ASSESSMENT OF GREEN RECOVERY PLANS AFTER COVID-19

October 2020

cambridge econometrics
clarity from complexity

WE MEAN BUSINESS
COALITION

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Executive Summary

Background context

It is now clear that Covid-19 is going to result in a substantial economic cost, in terms of both GDP and lost jobs, in the first half of the 2020s. In most countries, the economic recovery will not be immediate and much of the lost output will never be made up. The model results presented in this report suggest that labour markets may not start to recover until the mid-2020s.

This report assesses two recovery plans that could boost both GDP and protect jobs. The first plan follows a 'return to normal' approach by reducing VAT rates and encouraging households to resume spending. The second plan is a 'Green' Recovery Plan that aims to boost economic activity while simultaneously reducing CO_2 emissions.

The Green Recovery Plan

Both plans have the same cost to government. The Green Recovery Plan includes a (smaller) reduction in VAT and otherwise consists of:

- Public investment in energy efficiency
- Subsidies for wind and solar power
- Public investment in upgrading electricity grids
- A car scrappage scheme in which subsidies are only provided to electric vehicles
- A tree planting programme

Key findings

The two recovery plans were assessed using Cambridge Econometrics' E3ME macroeconomic model. The key findings are:

- Both recovery plans provide immediate boosts to output and employment, but the impact is consistently larger in the Green Recovery Plan. The Green Recovery Plan may also provide long-term economic benefits.
- The VAT recovery plan is effective at increasing consumer spending but does not increase investment by much. A broader set of policies, such as in the Green Recovery Plan, is required to increase production and jobs across the whole economy.
- Although Covid-19 may reduce global CO_2 emissions substantially in 2020, by 2030 the reduction is expected to be only 2%. The VAT recovery scenario would not reduce emissions further. The Green Recovery Plan could reduce emissions by a further 7% globally. While not enough to be consistent with the Paris Agreement, this reduction would provide a starting point for further policy.
- All five environmental policies boost GDP and employment. The car scrappage scheme has the largest overall impacts on GDP and employment up to 2030. However, it does not always provide the largest reduction in emissions, especially in countries that still use coal to generate electricity. Some tailoring of policies is therefore needed at national level.

This report presents the model results at global level, EU level and for six countries. In all countries the Green Recovery Plan produces the best results for GDP, employment and emission reductions. The results suggest there is a strong case for including the policies listed above in national responses to Covid-19.

1 Covid-19 and the Green Recovery

1.1 The economic impacts of Covid-19

'Unprecedented' economic cost

As 2020 has progressed, the economic impacts of Covid-19 have become clearer. Falls in production have been unprecedented. Millions of people around the world have come to rely on government support mechanisms.

The effects of the pandemic have been quite different to those of the global financial crisis. The sectors impacted are primarily those that serve consumers, especially in 'social' sectors such as hospitality, although falls in investment have now made the impacts much wider. However, the scale and nature of the impacts has meant that no sector has been left unaffected.

The modelling of Covid-19 in this report builds on the approach developed by Cambridge Econometrics in mid-2020[1]. The scenario has been updated to take in more recent information, with the macro level outcomes for each country remaining similar to those predicted by the IMF[2].

The impacts on employment have been estimated by the model. It is important to note that the change in employment in this report reflects only the change in employment due to economic conditions; it does not include workers who are unable to work because of direct restrictions (which would be expected to be removed once we enter recovery phase). The loss of employment including these restrictions would be much higher[3].

Although Covid-19 continues to cause economic damage, thoughts are now turning to 'what next'? Eventually, government support schemes will transition to economic recovery measures. But the nature of the recovery is also important, with impacts that could last well beyond the current short-term timeframe that policy makers are currently focusing on.

The costs of a changing climate

At the same time, the effects of climate change are becoming increasingly obvious worldwide. The costs of both meeting the climate challenge are considerable. However, if large amounts of public spending are required anyway, why not direct it towards reducing our carbon footprints?

This question is the reason that the We Mean Business coalition, among others, have called for a Green Recovery Plan to Covid-19. This report assesses whether it is possible to have such a recovery plan that is effective at reducing greenhouse gas emissions while simultaneously boosting incomes and employment.

[1] https://www.e3me.com/developments/economic-impacts-coronavirus-e3me/

[2] https://www.imf.org/en/Publications/WEO/Issues/2020/06/24/WEOUpdateJune2020

[3] See e.g. https://www.ilo.org/wcmsp5/groups/public/@dgreports/@dcomm/documents/briefingnote/wcms_755910.pdf

1.2 Assessing a green recovery plan

We use Cambridge Econometrics E3ME macroeconomic model[4] to assess the socio-economic and environmental impacts of such a green recovery plan. Four scenarios are developed to carry out the assessment:

- A pre-covid 'business as usual' base case
- No recovery plan (Covid-19 baseline case)
- A VAT recovery scenario (VAT rates reduced by five percentage points worldwide[5])
- The Green Recovery Plan (see below)

The level of support in both the VAT and green recovery packages remains in full force over the period 2021-2023, and is gradually phased out over time as the global economy recovers from the effects of Covid-19.

When presenting results in the following sections, we show the impacts as deviations from the pre-covid base case, so that the charts show both the impacts of Covid-19 and how the recovery packages mitigate these impacts.

1.3 The Green Recovery Plan

The Green Recovery Plan in this report consists of five distinct policies, described in turn below. These five policies are combined with a more conventional measure (VAT cuts) to provide an economic stimulus that reduces job losses over the period 2021-2024.

The recovery plan is additional to any government support measures that have already been implemented during the pandemic (these measures are included in all the scenarios except the pre-covid baseline).

Increased energy efficiency in buildings

Due to inertia and long-lived capital stock, buildings will be one of the most difficult sectors to decarbonise. In most countries, the impacts of policy so far have been relatively limited.

This policy sets a mandate to increase energy efficiency in buildings. It includes measures such as insulation and double glazing, and also the use of more efficient appliances.

It is assumed that energy consumption in buildings falls by 8% compared to what it otherwise would have been, with most of the energy saving measures being implemented over 2021-2023. This scale of reductions is seen as ambitious but achievable; for example, it would cover the gap in the EU to be consistent with its proposed new 2030 targets.

The investment costs are derived from IEA analysis[6]. It is assumed that the costs are covered by national governments as part of the economic recovery measures.

[4] https://www.e3me.com

[5] Sales taxes in the US.

[6] https://www.iea.org/topics/energy-efficiency

Subsidies for wind and solar deployment

Decarbonising the power sector remains the priority for reducing emissions in many countries. The costs of wind and solar power have fallen dramatically in recent years, with the technologies now becoming established in most countries.

Rates of uptake remain limited, however, by the long lifetimes of existing infrastructure and industry inertia. This policy aims to boost uptake by offering a capital subsidy of 50% on new wind and solar equipment. This subsidy is paid by national governments as part of the recovery package. It aims to lead to both a less carbon-intensive energy system and lower electricity prices.

The subsidy rate of 50% was chosen because it should lead to a high rate of uptake[7], but places a limit on the public sector contribution to costs.

Improvements to electricity grids

The combination of a more electrified energy system and a higher share of intermittent renewable generation will lead to a need for improved electricity grid infrastructure. Rather than risk this need becoming a bottleneck on energy system development, in the Green Recovery Plan grid improvements are accelerated.

At present, this measure does not include large-scale investment in storage technologies; the focus is instead on increasing capacity and improving interconnections. However, it is implicitly assumed that the grid enhancements are aimed at integrating higher variable renewable generation.

National governments cover the investment costs as part of the recovery plan.

An EV car scrappage scheme

After the 2008 financial crisis, several countries implemented schemes whereby old vehicles could be replaced by more efficient ones. The scheme modelled here is similar, except it is only available for purchases of battery electric vehicles (EVs, excluding hybrid vehicles).

It is assumed that national governments pay 20% of the cost of the new vehicle, bringing costs of EVs closer to average conventional vehicle costs (and much cheaper from a lifetime cost perspective).

In the modelling, it is assumed that initially households bring forward vehicle purchases using savings accumulated during lockdown periods. Over time, however, additional spending on vehicles starts to displace other spending, meaning that the stimulus effects are smaller.

Tree planting across the world

Tree planting provides a relatively easy way to boost employment in a struggling economy. In the scenario we assume that an additional 10 billion trees are planted worldwide over 2021-2023. While ambitious, it should be noted that the total number of trees planted would still fall a long way short of the target of the Trillion Tree Campaign[8].

The 10 billion trees are allocated to countries based on a combination of land mass and the size of the current forestry sector in each country. It is assumed that each tree costs on average $12 to grow and plant, with 50% of the cost accounted for by wages that vary between countries.

[7] Higher subsidy rates do not lead to much faster rates of uptake because of grid constraints.

[8] https://en.wikipedia.org/wiki/Trillion_Tree_Campaign#:~:text=The%20Trillion%20Tree%20Campaign%20is,Movement%20in%20Africa%20in%201977.

In our analysis, the emissions savings from each tree are assumed to be 1 tCO_2, shared equally over a 100-year lifetime.

2 Global Results

2.1 Socio-economic impacts

Macro outcomes

Figure 2.1 shows the global impacts on GDP. Covid-19 is expected to cost 8% of global GDP (measured at market exchange rates) in 2020. Some of the lost output is made up in future years, but even by 2030 GDP is 4% below the pre-covid baseline value.

The VAT reduction scenario gives an immediate boost to the global economy, that gradually reduces up to 2030. In comparison, the Green Recovery Plan gives a larger stimulus and also shows a permanent benefit to GDP.

Figure 2.2 shows the impacts on employment. Global employment falls by more than 50 million people in 2020 and, without support, employment keeps on falling until 2023. The recovery plans aim to stop further reductions in employment. Again, the Green Recovery Plan produces better results, both in 2021 and in the long term.

Figure 2.1: GDP impacts at global level

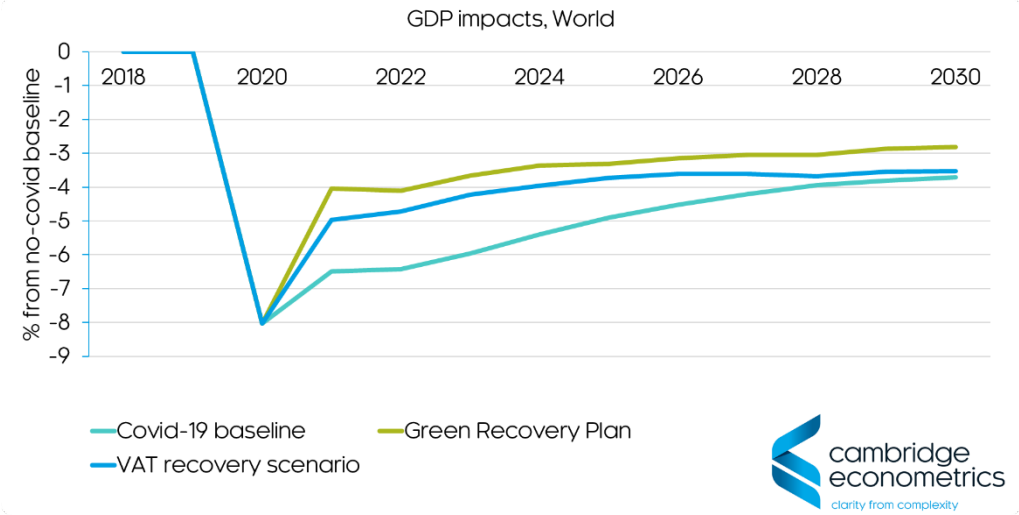
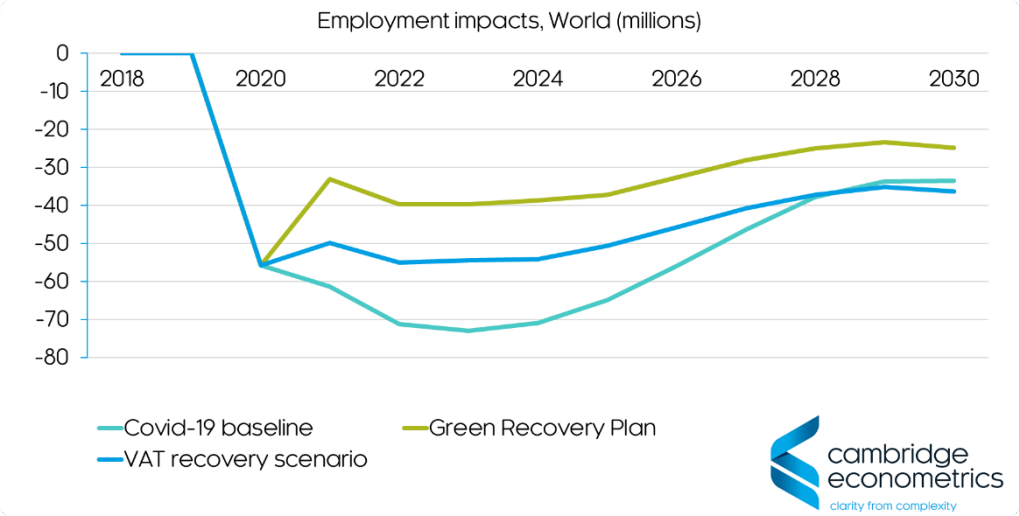


Figure 2.2: Employment impacts at global level



Sectoral impacts

Covid-19 has affected all sectors of the global economy (see Table 2.1). The most affected sectors are those that produce investment goods and consumer services. The VAT recovery scenario is effective at boosting demand for consumer services (which it lowers the price of). However, the Green Recovery Plan leads to better results across all sectors except for energy and utilities.

