Supplementary Appendix A. Summary of the effects of climate mitigation measures on output and employment and additional results

Summary of the effects of climate mitigation measures on output and employment

The impact of climate change on GDP and employment varies widely between countries. These differences correspond to the potential benefits from additional investment in energy efficiency and renewables and from reduced dependence on fossil fuel imports and their lower prices. The larger the potential benefits from these investments and the scope for benefiting from lower prices for such fuels, the more positive the response. Overall, the employment effects broadly follow the GDP results, although to a lesser extent. The main findings are summarised below, with reference to specific national cases:

1. Latvia experiences a particularly large positive boost due to the large scale of energy efficiency investments and the decline in fossil fuel imports. The impact on GDP is not as large as in other countries because the benefits accrue to equipment suppliers rather than to consumer incomes. As a result, the stimulus for labour-intensive consumer services is lower.
2. The meagre positive effects in Denmark have to do with its already leading position of renewable power generation and energy efficiency investments at the beginning of the period. The amount of additional investment needed to reach the CO_2 emissions target is low.
3. In Poland, the decline in coal production offset the gains in other economic

activities. This explains the very small impact on output and the slightly negative impact on employment. Petrol and electricity prices rise, leading to a fall in consumer spending (relative to the baseline).

4. Spain enjoys comparatively high employment growth in the simulations under the climate change mitigation measures. The increased importance of solar photovoltaic electricity leads to a decrease in electricity prices. Such a development boosts disposable income, consumer spending and ultimately the demand for consumer services (which are labour intensive).
5. In Cyprus, the employment effect is relatively small compared to the impact on GDP. In this case, electricity prices increase due to the transition to low-carbon technology, which reduces wages and consequently consumer spending (which drives demand for goods and services in labour-intensive sectors). The country also suffers a loss of external competitiveness, which reduces exports relative to the baseline.

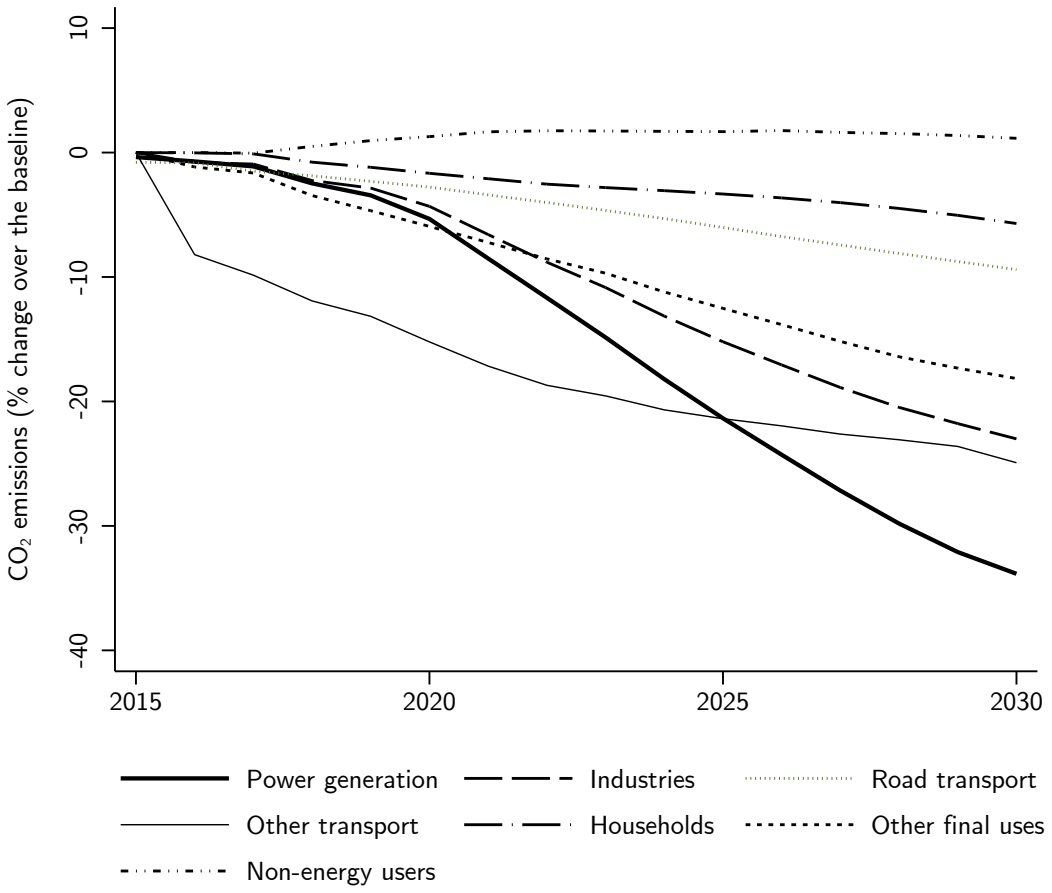
The interested reader can find additional details in the background technical report of the project (Eurofound, 2019).

