures to protect the economy and financial system. We use two of these scenarios to model future CO_2 emissions. In the A3 "Rapid containment" scenario the virus is contained by Q3 2020. The "Muted recovery" A1 scenario sees further lockdown measures in Q4 and more widespread business failures, larger government deficits, credit market distress etc. "Muted recovery" is more pessimistic than the S&P forecast, but is still not a worst case scenario. The more optimistic "Rapid containment" shows a strong economic rebound in 2021.

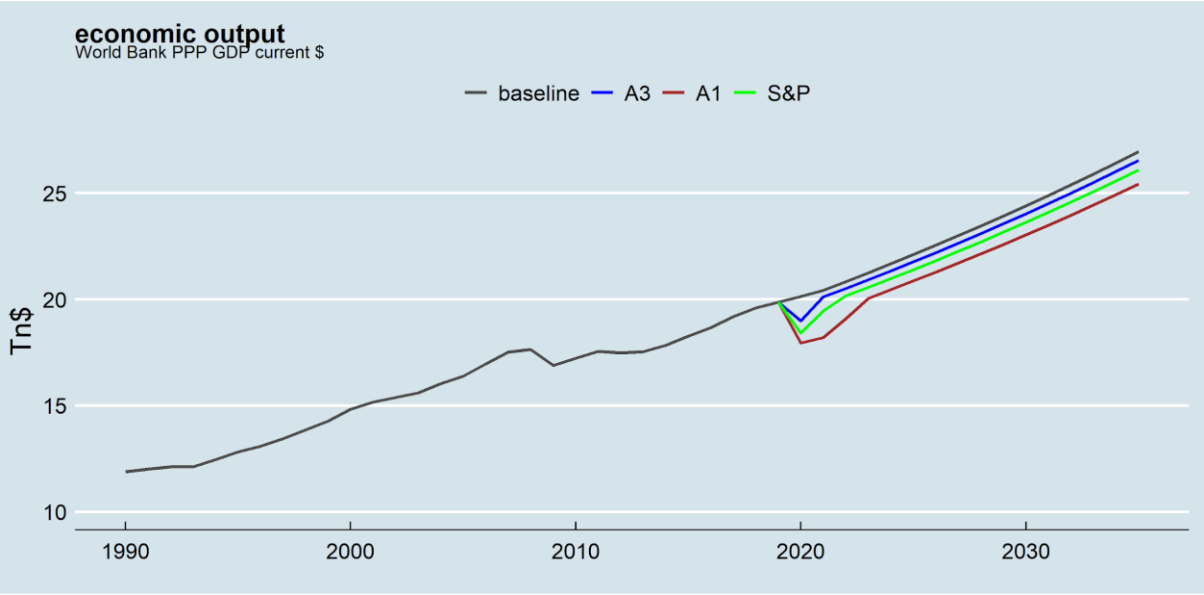

Figure 2. Economic output (as measured by World Bank PPP GDP current $) assuming a long-term post-crisis growth rate of 2%.

CO_2 emissions

Energy and carbon intensities of economic output have trended lower over time. In Europe, the 2017 carbon intensity of 0.18$GtCO_2$/Tn$ represented a 51% decline relative to 1990 (Figure 3). The objective of climate policy is to lower carbon intensity. The fraction μ represents the gap between no policy, or business as usual (BAU), emissions and the reduction in emissions achieved as a result of climate policy [9]. Integrated assessment models estimate costs using abatement cost curves that are convex functions of μ [9]. A higher emissions reduction target corresponds to a higher value of μ and higher costs.