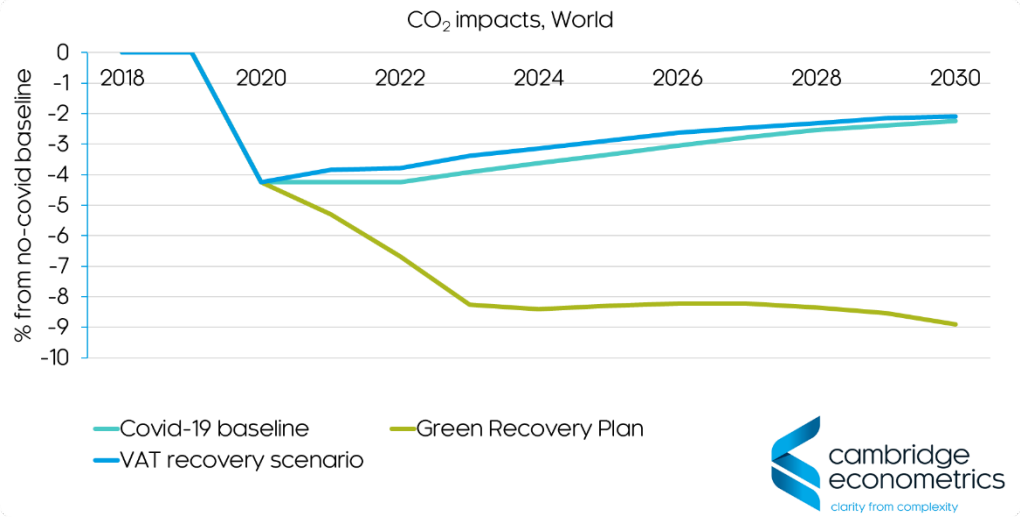
Table 2.1: Sectoral production impacts at global level (2024), % from no-covid baseline

	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-1.4	-0.4	-0.6
Energy and Utilities	-2.4	-4.1	-2.0
Basic Manufacturing	-4.1	-2.4	-3.2
Advanced Manufacturing	-7.2	-5.2	-6.5
Construction	-6.5	-5.1	-6.2
Consumer Services	-5.0	-2.9	-3.3
Transport and Comms.	-3.2	-2.2	-2.1
Business Services	-4.5	-2.6	-3.2
Public Services	-0.9	0.2	-0.4

2.2 Impacts on CO_2 emissions

Figure 2.3 shows the impact of the scenarios on CO_2 emissions. Global emissions are expected to fall by at least 4% in 2020 but the effect is expected to be temporary. However, the Green Recovery Plan could lead to a long-term reduction in emissions of around 9%, with contributions from all the different policies included in it (see below).

Figure 2.3: CO_2 impacts at global level

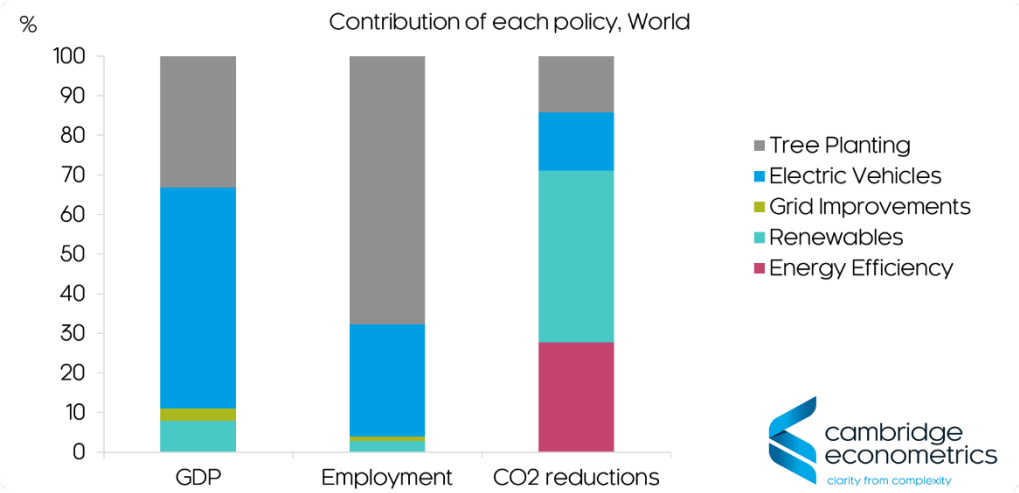


2.3 Contribution of each policy

Figure 2.4 shows the contribution that each policy makes to the impacts on GDP, employment and CO_2 emissions. The chart shows that the single biggest impact on GDP comes from the car scrappage scheme. However, the tree planting programme is more effective for creating jobs, particularly in developing countries with low labour costs.

We do not attribute any direct emission reductions to grid improvements (it is more of an enabling technology), but all four of the other policies make a substantial contribution over 2021-30. The largest impacts are from the renewables subsidies, followed by the energy efficiency measures.

Figure 2.4: Contribution of each policy, global level (2021-2030)



3 Results for the EU

3.1 Socio-economic impacts

Macro outcomes

The Covid-19 pandemic is expected to cost the EU between 8 and 9% of GDP, with around half of that being made up by 2030 (see Figure 3.2). The two recovery packages have immediate benefits to GDP in 2021, with the Green Recovery Plan being slightly better. By 2030, however, the results for the Green Recovery Plan are much better. This is in part driven by reductions in fuel imports to Europe, which outlast the initial investment stimulus.

Figure 3.1 shows the impacts on employment. The model results show that, without support, a prolonged slump in employment to 2023 is possible. The VAT recovery scenario and Green Recovery Plan are effective at stopping the slump getting worse. The Green Recovery Plan also has long-term benefits for employment levels in the EU.

Figure 3.2: GDP impacts in the EU

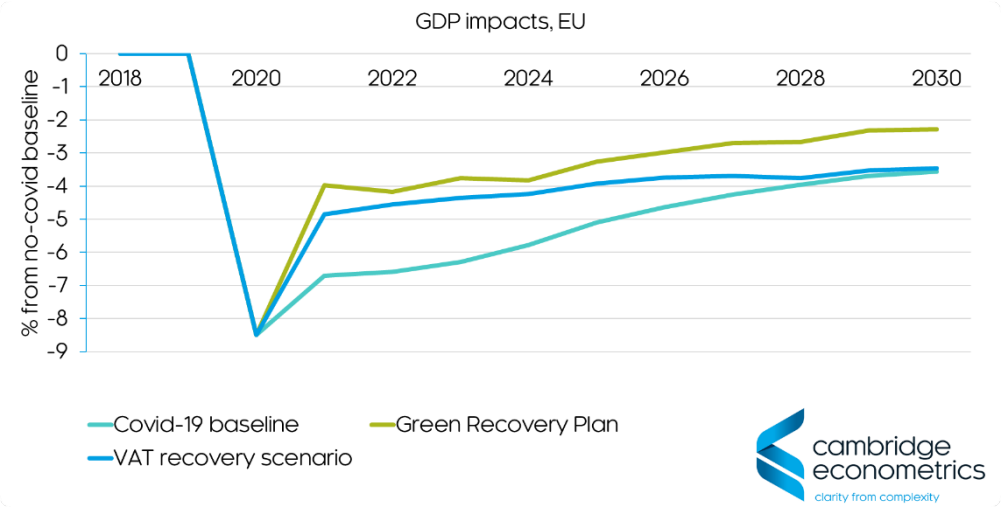
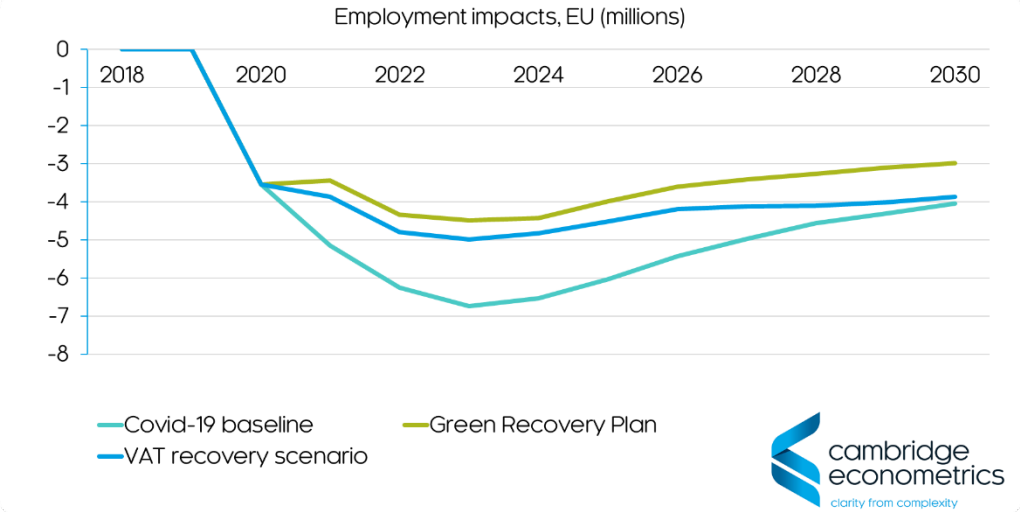


Figure 3.1: Employment impacts in the EU



Sectoral impacts

Table 3.1 shows the impacts of Covid-19 and the recovery plans on each sector in 2024. Consumer services were initially affected by the pandemic, but a loss of investment means that manufacturing and construction have also been hit hard. The VAT recovery scenario largely benefits the consumer services sector (which can lower prices if VAT is reduced). The Green Recovery Plan also brings back some of the lost output in manufacturing and construction, for example driven by renewables construction and purchases of electric vehicles.

Table 3.1: Sectoral production impacts at global level (2024), % from no-covid baseline

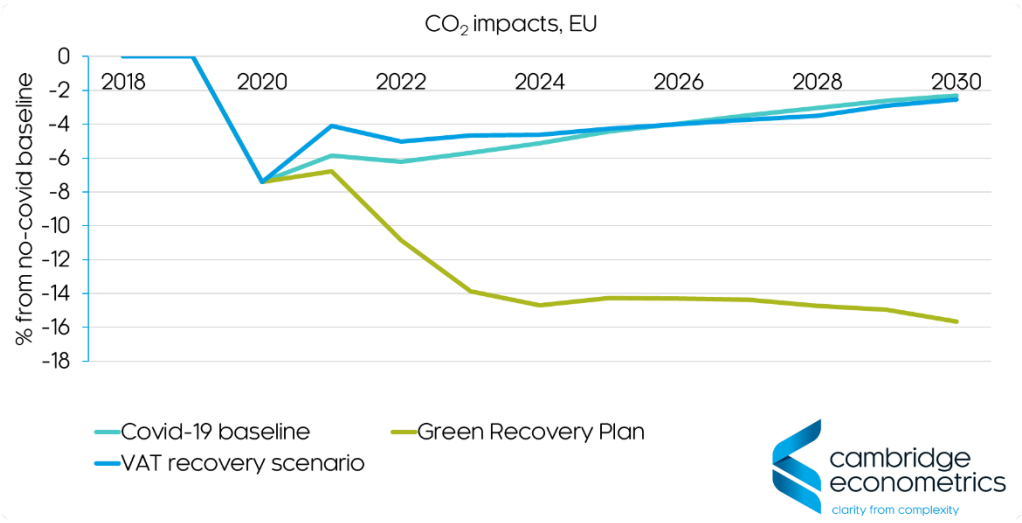
	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-3.2	-0.9	-1.9
Energy and Utilities	-4.8	-6.3	-3.6
Basic Manufacturing	-7.1	-4.5	-5.8
Advanced Manufacturing	-11.8	-9.6	-11.0
Construction	-9.8	-8.0	-9.3
Consumer Services	-6.7	-4.1	-4.6
Transport and Comms.	-4.6	-4.8	-3.4
Business Services	-4.6	-2.7	-3.2
Public Services	-1.1	-0.3	-0.6

3.2 Impacts on CO_2 emissions

Figure 3.3 shows the impact of the scenarios on CO_2 emissions. The estimated reduction in emissions from Covid-19 is conservative and does not include the early closure of some coal plants. However, the model results match the consensus that by 2030 the impacts of Covid-19 will be limited.