References

Eurofound. (2019). *The future of manufacturing in Europe*. Publications Office of the European Union. http://eurofound.link/fomeef18002

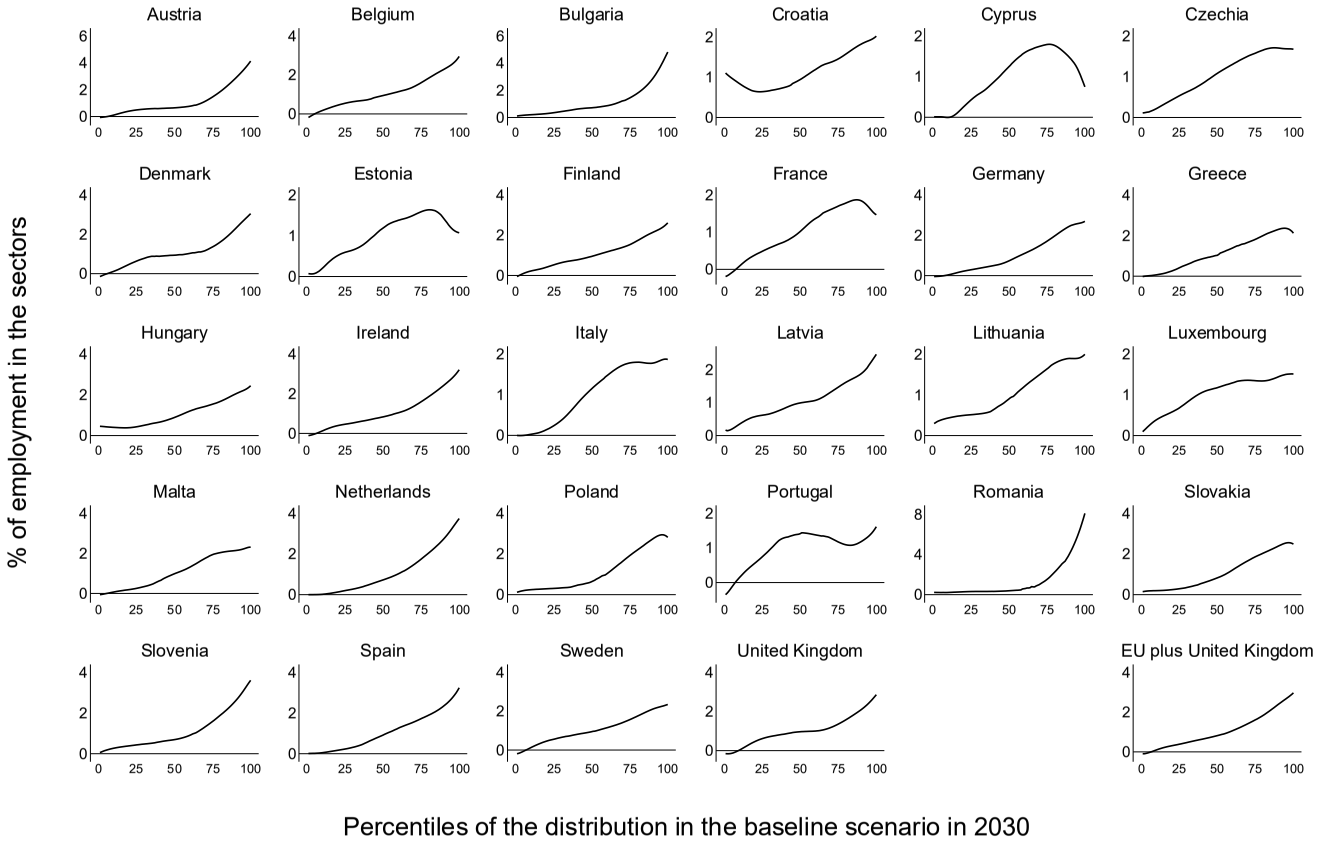
Additional results

Figure S1. Change in CO_2 in the EU by economic sector (% change over the baseline, 2015–2030)



Source: Authors' analysis.

Figure S2. Distribution of employment in mining and quarrying, utilities, manufacturing of coke and refined petroleum products across the occupational structure in 2030 in the baseline scenario (% total employment in the sectors)



Note: Locally weighted scatterplot smoothing with a bandwidth of 0.75.
Source: Authors' analysis.

Table S1. Change in employment in 2030 under the two-degree scenario compared to the baseline by country, occupation and industry (% change deviation from baseline)

		Occupation				Sector of activity						
	Total	High-skilled white collar	Low-skilled white collar	High-skilled blue collar	Low-skilled blue collar	Agriculture, forestry and fishing; Mining and quarrying	High-technology industry	Low-technology industry	Construction	Knowledge-intensive services	Less knowledge-intensive services	Non-manufacturing industries
AT	0.46	0.43	0.38	0.55	0.58	0.29	0.60	0.82	0.55	0.40	0.49	−2.35
BE	0.98	0.95	1.17	1.00	0.76	0.24	1.21	0.10	2.49	0.89	1.17	−2.43
BG	0.31	0.05	0.31	0.58	0.45	1.05	−0.48	0.52	1.05	0.49	0.41	−12.65
CY	0.06	0.04	−0.02	0.20	0.12	0.40	0.06	−0.12	0.80	0.19	−0.06	−3.87
CZ	0.52	0.56	0.43	0.92	0.15	−5.20	0.79	1.17	2.56	0.46	0.57	−1.99