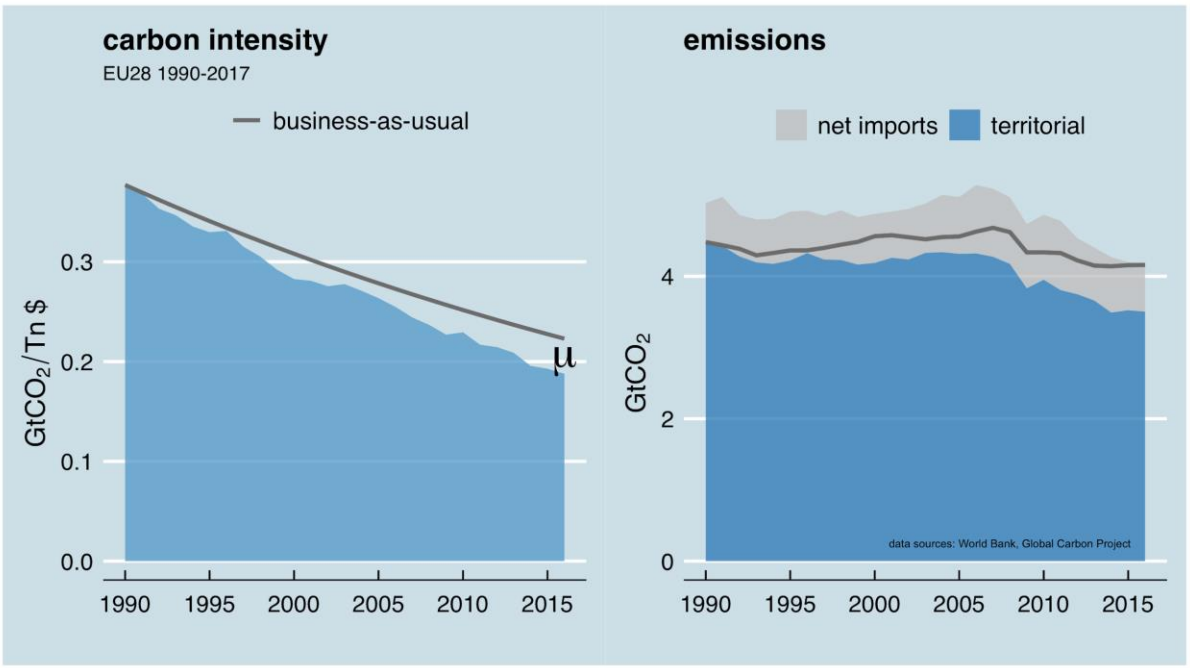

Figure 3. Carbon intensity and emissions (fossil CO_2 and cement) for EU28. Economic output measure is GDP PPP current $ (World Bank). The solid line indicates business-as-usual (BAU) carbon intensity assumed to follow a 2% annual decay. The fractional difference between the BAU lines and blue areas corresponds to the effect of climate policy μ. μ is zero in 1990 and reaches 0.15 in 2017. Net imports of carbon emissions to EU28 from international trade are also shown for comparison.

Annual fossil CO_2 emissions will drop sharply in 2020 as a result of the fall in economic activity. While the details will differ, we assume that the current crisis follows the pattern seen following the financial crisis of 2008,[2] where there was no sustained fall in emissions

[2] By definition, the percentage annual change in emissions E is the sum of the percentage changes in output Y and carbon intensity I: $\delta E/E=\delta I/I+\delta Y/Y$. During the great financial crisis in 2009, economic output fell by 4.3% while emissions fell by 8.2%. The difference corresponds to a fall in carbon intensity. This in turn reflects a strong downturn on carbon-intensive cement production and heavy industry. The next year, Y grew by 2%, I increased by 1% and E increased by 3%. Thus, the fall in I over a two year post-crash period was in line with the long term trend as seen in Figure 3. Clearly the impact of the crisis on carbon intensity was short-lived.

intensity (Figure 3) due to the crisis. Of course, it is possible that longer term effects on carbon intensive sectors such as air transport may occur in the aftermath of COVID-19. This could also be driven by new policy measures. However, here we assume that the main implications for cumulative emissions and climate policy derive from the overall drop in economic activity. Note that non-CO_2 greenhouse gases and emissions from land use change are excluded from this analysis.