The Green Recovery Plan scenario shows a large reduction in emissions, reaching 16% by 2030. All the policies contribute to this reduction (see below). It is noticeable that reductions in emissions continue after 2021-2023, indicating the long-term benefits of establishing low-carbon technologies in the European market.

Figure 3.3: CO_2 impacts in the EU



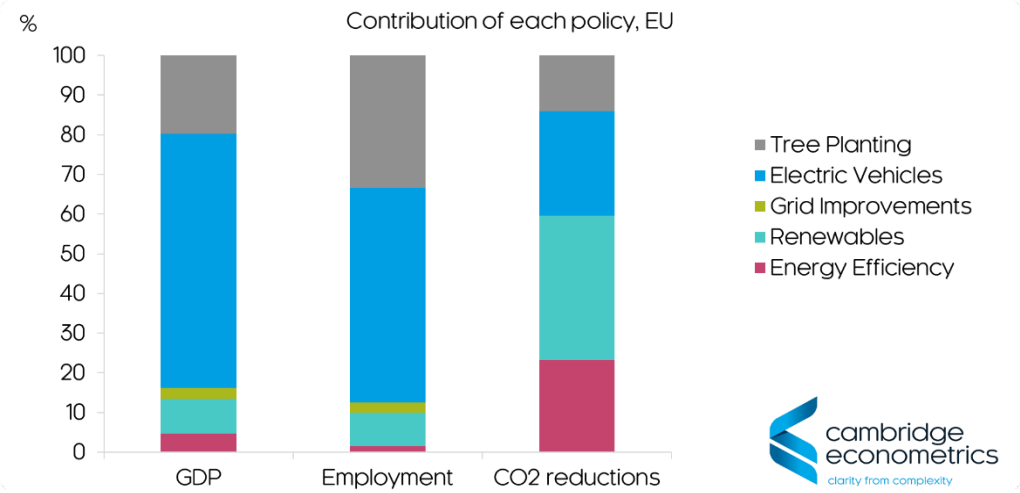
3.3 Contribution of each policy

Figure 3.4 shows the percentage contribution of each environmental policy to the aggregate outcomes in the Green Recovery Plan, aggregated across 2021-2030. For GDP, the largest contribution comes from the car scrappage scheme that promotes EVs. The impact of the renewables subsidies is less, in part because renewables are being built anyway in Europe. The energy efficiency investment creates activity over the crucial period 2021-2023 but less thereafter, so has a more modest impact overall.

The contribution of each policy to jobs is similar to that for GDP, but the tree planting programme has a larger impact. The main reason is that the jobs related to tree planting are lower skilled than those related to electric vehicles, so the same amount of funding can create more jobs.

The right-hand bar on the figure shows that the biggest contribution to reducing emissions comes from the renewables subsidies, which push large amounts of coal power in Europe out of the market and so are effective at reducing total emissions. The energy efficiency and EV promotion also make a substantial contribution to the total, with the tree planting accounting for the remaining 14% of emission reductions.

Figure 3.4: Contribution of each policy in the EU (2021-2030)



4 Results for Germany

4.1 Socio-economic impacts

Macro outcomes

Figure 4.1 and Figure 4.2 show the impacts of the five measures on GDP and employment. The VAT recovery scenario is added for comparison.

Although the consensus is that Germany has handled the Covid-19 crisis relatively well, its economy has been weakened by a global fall in demand for the high-value machinery that it exports. Some of its neighbours have also been severely affected by the pandemic. Without support, the German economy is therefore not expected to rebound quickly.

Both the VAT and Green Recovery Plan scenarios have an immediate effect on stimulating the economy and preventing further job losses. However, the model results suggest that some further longer-term support could be required.

The results from the Green Recovery Plan are consistently better than those from the VAT recovery scenario, both in terms of GDP and employment.

Figure 4.1: GDP impacts in Germany

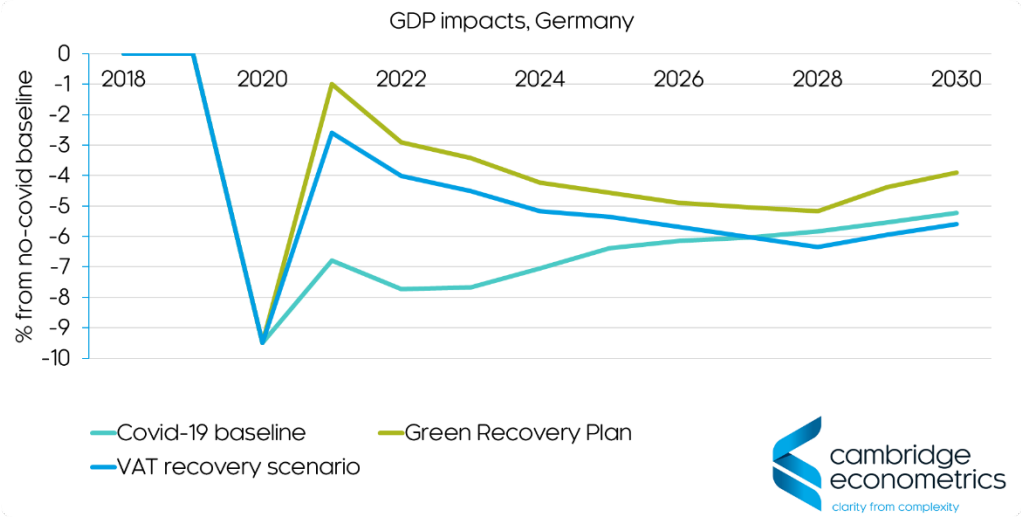
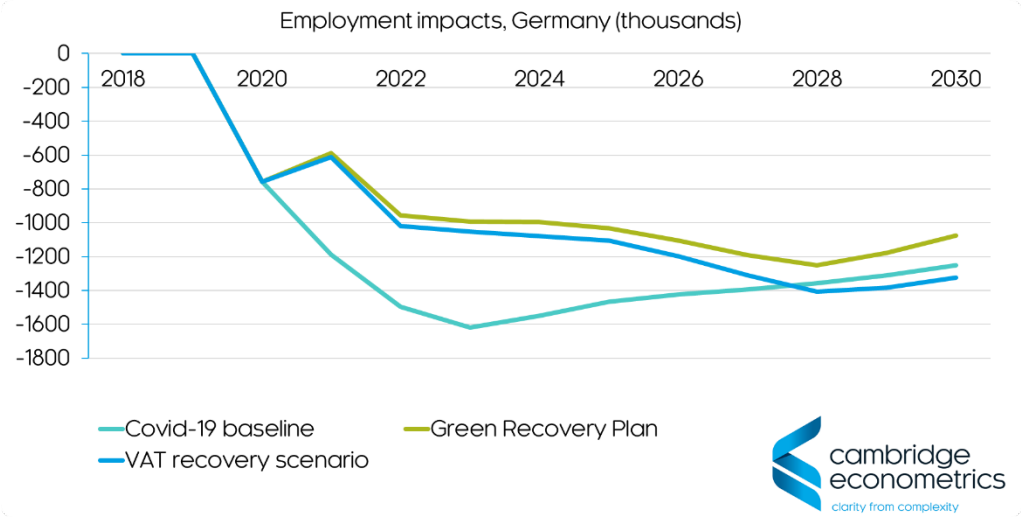


Figure 4.2: Employment impacts in Germany



Sectoral impacts

Table 4.1 shows the impacts of the measures on each sector in 2024. The impacts of Covid-19 are greatest in the manufacturing sectors that supply investment goods and consumer services.

The VAT and Green Recovery Plan scenarios are both effective at boosting activity in most sectors. Results for the Green Recovery Plan are better, particularly in the services sectors. The only sectors that fare worse under the Green Recovery Plan are the energy sectors, which see reduced demand from the efficiency measures.

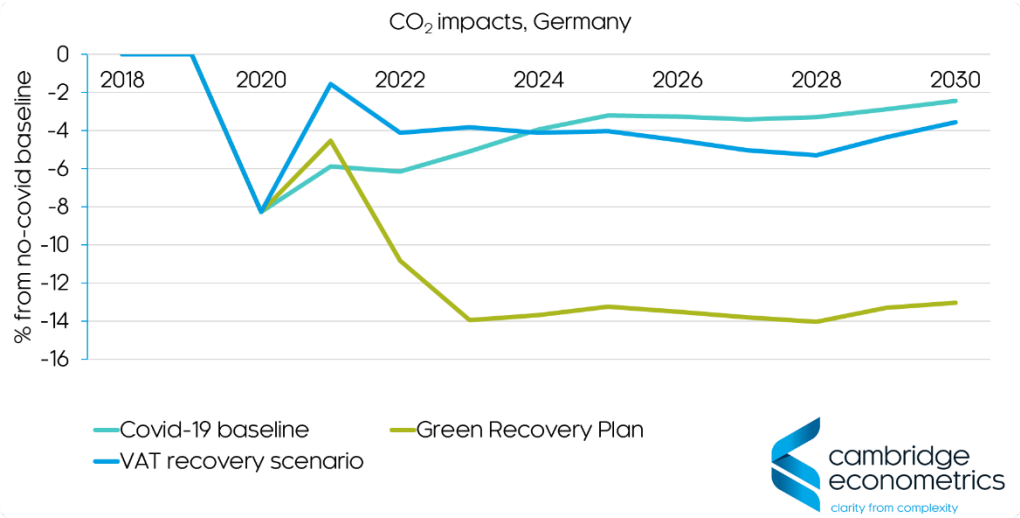
Table 4.1: Sectoral production impacts in Germany (2024), % from no-covid baseline

	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-6.0	2.1	2.5
Energy and Utilities	-6.0	-6.8	-4.4
Basic Manufacturing	-10.2	-7.1	-7.8
Advanced Manufacturing	-13.4	-12.0	-13.1
Construction	-11.5	-9.1	-10.8
Consumer Services	-8.2	-3.8	-5.1
Transport and Comms.	-7.2	-3.8	-4.8
Business Services	-5.9	-2.9	-3.8
Public Services	-1.3	-0.2	-0.7

4.2 Impacts on CO_2 emissions

Figure 4.3 shows the impact of the scenarios on CO_2 emissions. In both the Covid-19 and VAT recovery scenarios emissions end up by 2030 only slightly below the no-covid baseline. However, the Green Recovery Plan could lead to a large and sustained reduction in emissions. Overall CO_2 emissions in Germany fall by more than 12% by 2023 compared to baseline; by 2030 the relative reduction in emissions is similar.

Figure 4.3: CO_2 impacts in Germany



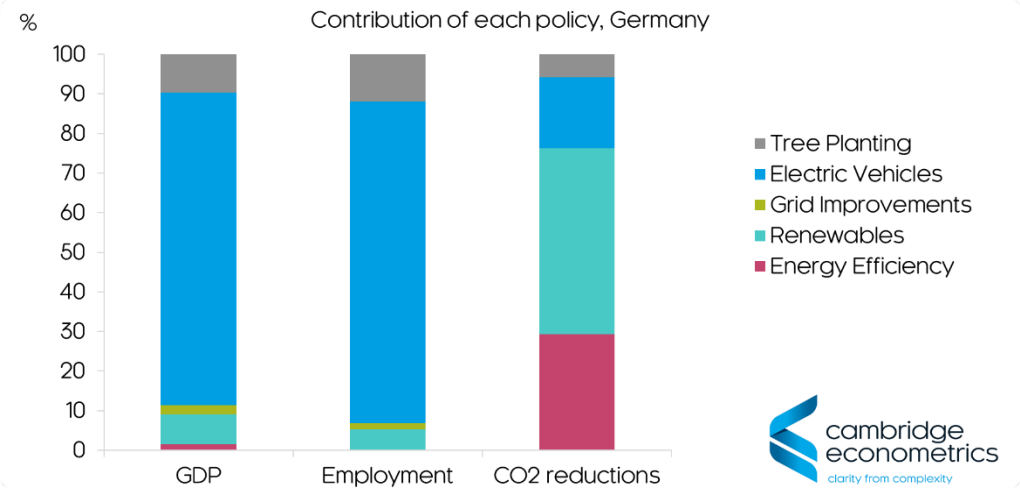
4.3 Contribution of each policy

Figure 4.4 shows the percentage contribution of each environmental policy to the aggregate outcomes in the Green Recovery Plan, aggregated across 2021-2030. For both GDP and employment, around 80% of the benefits come from the car scrappage scheme and EV promotion. This result reflects both the potential of building the EV market share in Germany, but also the impact of exporting additional vehicles to other countries.

In contrast, around half of the domestic emission reductions in Germany come through the renewables subsidies, with another quarter coming from the energy efficiency measures. The contribution from EVs is smaller, although it should be noted that there is an additional benefit from the interaction of having more EVs and increased renewables to power them that is not shown in the chart.