DE	0.84	0.82	0.71	1.27	0.75	0.03	0.12	0.33	3.12	0.63	1.00	1.62
DK	0.15	0.14	0.08	0.33	0.19	−0.42	1.28	0.79	0.53	0.11	−0.01	−0.94
EE	0.38	0.32	0.36	0.53	0.45	0.13	0.44	0.25	1.16	0.28	0.54	−1.94
EL	0.69	0.85	0.76	0.35	0.72	0.02	−0.15	0.39	0.99	0.82	0.86	−3.21
ES	0.91	0.81	0.88	1.42	0.84	0.02	0.33	1.98	2.34	0.63	0.86	−0.06
EU + UK	0.51	0.47	0.53	0.65	0.45	−0.56	0.62	0.72	1.05	0.42	0.65	−2.35
FI	0.37	0.15	0.32	0.54	0.92	0.10	0.84	0.98	0.91	0.01	0.83	−7.06
FR	0.35	0.34	0.31	0.61	0.26	2.03	0.68	1.46	−0.20	0.12	0.51	−0.39
HR	0.37	0.29	0.22	0.82	0.41	1.76	1.93	0.32	0.38	0.15	0.39	0.00
HU	0.38	0.26	0.23	0.67	0.60	0.17	0.78	1.27	1.34	0.26	0.24	−4.14
IE	0.08	0.09	0.08	0.06	0.10	−0.03	0.32	0.23	0.00	0.09	0.10	−1.03
IT	0.50	0.59	0.43	0.51	0.41	0.89	1.98	0.27	0.50	0.62	0.33	−1.23
LT	0.31	0.27	0.25	0.44	0.33	0.00	1.09	0.27	1.16	0.20	0.31	−1.30
LU	0.13	0.10	0.07	0.38	0.17	0.80	0.15	0.24	0.66	0.04	0.09	−0.63
LV	0.57	0.47	0.45	0.54	0.90	0.48	0.46	0.19	1.42	0.47	0.78	−2.44
MT	0.57	0.55	0.65	0.59	0.47	0.20	0.17	0.39	0.32	0.64	0.66	0.00
NL	0.23	0.32	0.15	0.08	0.22	−0.10	−0.06	0.23	0.16	0.57	−0.16	−1.43
PL	−0.07	−0.18	0.22	0.48	−0.76	−4.02	0.76	1.08	1.02	0.32	0.60	−6.82
PT	0.41	0.40	0.46	0.39	0.39	0.09	0.54	0.23	0.87	0.50	0.38	−0.37
RO	0.47	0.49	1.02	0.07	0.45	−0.09	0.51	0.38	0.00	0.55	1.17	−2.59
SE	0.22	0.15	0.17	0.26	0.53	0.15	0.10	0.43	0.12	0.12	0.47	−1.07
SI	0.08	0.03	0.04	0.11	0.21	−0.08	−0.08	0.36	0.05	0.00	0.14	0.00
SK	0.59	0.42	0.51	0.75	0.95	0.00	0.62	0.40	1.60	0.40	0.84	−1.74
UK	0.46	0.40	0.52	0.23	0.64	−0.92	1.32	0.66	0.13	0.33	0.78	−5.31