EU Policy response

We re-examine EU policy targets in light of uncertain economic outlook and the possibility of significantly lower emissions due to the COVID-19 crisis. Individual member states have produced *National Energy and Climate Plans* that detail measures needed to achieve their individual Effort-Sharing targets [10]. These plans were prepared at the end of 2019 prior to the COVID-19 crisis and therefore reflect a baseline economic growth scenario that likely no longer applies. Moreover, increased ambition is proposed under the draft *European Green Deal* and first revision of the European Union's Paris Agreement contribution. Since these ambitious targets are only a decade away, a prolonged economic crisis would have significant implications.

Figure 4 shows the effect of the pandemic on emissions targets for the A1 and S&P economic growth scenarios. We first model the emissions under the current policy measures designed to achieve 40% emissions reduction by 2030, the 'maintain current policy measures' or 'continue' policy option. We find that both economic growth scenarios lead to an early achievement of the 2030 target in 2027. The rapid containment (A3) economic scenario also results in an early achievement of the 2030 target, albeit by only 0.7 years. We compare these new trends with an emissions path to a 52.5% reduction by 2030, the midpoint of the Green Deal target range under consideration. Even under the more pessimistic economic recovery scenario, A1, we see that current policy measures are insufficient to achieve this target.

Finally, we compare an alternative policy setting where in light of the lower economic growth, the only policy measures implemented are those necessary to achieve a 40% reduction by 2030, the 'maintain current target' policy option shown in Figure 4. It is clear from the graph that this policy option moves away from the straight line path to net zero emissions in 2050 envisaged under the European Green Deal. Effectively "maintain current target" represents a relaxation of climate policy.

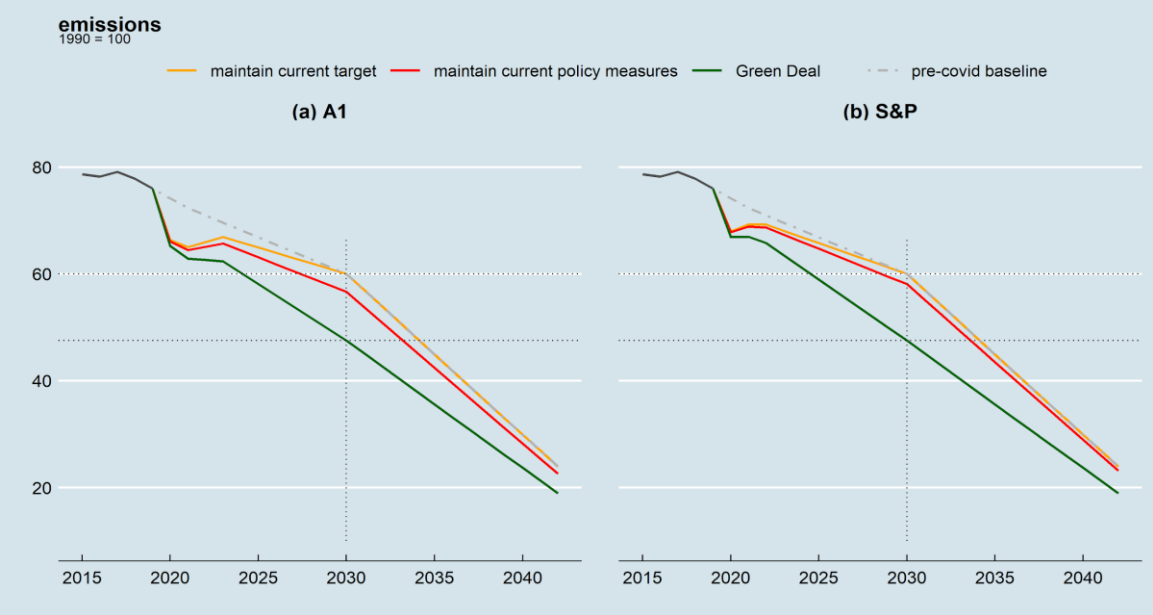

Figure 4. (a) Emissions relative to 1990 in A1 "muted recovery". (b) Emissions relative to 1990 using the S&P forecast. The 40% emissions reduction targets are achieved earlier than 2030 if the current policy measures designed to achieve 40% emissions reduction in 2030 are maintained. Only the Green Deal puts Europe on a straight line path to zero emissions in 2050.