The tree planting scheme makes a small additional contribution.

Figure 4.4: Contribution of each policy in Germany (2021-2030)



5 Results for Spain

5.1 Socio-economic impacts

Macro outcomes

The model results suggest that the Spanish economy will be hit hard by Covid-19, with a long road to recovery. Figure 5.1 and Figure 5.2 show the impacts of Covid-19 and the recovery plans on GDP and employment.

The recovery plans are successful in both reducing the short-term negative effects of Covid-19 and increasing GDP in the long run. Both recovery packages show benefits but these are consistently larger (by around 1% of GDP) for the Green Recovery Plan.

The recovery packages are also able to reduce the loss of jobs in Spain (by around 400,000 people in the Green Recovery Plan). However, the persistent nature of reduced employment levels in Spain suggests that some longer-term measures to boost employment may also be required.

Figure 5.1: GDP impacts in Spain

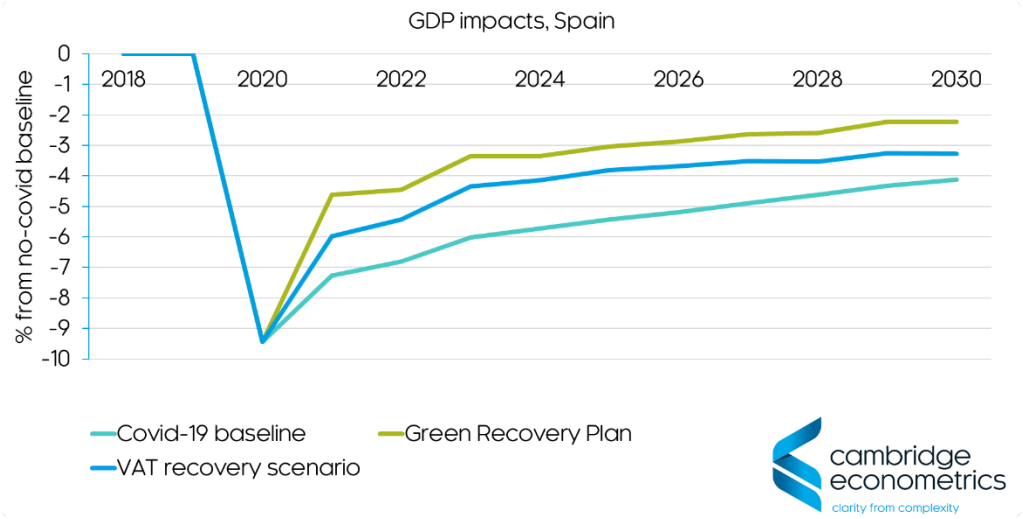
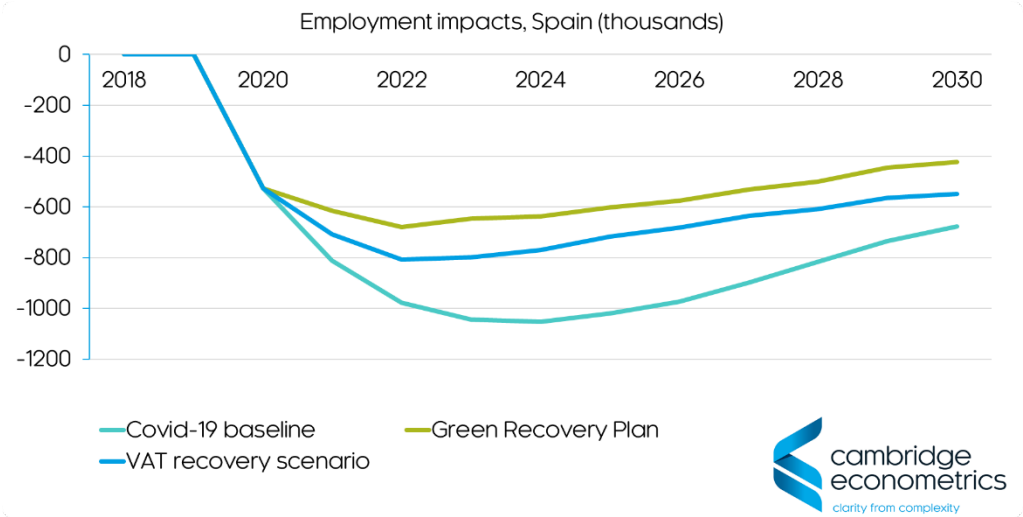


Figure 5.2: Employment impacts in Spain



Sectoral impacts

Table 5.1 shows the impacts on sectoral production in Spain. Although the Spanish economy is particularly impacted through a loss of tourism, consumer services have started to recover by 2024. However, with levels well below capacity, investment remains weak and recovery is much slower in the advanced manufacturing (e.g. engineering) and construction sectors.

The VAT recovery scenario provides a boost to household expenditure and therefore the consumer services sectors. The impact on investment sectors like construction is more noticeable in the Green Recovery Plan. Overall, with the exception of energy and utilities, all sectors see the smallest reduction in output in the Green Recovery Plan.

Table 5.1: Sectoral production impacts in Spain (2024), % from no-covid baseline

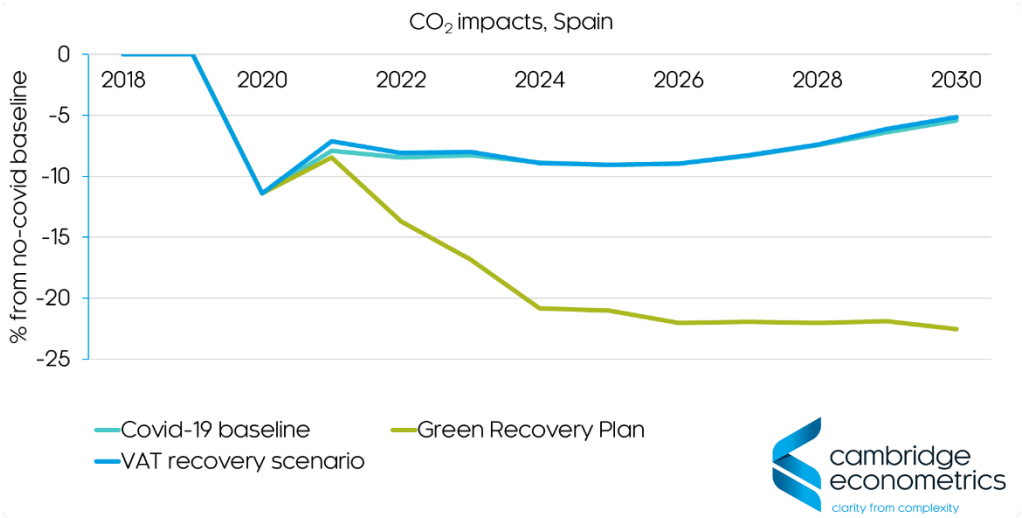
	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-5.5	-2.1	-3.8
Energy and Utilities	-6.8	-7.1	-5.1
Basic Manufacturing	-8.4	-6.1	-7.0
Advanced Manufacturing	-14.9	-11.6	-13.4
Construction	-8.8	-7.2	-8.4
Consumer Services	-6.1	-3.3	-4.4
Transport and Comms.	-4.6	-3.2	-3.4
Business Services	-3.7	-2.2	-2.7
Public Services	-1.6	-0.4	-1.0

5.2 Impacts on CO_2 emissions

The prolonged loss of production in the Spanish economy means that CO_2 emissions are still 5% below the pre-covid baseline in the Covid-19 scenario (see Figure 5.3). The VAT recovery scenario has little impact on emissions.

The Green Recovery Plan shows substantial emissions reductions, however. Driven by uptake of renewables and electric vehicles (see below), Spanish emissions could be reduced by a further 15% by 2030.

Figure 5.3: CO_2 impacts in Spain

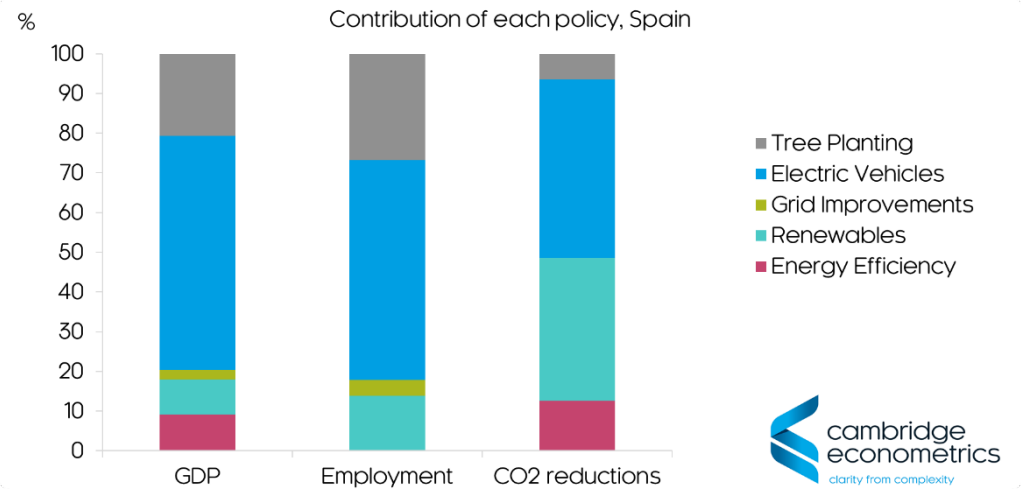


5.3 Contribution of each policy

Figure 5.4 shows how each of the five policies contributes to the green recovery in Spain (aggregated over 2021-30). Like the other European countries, the largest benefits to GDP in Spain come from the vehicle scrappage scheme; this accounts for around 60% of the GDP increase and 50% of the employment increase. The tree planting programme contributes 20-30% of the economic and employment benefits, with the rest being made up by the other policies.

The CO_2 reductions in Spain come mostly from the increase in renewables near the beginning of the period, and the increasing penetration of electric vehicles. These two measures account for around 81% of the total emissions reduction.

Figure 5.4: Contribution of each policy in Spain (2021-2030)



6 Results for Poland

6.1 Socio-economic impacts

Macro outcomes

The Polish economy has been less affected by Covid-19 than many other countries' economies and is expected to rebound back to strong growth in 2021. However, the modelling suggests that the recovery in jobs could lag that for GDP, so there is a case for economic stimulus.

Figure 6.1 shows the impacts of the three scenarios on GDP. The VAT recovery scenario could get the Polish economy almost back to baseline, nearly neutralising the effects of Covid-19. The Green Recovery Scenario could do even better, offsetting all the negative effects of Covid-19.

The results for employment (Figure 6.2) follow a similar pattern. Instead of sustained job losses due to Covid-19, the Green Recovery Plan is able to create enough jobs so that the overall net change in employment is close to zero.

Figure 6.1: GDP impacts in Poland

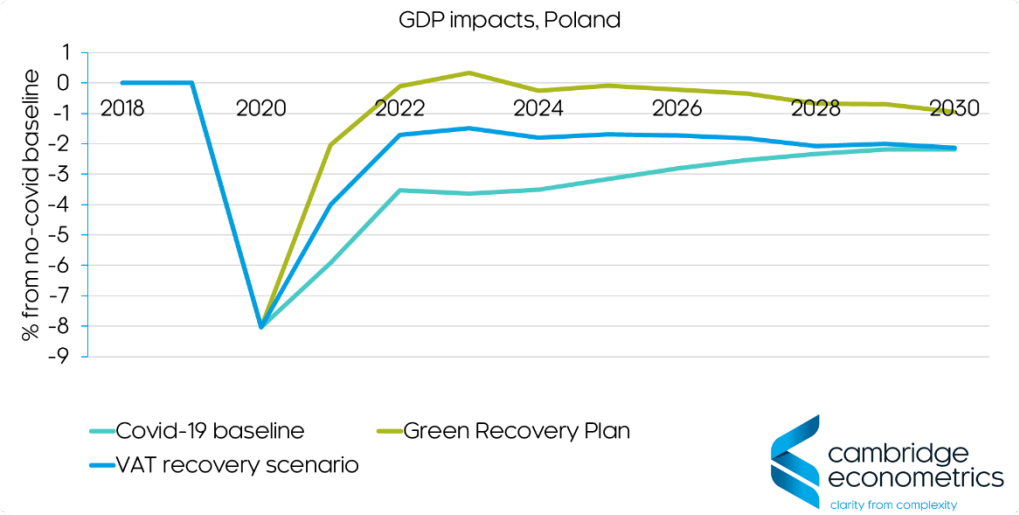
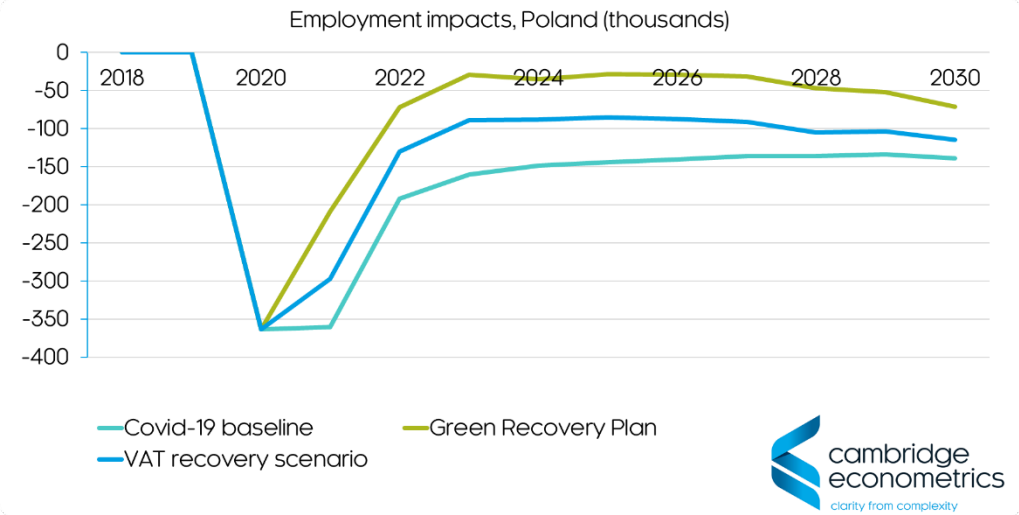


Figure 6.2: Employment impacts in Poland



Sectoral impacts

Table 6.1 shows the impacts of the pandemic and recovery plans on each sector in 2024. By 2024, Poland is in recovery even in the Covid-19 baseline, so in most sectors the impacts are smaller than in the other countries presented in this report.