Source: Authors' analysis.

Table S2. The 10 occupations and industries with the highest and lowest growth in the European Union in 2030 (% change deviation from baseline)

Occupation	%Δ	Industry	%Δ
Stationary plant and machine operators	−0.09	Mining and quarrying	−16.56
Armed forces	0.21	Manufacture of coke and refined petroleum products	−6.91
Personal care workers	0.22	Electricity, gas, steam and air conditioning supply	−4.92
Street and related sales and service workers	0.25	Veterinary and other professional, scientific and technical activities	−0.58
Teaching professionals	0.25	Wholesale and retail trade and repair of motor vehicles and motorcycles	−0.54
Subsistence farmers, fishers, hunters and gatherers	0.29	Other service activities	−0.02
Science and engineering professionals	0.36	Water collection, treatment and supply	−0.00
Health professionals	0.37	Sewerage and waste	0.00
Refuse workers and other elementary workers	0.37	Insurance, reinsurance and pension funding	0.04
Other clerical support workers	0.39	Water transport	0.05
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Numerical and material recording clerks	0.62	Manufacture of other transport equipment	0.86
General and keyboard clerks	0.63	Construction	1.05
Assemblers	0.65	Legal and accounting and management activities	1.18
Personal service workers	0.68	Accommodation, food and beverage service activities	1.19
Information and communications technicians	0.70	Manufacture of rubber and plastic products	1.22
Information and communications technology professionals	0.73	Rental and leasing activities	1.28
Food processing, wood working, garment and other craft and related trades	0.75	Security and investigation, service to building and landscape and office activities	1.43
Hospitality, retail and other services managers	0.84	Computer and information service activities	1.44
Building and related trades workers, excluding electricians	0.89	Manufacture of basic metals	1.46
Food preparation assistants	1.07	Manufacture of textiles, clothing and leather	2.12

Source: Authors' analysis.