Table 1 compares the implications of COVID-19 for existing policy measures and for the Green Deal. The current 40% EU emissions target would be achieved 2.6 years earlier than baseline under "muted recovery" if current policy measures are continued and lead to emissions reduction of 43.3% in 2030. Using an illustrative abatement cost function $0.0205\mu^{1.4}$[9], cumulative 2021-2030 savings relative to the pre-crisis baseline in the A1 economic scenario are in the order of 143Bn$, 56Bn$ and 156Bn$ under "maintain current target", "continue" and Green Deal policies respectively. Note that the impacts are quite modest in the V-shaped "rapid containment" scenario.

SCENARIO	POLICY	REDUCTION IN 2030	YEARS BEFORE 2030 40% REDUCTION REACHED	ESTIMATED % COST SAVING VS PRE-COVID BASELINE
A1: muted recovery	Continue	43.3%	2.6	-6%
	Green Deal	52.5%	5.9	-11% to -16%
A3: rapid containment	Continue	41%	0.7	-1.5%
	Green Deal	52.5%	5.2	-3% to -4%
S&P	Continue	41.9%	1.5	-3%
	Green Deal	52.5%	5.5	-6% to -8%

Table 1. Implications of COVID-19 for the current policy and for a 52.5% Green Deal target. In "muted recovery" 40% targets are achieved by mid-2027 when current policy measures are continued. Under the Green Deal this reduction is already achieved in 2024 under all scenarios. Illustrative percentage cost savings shown are cumulative discounted cost differences for 2021-2030 relative to the pre-COVID-19 baseline scenario.

Conclusions

The COVID-19 economic downturn will cause European CO_2 emissions to fall in the immediate future. Like many other societal impacts [11], the climate impacts will depend on the speed and nature of the economic recovery and government policies implemented. In this short paper, we have examined the impact of various economic recovery scenarios on the EU emissions targets with a range of policy approaches.

Our modelling estimates indicate that the 2030 40% emissions reduction goal is likely to be achieved ahead of time under the three economic recovery scenarios modelled if we continue to implement existing policy measures. A slower economic recovery will reduce the effort needed to meet the 40% target in 2030. This assumes that no other barriers to emissions reduction arise due to the COVID-19 pandemic, such as financial or innovation constraints.

We could view all this differently. Instead of relaxing our policy measures, governments could take advantage of the break in emissions increases and intensify their ambition to mitigate climate change. With sustained lower economic activity, we estimate that it will be significantly less expensive to reduce greenhouse gas emissions than previously thought. Governments could push for stronger emissions targets and associated policy measures, perhaps as part of an economic stimulus package under the framework of the Green Deal under negotiation in Europe.

The European and global economy has undergone a major shock. As governments consider how best to reboot their economies, they should make public financial support for business conditional on climate action and environmental resilience. Innovative ideas are needed to reimagine a more sustainable economic structure that creates employment in green sectors and businesses, for example in the provision of energy efficiency construction and services, renewable energy, or intelligent transport services [12].

Climate action is needed in the short, medium and longer term to avoid a future climate crisis. Emissions that are not reduced today will need to be reduced tomorrow and therefore reduced climate policy ambition now is simply a deferment of future payments for the future costs of climate damage and/or more ambitious policy. Without a significant increase in global ambition, carbon budgets corresponding to the IPCC 1.5^{o}C temperature threshold will be substantially depleted within a decade [13].

There are also additional benefits associated with climate action such as public health and well-being that should be included in any weighing up of the costs and benefits of climate action. Understanding the consequences of the COVID-19 pandemic on climate policies and targets reveals policy options. The stronger measures needed to reach Green Deal goals may be less costly than previously anticipated. Governments should not take the easy way out and relax emissions policies and settle for lower emissions targets.

Acknowledgements

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Appendices

Appendix A. Growth assumptions

Growth rate assumptions are summarised in Table 2.