The Green Recovery Plan provides a boost to all sectors. All sectors except energy and utilities, advanced manufacturing and construction could end up with output above pre-covid baseline levels. However, the fall in the energy sector is more substantial.

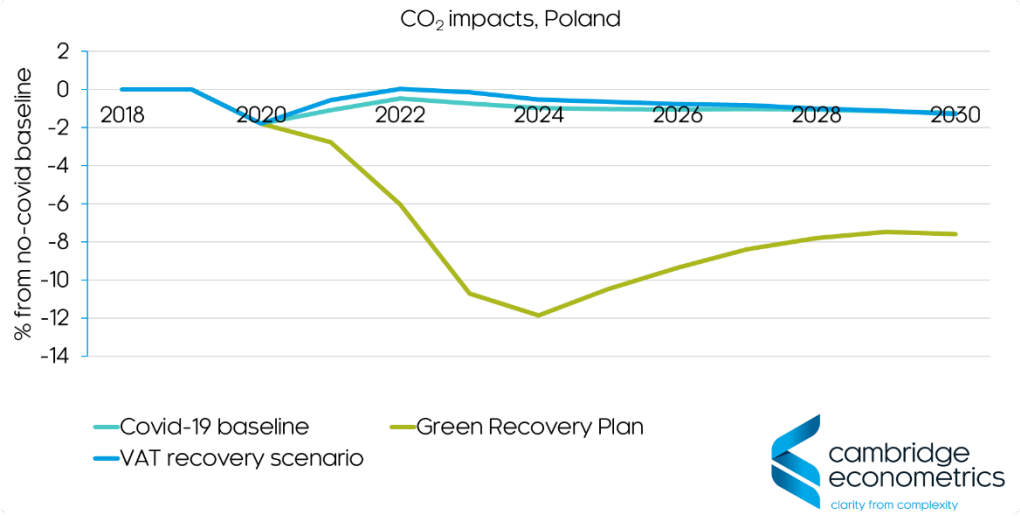
Table 6.1: Sectoral production impacts in Poland (2024), % from no-covid baseline

	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-1.2	1.3	0.0
Energy and Utilities	-0.7	-4.4	-0.3
Basic Manufacturing	-2.6	0.6	-1.4
Advanced Manufacturing	-3.6	-1.9	-2.9
Construction	-6.6	-5.0	-5.9
Consumer Services	-4.6	1.4	-2.5
Transport and Comms.	-1.2	-0.3	-0.7
Business Services	-3.7	-0.5	-1.9
Public Services	-0.8	0.6	-0.2

6.2 Impacts on CO_2 emissions

The impact of the pandemic on emissions in Poland is close to zero throughout the period up to 2030 (see Figure 6.3). In contrast, the Green Recovery Plan has the potential to reduce Poland's emissions by up to 10% by 2024. However, it is noticeable that not all of the effects persist; although emissions from vehicles keep decreasing after 2024, the ending of renewables subsidies is too soon for renewables to displace conventional power sources in Poland and some of the initial reductions in emissions are offset.

Figure 6.3: CO_2 impacts in Poland



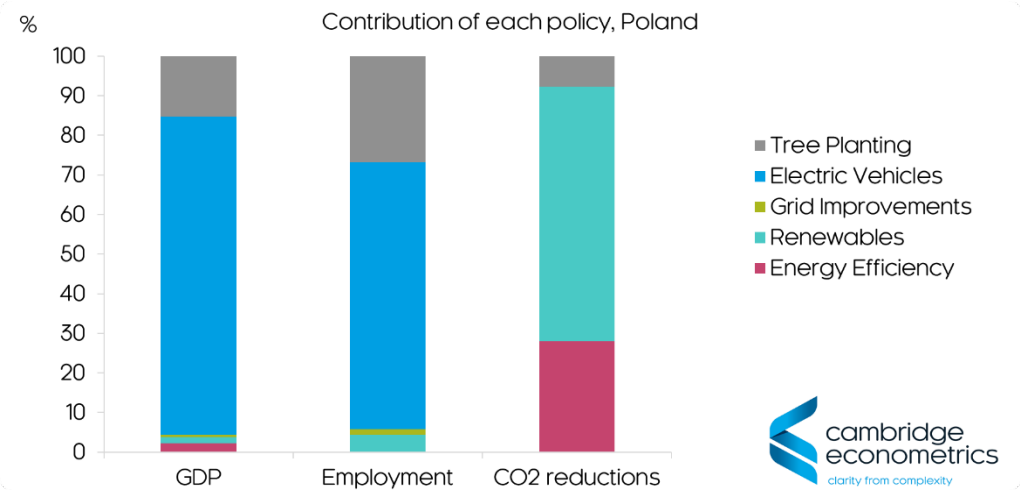
6.3 Contribution of each policy

Figure 6.4 shows the percentage contribution of each environmental policy to the aggregate outcomes in the Green Recovery Plan, aggregated across 2021-2030. For GDP and employment, the results are similar to those for Germany, with 70-80% of the benefits accruing through the EV promotion car scrappage scheme. Again, similarly to Germany, this result reflects a combination of domestic uptake of EVs and exports of cars or components.

The tree planting programme also makes a notable contribution, including around a quarter of the jobs that are created.

In contrast, the reductions in emissions accrue largely to the renewables subsidies and the energy efficiency measures. This outcome reflects the carbon-intensive nature of Poland's power sector, which limits the benefits of increasing the use of EVs; but allows for large potential emission reductions from renewable substitution or reducing electricity consumption through efficiency measures.

Figure 6.4: Contribution of each policy in Poland (2021-2030)



7 Results for the UK

7.1 Socio-economic impacts

Macro outcomes

The UK economy has been severely affected by Covid-19 and is likely to make up lost production only slowly (see Figure 7.1). The effects on employment have been smaller but remain uncertain going forward once existing support schemes are phased out (see Figure 7.2).

The two recovery plans modelled both help the UK over the period 2021-2024, but have little long-term impact. The Green Recovery Plan again shows better outcomes for GDP and jobs in both the short and long runs, but the difference is less pronounced than in other countries. One reason is that the VAT reductions are particularly effective in the UK's service-oriented economy.

Figure 7.1: GDP impacts in the UK

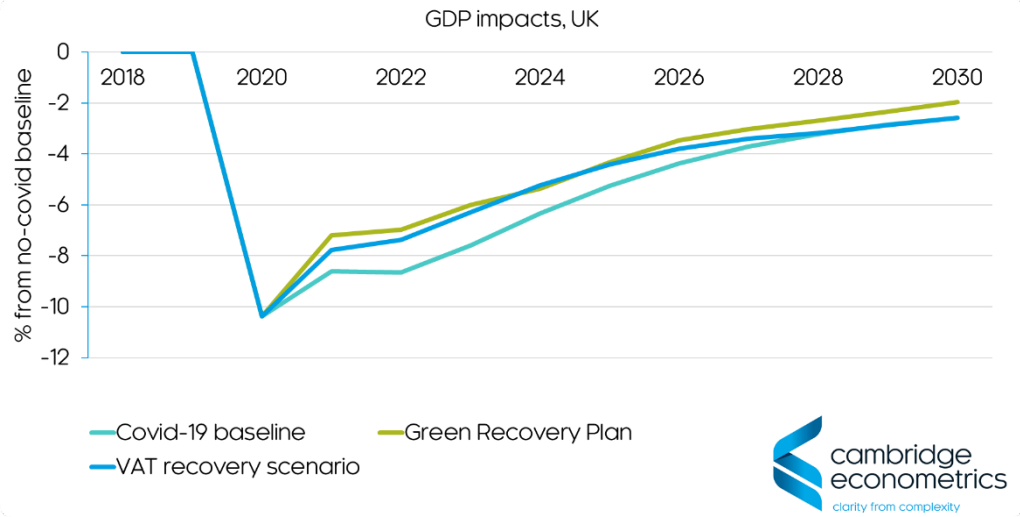
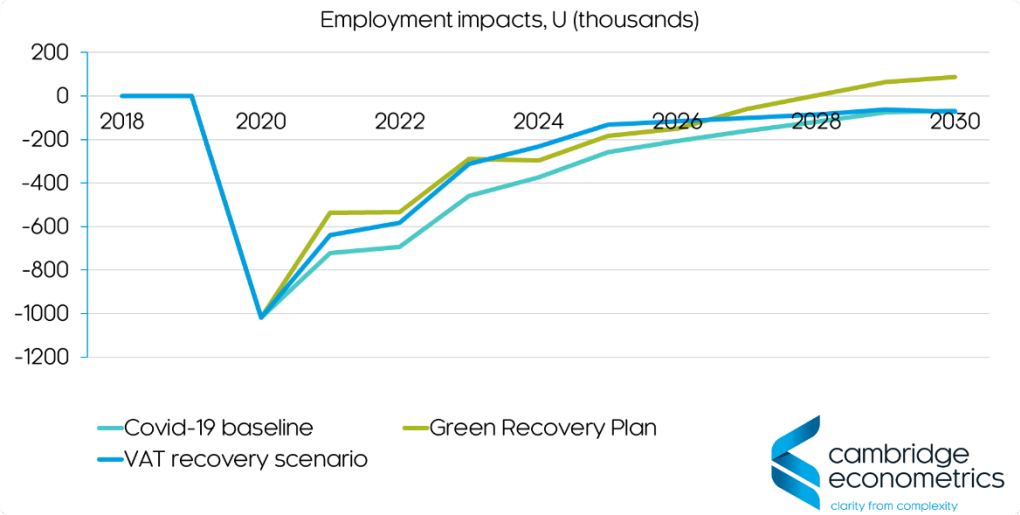


Figure 7.2: Employment impacts in the UK



Sectoral impacts

Table 7.1 shows the impacts on sectoral production in the UK. Like other countries, manufacturing and construction are affected by the most because of the effects of the pandemic on investment. It is noted, however, that the impacts on consumer services are more modest by 2024.

The Green Recovery Plan lessens the effects on manufacturing. Primarily this impact arises through a small increase in the demand for investment goods (e.g. electric vehicles). There is less spillover to other sectors, however, than in other countries, which is another reason for the overall impacts being limited.