Table S3. Robustness checks (I): Change in inequality and polarisation in 2030 using alternative measures (% change over the baseline)

	$I(0.25)$	$I(0.5)$	$I(0.75)$	$P_2(0.5)$	$P_2(2)$
AT	−0.001	−0.000	−0.000	0.008	0.001
BE	−0.006	−0.005	−0.003	0.024	0.070
BG	−0.025	−0.020	−0.016	−0.165	−0.202
CY	−0.002	−0.002	−0.002	−0.007	−0.005
CZ	−0.009	−0.008	−0.007	0.098	0.024
DE	−0.003	−0.002	−0.001	−0.003	−0.011
DK	−0.000	−0.000	0.000	0.032	0.000
EE	−0.000	−0.001	−0.001	−0.098	−0.057
EL	0.009	0.005	0.002	−0.015	−0.030
ES	0.008	0.005	0.003	−0.157	−0.085
EU + UK	−0.002	−0.001	−0.001	−0.043	−0.039
FI	−0.006	−0.004	−0.003	−0.068	0.003
FR	0.009	0.006	0.004	0.044	0.016
HR	0.000	0.002	0.003	−0.025	0.018
HU	0.002	0.002	0.001	−0.099	−0.034
IE	−0.001	−0.000	0.000	−0.002	−0.001
IT	0.005	0.002	0.001	−0.048	−0.047
LT	0.001	0.001	0.000	−0.071	−0.043
LU	−0.001	−0.001	−0.000	0.003	0.007
LV	−0.005	−0.006	−0.006	−0.136	−0.069
MT	−0.004	−0.002	−0.001	−0.045	−0.013
NL	0.002	0.002	0.001	−0.030	0.018
PL	−0.021	−0.019	−0.017	−0.049	−0.239
PT	0.005	0.003	0.002	−0.033	−0.019
RO	0.025	0.024	0.022	−0.008	−0.018
SE	0.005	0.004	0.003	−0.017	0.014
SI	0.001	0.001	0.000	−0.011	−0.017
SK	−0.001	−0.001	−0.001	−0.062	−0.028
UK	−0.009	−0.004	−0.001	0.064	0.029

Source: Authors' analysis.

Table S4. Robustness checks (I): Change in inequality and polarisation in 2030 using a ranking based on educational attainment (% change over the baseline)

	$I(0)$	$I(0.25)$	$I(0.5)$	$I(0.75)$	$P_2(0.5)$	$P_2(1)$	$P_2(2)$
AT	−0.004	−0.002	−0.001	−0.000	0.016	0.003	0.002
BE	−0.006	−0.005	−0.004	−0.003	0.108	0.059	0.015
BG	−0.053	−0.037	−0.026	−0.019	0.233	0.104	0.024
CY	−0.005	−0.004	−0.003	−0.002	0.036	0.030	0.024
CZ	−0.013	−0.011	−0.009	−0.008	−0.032	−0.025	−0.020
DE	−0.009	−0.005	−0.003	−0.002	−0.022	−0.020	−0.018
DK	−0.000	−0.000	0.000	0.000	0.021	0.012	0.007
EE	−0.011	−0.008	−0.005	−0.003	−0.019	0.010	0.016
EL	0.025	0.015	0.008	0.003	−0.039	−0.028	−0.021
ES	0.009	0.006	0.004	0.003	−0.105	−0.090	−0.061
EU + UK	−0.003	−0.002	−0.002	−0.001	−0.003	−0.007	−0.012
FI	−0.010	−0.008	−0.006	−0.004	0.015	−0.000	−0.006
FR	0.010	0.008	0.006	0.004	−0.031	−0.023	−0.016
HR	−0.008	−0.003	0.000	0.003	0.067	0.054	0.038
HU	0.001	0.001	0.001	0.001	0.081	0.062	0.028
IE	0.004	0.002	0.001	0.000	−0.002	−0.003	−0.003
IT	−0.001	−0.000	0.000	0.001	0.043	0.035	0.023
LT	0.001	0.000	−0.000	−0.000	0.032	0.023	0.016
LU	−0.003	−0.002	−0.001	−0.000	0.033	0.023	0.015
LV	−0.016	−0.013	−0.011	−0.008	0.082	0.045	0.006
MT	0.013	0.004	0.001	−0.001	−0.033	−0.020	−0.032
NL	0.006	0.004	0.002	0.001	−0.007	0.009	0.007
PL	−0.037	−0.030	−0.024	−0.019	0.144	0.088	0.043
PT	0.009	0.006	0.004	0.002	0.034	0.032	0.026
RO	0.073	0.055	0.040	0.028	−0.042	−0.037	−0.038
SE	0.000	0.002	0.002	0.003	0.010	0.008	0.017
SI	0.002	0.001	0.001	0.000	0.005	0.007	0.003
SK	−0.013	−0.008	−0.005	−0.003	0.066	0.046	0.019
UK	−0.001	−0.001	−0.001	−0.001	−0.017	−0.022	−0.028