	2020	2021	2022	2023
Baseline	1.4%	1.4%	2%	2%
A3: rapid containment	-4.4%	5.9%	2%	2%
A1: muted recovery	-9.7%	1.4%	5%	5%
S&P April 2020	-7.3%	5.6%	3.7%	2%

Table 2. Growth rate scenarios. EU28 and Eurozone growth rates are assumed to be the same. Prior to COVID-19, Eurozone growth was forecast to be 1.4% in 2020 and 2021 (World Bank).

Appendix B. Sensitivity analysis

Realised emissions reduction relative to 1990 in the "continue" policy option depends only on the loss of output relative to baseline due to the pandemic (Figure 2). The relationship is simply $T = T_0 + (1 - T_0)\frac{Y_{baseline} - Y}{Y_{baseline}}$, where T is the emissions reduction achieved in 2030, T_0 is the original emissions reduction target and $Y_{baseline}$ is baseline output in 2030. For example, current policy measures would be sufficient to reach a 50% reduction target if output in 2030 were 17% below baseline. Clearly the target overshoot $T - T_0$ is insensitive to the BAU emissions intensity assumption and only weakly sensitive to baseline growth assumptions.

On the other hand, the illustrative abatement costs are sensitive to both assumed BAU decay in carbon intensity and baseline economic growth. Of course, costs also depend on the assumed total abatement cost curve model. Figure 5 shows the dependence of European Green Deal abatement costs on parameters in the "muted recovery" scenario. Note that the cost of Green Deal 2021-2030 is $1.3Tn with our central parameters, smaller than the cost of measures to deal with the pandemic.

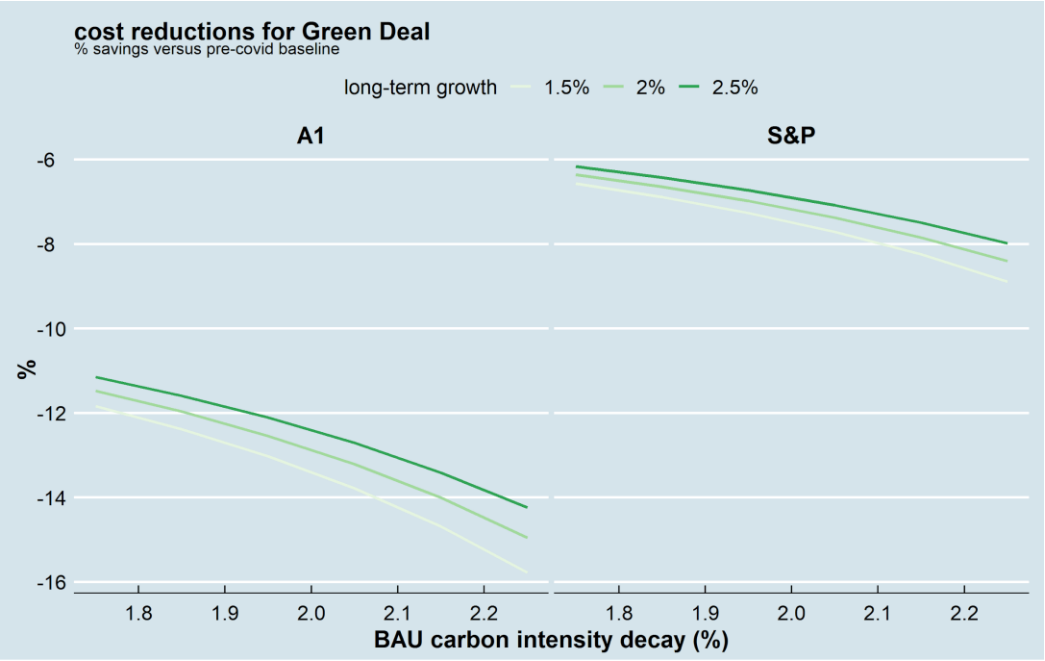

Figure 5. Sensitivity of Green Deal illustrative costs to key modelling parameters relative to a baseline of no COVID-19 pandemic. The x-axis is the BAU carbon intensity decay rate, and % cost reductions are shown for long term growth rates 1.5%, 2% and 2.5%. Savings for "muted recovery" for example lie in the range -11% to -16% (see Table 1).