Table 7.1: Sectoral production impacts in the UK (2024), % from no-covid baseline

	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-0.3	-0.3	-0.3
Energy and Utilities	-5.2	-9.4	-4.9
Basic Manufacturing	-10.3	-8.9	-10.0
Advanced Manufacturing	-13.1	-10.0	-12.9
Construction	-7.8	-7.6	-8.0
Consumer Services	-2.6	-2.8	-2.6
Transport and Comms.	-4.7	-4.7	-4.5
Business Services	-2.7	-2.6	-2.6
Public Services	-0.5	-0.3	-0.5

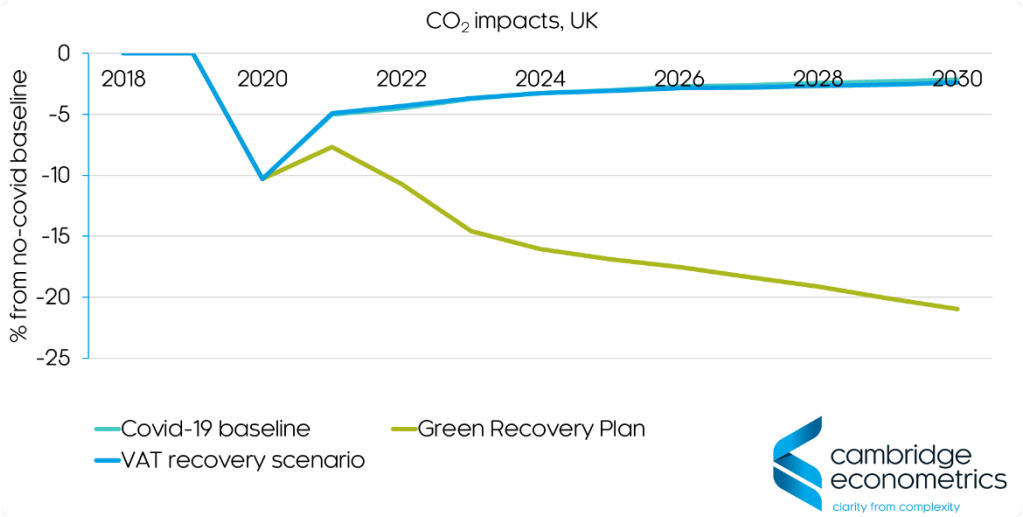
7.2 Impacts on CO_2 emissions

Figure 7.3 shows the impact of the scenarios on emissions. Although Covid-19 has a large short-term impact on UK emissions, by 2030 the difference is reduced to around 2%.

The VAT recovery scenario has almost no impact on CO_2 emissions in the UK. However, the Green Recovery Plan leads to falls in emissions that continue increasing beyond the end of the stimulus period. There are two reasons for this long-term impact:

- The support for renewables provides additional stimulus to a growing sector and conventional capacity is reduced over 2021-2024.
- Electric vehicles become established as a mainstream technology and the vehicle fleet starts to transition *even after the subsidies are withdrawn*.

Figure 7.3: CO_2 impacts in the UK

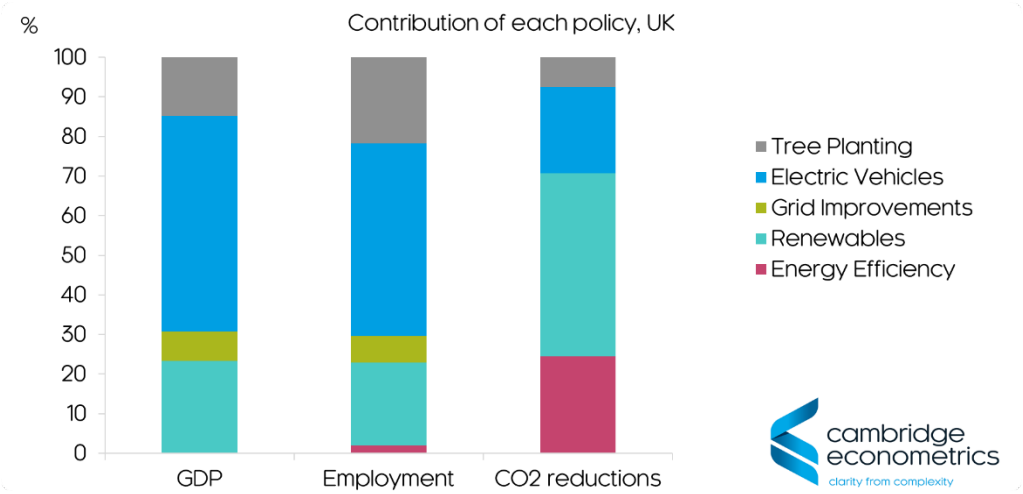


7.3 Contribution from each policy

Figure 7.4 shows the percentage contribution of each environmental policy to the aggregate outcomes in the Green Recovery Plan, aggregated across 2021-2030. As with the results for the EU, the shift to EVs through a car scrappage scheme makes the largest contribution to the GDP and employment impacts. However, the UK sees a much larger contribution from the renewables subsidies and grid improvements (around 30% combined) than in other European countries.

The renewables subsidies make the largest contribution to emission reductions in the UK (around 50%), with a further 20% coming from energy efficiency. Most of the remaining emission reductions come from the uptake of electric vehicles.

Figure 7.4: Contribution of each policy in the UK (2021-2030)



8 Results for the US

8.1 Socio-economic impacts

Macro outcomes

The impacts of Covid-19 in the US are shown in Figure 8.1. The initial loss of GDP is around 9% compared to the baseline. There is a gradual recovery but by 2030 the difference is still more than 3%. The VAT scenario provides economic benefits across the whole projection period. However, despite the US's large domestic energy sector, the Green Recovery performs slightly better in all years.

Both recovery scenarios are also successful in reducing the number of jobs lost to Covid-19 (see Figure 8.2). Again, the Green Recovery Plan is slightly better for creating jobs.

Figure 8.1: GDP impacts in the US

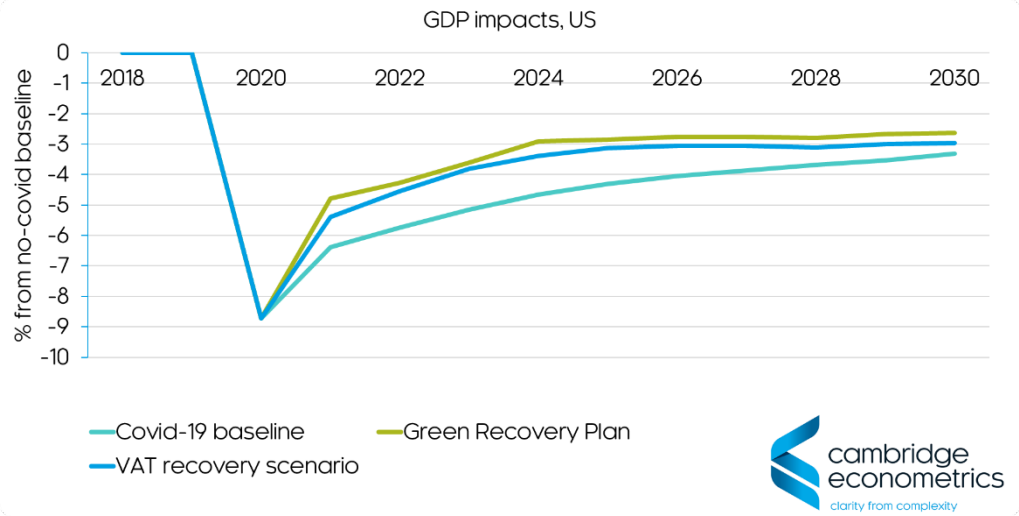
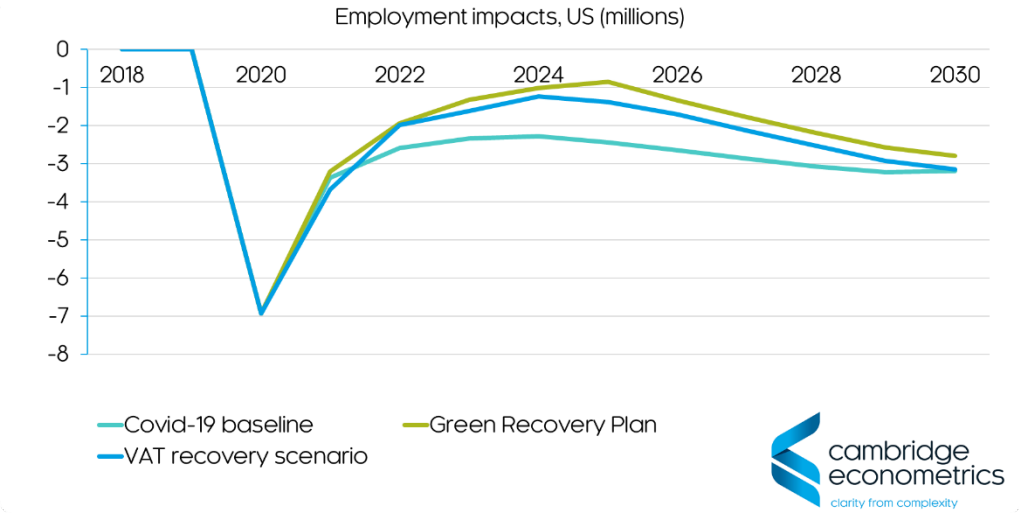


Figure 8.2: Employment impacts in the US



Sectoral impacts

Table 8.1 shows the sectoral impacts in each scenario for the year 2024. In almost all sectors the Green Recovery Plan reduces the losses from Covid-19 by the most. The exception is the energy sector, which sees reduced demand from the efficiency measures and the renewables subsidies.

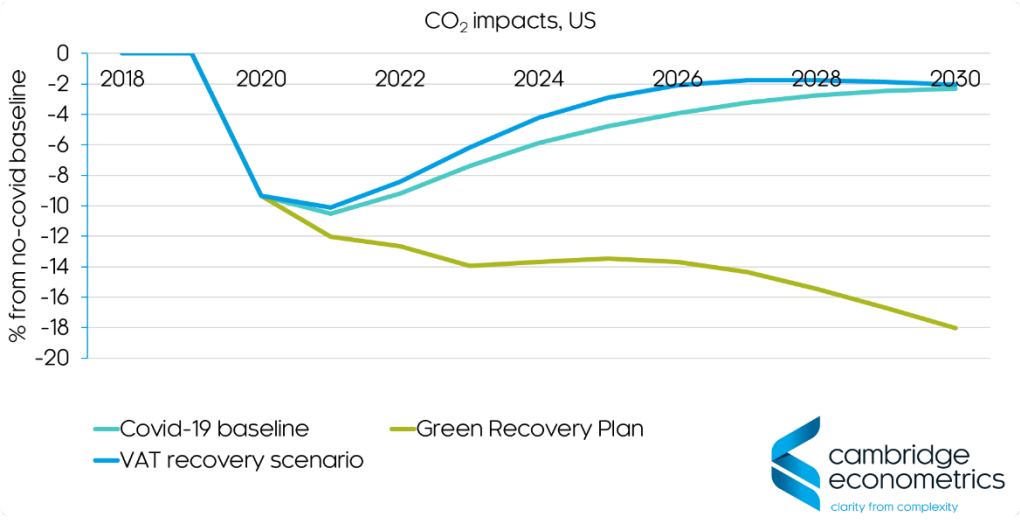
Table 8.1: Sectoral production impacts in the US (2024), % from no-covid baseline

	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-5.5	-4.3	-4.9
Energy and Utilities	-1.3	-3.6	-0.9
Basic Manufacturing	-5.4	-3.3	-4.2
Advanced Manufacturing	-8.4	-5.6	-7.1
Construction	-8.8	-7.7	-8.0
Consumer Services	-4.9	-3.0	-3.7
Transport and Comms.	-1.1	0.3	-0.1
Business Services	-2.3	-0.7	-1.2
Public Services	-0.5	0.3	-0.1

8.2 Impacts on CO_2 emissions

The pattern in CO_2 emissions in the US is similar to that seen in other countries. Although Covid-19 causes an immediate fall in emissions, by 2030 the difference is reduced to 2%. The Green Recovery Plan leads to a much larger reduction in emissions, however. Power sector emissions fall by around 10% over 2021-2024 because of higher renewable penetration (and do not increase after 2024). Promotion of electric vehicles also reduces road transport emissions, and allows EVs to become established in the US market, with further uptake even once the subsidies have been removed.

Figure 8.3: CO_2 impacts in the US



8.3 Contribution of each policy

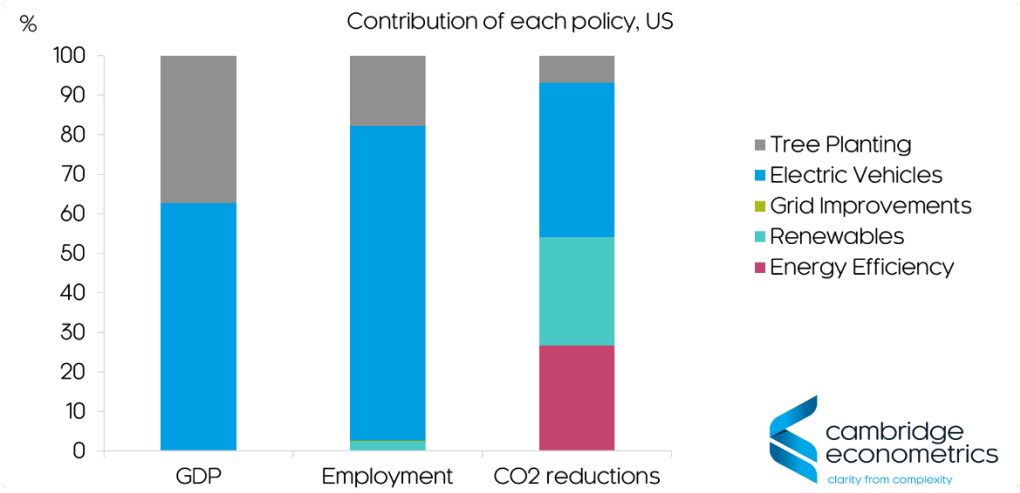
Figure 8.4 shows the percentage contribution of each environmental policy in the US to the aggregate outcomes in the Green Recovery Plan, aggregated across 2021-2030. More than half of the benefits to GDP and employment accrue from the promotion of electric vehicles.

When interpreting these results, it must be remembered that the US has a large domestic energy sector, which exports to other countries. This means that any policy that reduces gas demand (i.e. energy efficiency or renewable subsidies) *anywhere in the world* will harm US energy production. As these results come from a global scenario, we therefore see no benefit to the US from these measures. This does not mean that energy efficiency or renewables subsidies *within* the US would cause negative impacts; it means that any benefits to the US from implementing these policies are outweighed by reduced demand for US gas from other countries.

The same logic applies to oil demand from vehicles, but the domestic stimulus from the scrappage scheme to promote electric vehicles is large enough to show a net benefit overall. The tree planting programme does not impact on energy demand and hence shows positive results.

In terms of the US's emissions, the car scrappage scheme provides around 40% of the benefits, with around 25% each for the energy efficiency investment and renewables subsidies. The tree planting makes up the remainder.

Figure 8.4: Contribution of each policy in the US (2021-2030)



9 Results for Japan

9.1 Socio-economic impacts

Macro outcomes

Japan's economy has been less affected by Covid-19 than some of the world's other major economies. However, while GDP is expected to rebound somewhat in 2021, the economy will not catch up further and there is a permanent reduction in GDP in the model results (see Figure 9.1). The nature of Japan's labour market means that the impacts on employment could also be long-lasting (see Figure 9.2).

The recovery plans have a modest positive effect in Japan. The reason they are less effective than in other countries is that high household savings rates reduce additional expenditure, making the VAT reductions in both recovery plans relatively ineffective. The Green Recovery Plan is therefore more effective because it pushes spending into the economy directly. The effects last up to 2030.

Figure 9.1: GDP impacts in Japan

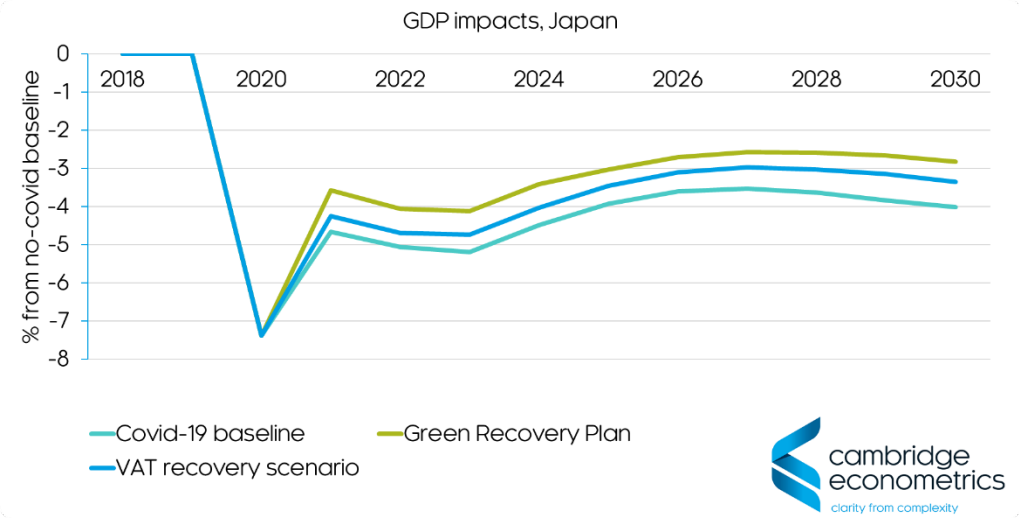
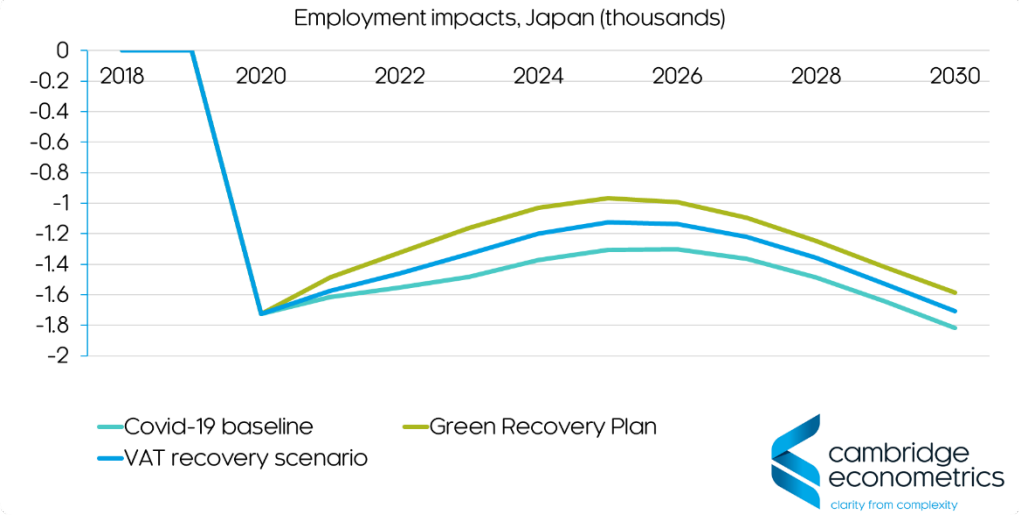


Figure 9.2: Employment impacts in Japan



Sectoral impacts

Table 9.1 shows the impacts of the measures on each sector in 2024. It is notable that the benefits of the VAT scenario are restricted mainly to the sectors that produce consumer goods. The Green Recovery Plan produces a broader set of economic impacts, also advanced manufacturing sectors and construction. In general it boosts all sectors (except energy) slightly more.

Table 9.1: Sectoral production impacts in Japan (2024), % from no-covid baseline

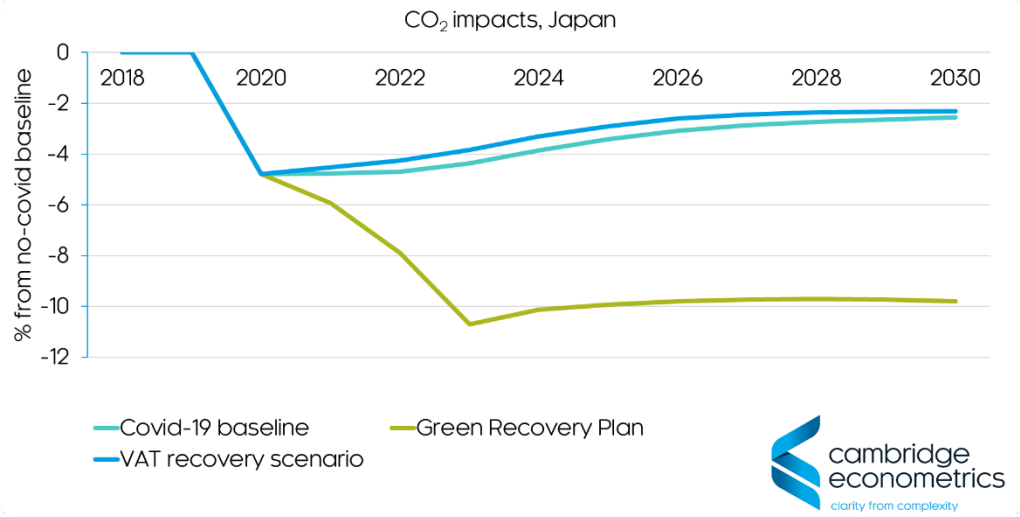
	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-2.4	-1.1	-1.6
Energy and Utilities	-1.0	-2.5	-0.6
Basic Manufacturing	-4.2	-3.1	-3.7
Advanced Manufacturing	-6.3	-5.2	-6.1
Construction	-7.1	-6.4	-7.2
Consumer Services	-4.5	-3.1	-3.6
Transport and Comms.	-2.3	-2.0	-2.4
Business Services	-5.3	-3.8	-4.7
Public Services	-1.5	-0.8	-1.0

9.2 Impacts on CO_2 emissions

Japan's economy has been less affected by Covid-19 that other countries' and the immediate impact on CO2 emissions is also less. Like other countries, this reduction is expected to be short lived, with a long-term reduction in emissions of just 2%.

The Green Recovery Plan leads to further emission reductions, reaching 10% from baseline by 2023. This reduction is driven mostly by the power sector bringing in more renewables, with a smaller contribution from the electrification of road transport.

Figure 9.3: CO_2 impacts in Japan



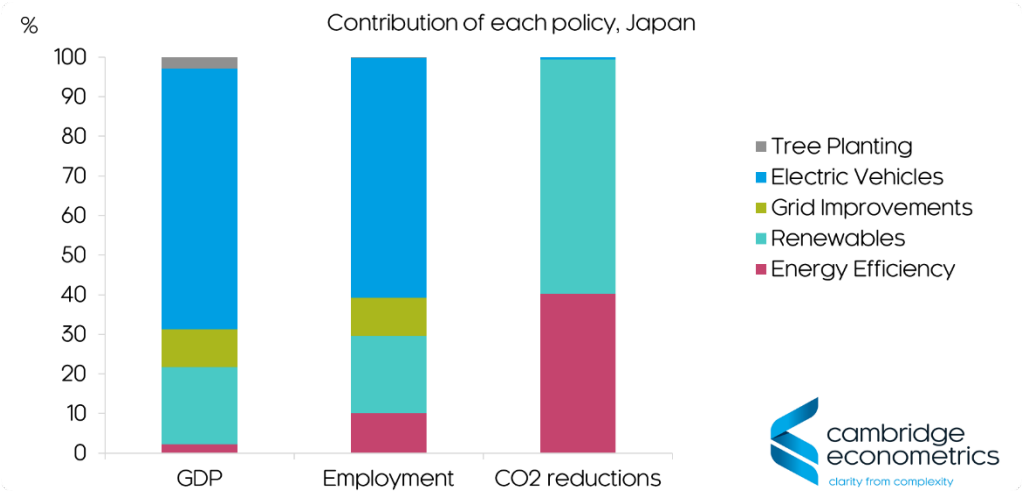
9.3 Contribution of each policy

Figure 9.4 shows the percentage contribution of each environmental policy to the aggregate outcomes in the Green Recovery Plan, aggregated across 2021-2030. Around two thirds of the increase in GDP comes from the vehicle scrappage scheme to promote electric vehicles (and 60% of jobs).

Most of the rest of the positive impact comes from the renewables subsidies (20%) and grid improvements (10%). There is a small contribution from the energy efficiency measures. It is assumed that there is little space for tree planting in Japan.

Assumptions about Japan's power mix remaining fossil fuel dependent (after the closure of many of its nuclear plants) mean that the emissions savings from switching to electric vehicles (from vehicles that are already efficient) are small. Instead, the reductions in emissions come from efforts to reduce the level of fossil-based generation, either through renewables substitution or energy efficiency measures to reduce gas and electricity consumption.

Figure 9.4: Contribution of each policy in Japan (2021-2030)



10 Results for India

10.1 Socio-economic impacts

Macro outcomes

Figure 10.2 shows the impact of Covid-19 and the recovery plans on GDP in India. Although only a small drop in GDP is expected in India in 2020, this compares to a high baseline growth rate, and so the net change is -10%. Over the period up to 2030, India is expected to make up for much of the lost growth, albeit slowly.

Both the VAT and Green Recovery scenarios have immediate benefits in 2021. The impacts of the VAT reductions dissipate once they are phased out, but the Green Recovery Plan leads to a permanent increase in GDP that fully offsets the effects of Covid-19 by 2030.

Figure 10.2: GDP impacts in India

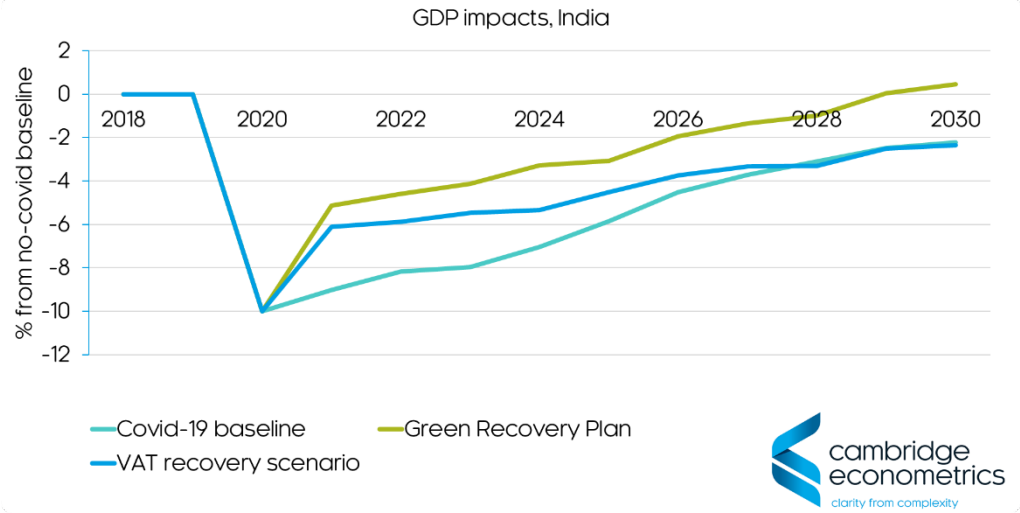
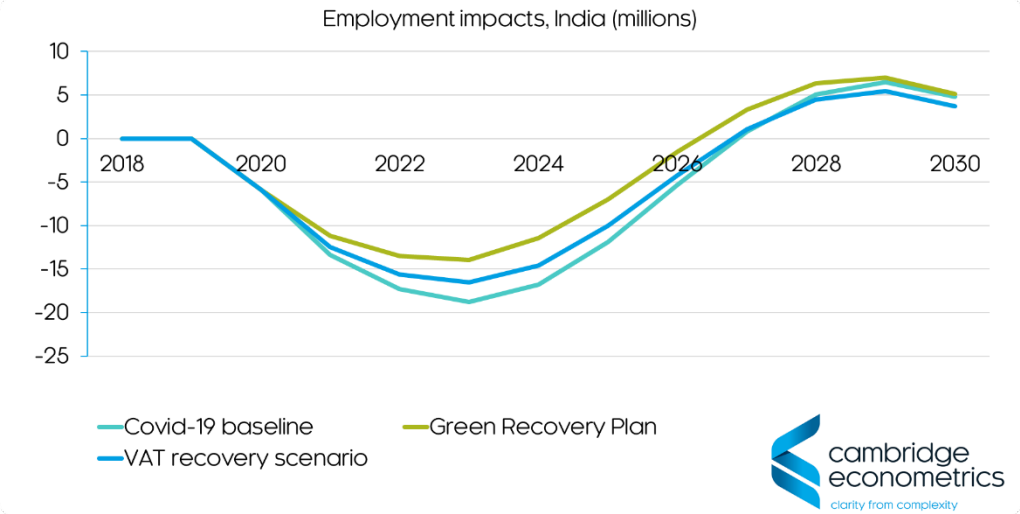


Figure 10.1: Employment impacts in India



Employment effects in India are driven largely by the construction sector, which has been hit particularly badly by Covid-19. The lagged effects suggest lower employment in the first half of the 2020s, with some catching up beyond 2025. The Green Recovery Plan plays a role in reducing the immediate

negative effects on employment, partly in construction but also in other sectors.

Sectoral impacts

Table 4.1Table 10.1 shows the impacts of the measures on each sector by 2024. The sectors most affected by Covid-19 are those related to investment and consumer products. The VAT recovery plan provides benefits to the consumer services and transport sectors but the Green Recovery Plan also benefits other sectors, including construction and business services. The only negative impacts are on the energy sector, which suffers from loss of demand due to the efficiency measures.

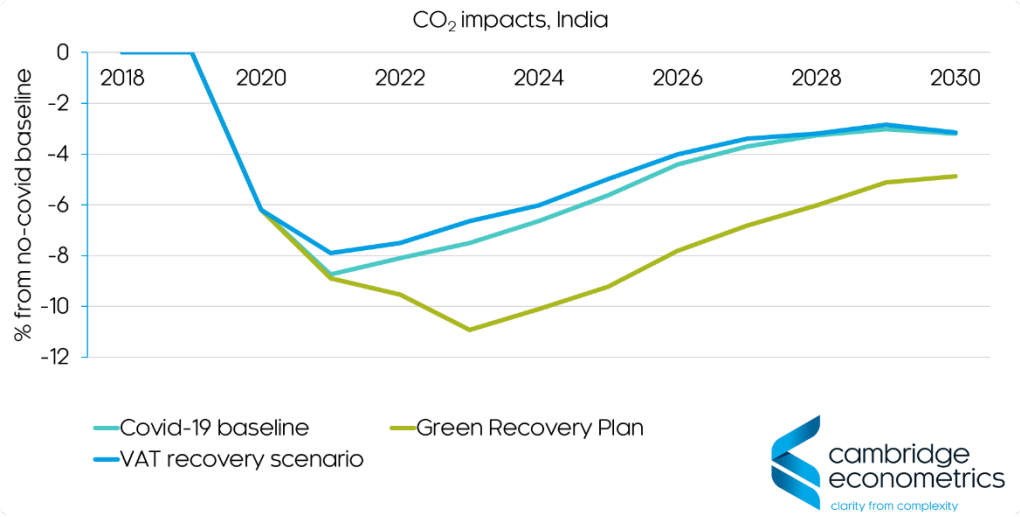
Table 10.1: Sectoral production impacts in India (2024), % from no-covid baseline

	Covid-19 baseline	Green Recovery Plan	VAT recovery scenario
Agriculture	-0.2	0.1	0.0
Energy and Utilities	-4.8	-9.5	-4.3
Basic Manufacturing	-6.5	-3.7	-5.8
Advanced Manufacturing	-13.8	-9.4	-13.3
Construction	-8.4	-6.5	-8.3
Consumer Services	-6.5	-4.4	-4.8
Transport and Comms.	-2.9	-0.9	-1.3
Business Services	-5.6	-3.6	-5.2
Public Services	-0.2	0.8	-0.2

10.2 Impacts on CO_2 emissions

The impact of Covid-19 on CO_2 emissions in India follows the pattern for GDP impacts, with larger reductions initially, but decreasing over time. The VAT recovery scenario increases emissions slightly by boosting GDP. The Green Recovery Plan reduces emissions further, by 1-2%. The benefits arise primarily due to greater energy efficiency and a small increase in renewables (see below). The model results suggest that further measures would be needed to lock in permanent emission reductions.

Figure 10.3: CO_2 impacts in India



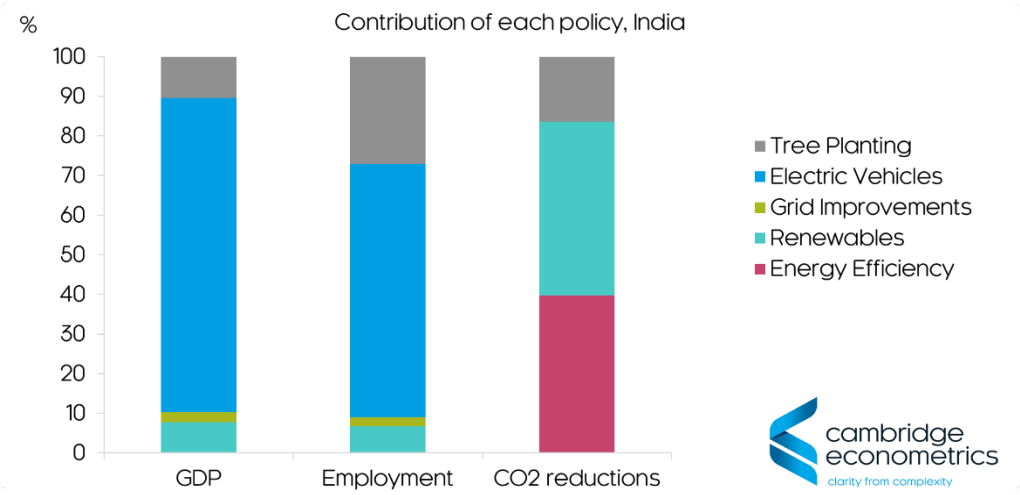
10.3 Contribution of each policy

Figure 10.4 shows the percentage contribution of each environmental policy in India to the aggregate outcomes in the Green Recovery Plan, aggregated across 2021-2030. The largest contribution to both GDP (79%) and employment (64%) is the car scrappage scheme to promote uptake of EVs. The tree planting programme accounts for 10% of the additional GDP and 27% of the additional employment.

There contributions to GDP and employment from the renewables subsidies, grid improvements and energy efficiency policies are important over the period 2021-2023, but are partially offset by reductions in employment after 2025, once the support comes to an end. This also reflects that employment (and emissions) in India head back towards baseline levels relatively quickly, so the timing of the support is important.

The contribution of each policy to reducing CO_2 emissions is quite different. Because India remains coal-intensive, the benefits of electric vehicles (some of which replace CNG cars) are limited. Instead, the emissions reductions come from measures that would lead to lower levels of coal-fired generation. Hence most of the emission reductions come from energy efficiency measures and renewables subsidies. The tree planting programme adds a further 16%.

Figure 10.4: Contribution of each policy in India (2021-2030)



11 Overall Conclusions

11.1 Conclusions from the analysis

Although there are many differences between the economies assessed in this report, there are some consistent themes in the modelling results. Most obviously, Covid-19 is going to result in a substantial economic cost, in terms of both GDP and lost jobs, in the first half of the 2020s. In most countries, the recovery will not be immediate and much of the lost output will never be made up. The sectors most affected are consumer services and sectors that produce investment goods (e.g. advanced manufacturing and construction).

National governments have already stepped in to provide support measures to stabilise their economies. However, to prevent a longer-term slump, more support will be needed.

Economic recovery

Two types of support were assessed in this report, both at global level but with results disaggregated by country. The VAT recovery plan reduces VAT by five percentage points and is effective at boosting household spending and production of consumer services. It has no environmental benefits and may even increase CO_2 emissions.

The Green Recovery Plan also includes VAT reductions, but combines them with measures to promote energy efficiency, renewable electricity generation, the take-up of electric vehicles and tree planting. It costs government the same amount as the VAT reduction scenario, but:

- it provides a bigger initial stimulus to jobs and employment
- it has more positive long-lasting economic benefits
- it benefits a broader group of sectors

A green recovery

In addition, the Green Recovery Plan could lead to CO_2 emission reductions of 7% by 2030, on top of the 2% reduction from Covid-19 itself. All five of the individual policies contribute substantially to the reduction in emissions, although it is not possible to attribute directly the effects of grid improvements to lower CO_2.

These reductions in emissions would not be sufficient to put the world on a path that is consistent with the goals of the Paris Agreement, but they would provide a start, while simultaneously supporting economic recovery. It should also be noted that there are several sectors (e.g. agriculture, industry, freight or public transport) that have not been directly affected by these policies. The addition of further policies could therefore ensure Paris compatibility.

11.2 Getting the policies right

In this report, the same policies are implemented in each country. However, the results point towards important differences in national circumstances that suggest different policy mixes may be better.

One important point that comes out from the results is that the car scrappage schemes tend to be the most beneficial policy in terms of GDP and

employment. This is consistent with the finding from analysis of the recovery measures implemented after the financial crisis in 2008[9]. This time around, the environmental benefits may be greater, especially if they allow electric vehicles to become established in national markets.

The environmental benefits of electric vehicles will only be realised, however, if the power sector fuel mix has moved away from coal. This report includes countries where this is not the case and where therefore (up to 2030) environmental benefits are limited[10]. However, it should be noted that there are still longer-term benefits of electrifying transport, even if there are no short-term CO_2 emission reductions. Nevertheless, in these countries larger short-term emission reductions can be achieved through renewables subsidies and efficiency measures.

The role of the domestic energy sector must also be considered when assessing economic impacts. Here, there is an important difference to the findings from 2008. With renewable shares increasing, the power sector is now much more capital-intensive than previously. Energy efficiency measures that would previously have led to less imported gas, now mean fewer new wind and solar installations, and a larger impact on the domestic economy. Countries that export gas will lose out from both domestic and external measures to improve efficiency.

Finally, the potential for tree planting is largely dependent on geographical factors. Where an ambitious tree planting scheme is possible, there are large potential economic and environmental benefits. While such a policy is often seen as modest, the effects could be real.

In summary, to maximise the potential benefits of a green recovery plan, a mixture of policies is needed. The Green Recovery Plan in this report provides an example of such a mixture. Even though this example is not the best mix of policies for every country covered, it still provides economic and environmental benefits in every country, over and above those in the VAT recovery scenario that we used for comparison. Further tailoring of policies could improve results further, but the results here provide strong support for greening the response to Covid-19.

[9] https://ec.europa.eu/environment/enveco/growth_jobs_social/pdf/studies/green_recovery_plans.pdf

[10] Results are consistent with recent academic literature: https://www.nature.com/articles/s41893-020-0488-7