Source: Authors' analysis.

Table S5. Robustness checks (II): Change in inequality and polarisation in 2030 using a ranking based on a non-pecuniary job quality index (% change over the baseline)

	$I(0)$	$I(0.25)$	$I(0.5)$	$I(0.75)$	$P_2(0.5)$	$P_2(1)$	$P_2(2)$
AT	0.001	0.001	0.000	0.000	0.030	0.018	0.008
BE	−0.012	−0.009	−0.006	−0.004	0.115	0.086	0.041
BG	−0.039	−0.029	−0.022	−0.018	0.003	−0.041	−0.040
CY	−0.004	−0.003	−0.003	−0.002	0.034	0.027	0.018
CZ	−0.004	−0.009	−0.009	−0.008	−0.069	−0.052	−0.063
DE	−0.004	−0.003	−0.002	−0.001	0.094	0.066	0.036
DK	0.000	0.000	0.000	0.000	0.013	0.017	0.019
EE	−0.009	−0.007	−0.005	−0.003	0.028	0.018	0.004
EL	0.000	0.000	0.001	0.000	0.005	−0.001	0.002
ES	0.010	0.008	0.006	0.004	−0.093	−0.085	−0.074
EU + UK	−0.004	−0.003	−0.002	−0.001	−0.005	−0.009	−0.016
FI	−0.010	−0.008	−0.006	−0.004	−0.040	0.024	0.027
FR	0.007	0.006	0.005	0.004	0.061	0.060	0.052
HR	0.001	0.002	0.003	0.004	0.061	0.036	0.025
HU	−0.001	0.000	0.001	0.001	0.017	0.043	0.037
IE	0.000	0.000	0.000	0.000	0.004	0.003	0.003
IT	0.001	0.001	0.001	0.001	0.014	0.014	0.013
LT	−0.003	−0.002	−0.001	−0.001	−0.012	0.012	0.010
LU	−0.003	−0.002	−0.001	−0.000	0.018	0.014	0.012
LV	−0.022	−0.017	−0.013	−0.009	0.097	0.073	0.040
MT	0.005	0.001	−0.000	−0.001	−0.056	−0.039	−0.039
NL	−0.000	0.001	0.001	0.001	0.018	0.029	0.033
PL	−0.002	−0.017	−0.020	−0.019	−0.147	−0.169	−0.199
PT	0.001	0.001	0.001	0.001	0.031	0.024	0.017
RO	0.036	0.031	0.028	0.024	−0.047	−0.029	−0.017
SE	0.002	0.003	0.003	0.003	0.108	0.062	0.050
SI	0.002	0.001	0.001	0.000	0.018	0.009	0.002
SK	−0.011	−0.008	−0.005	−0.003	0.019	0.007	−0.000
UK	−0.004	−0.002	−0.002	−0.001	−0.003	−0.010	−0.008

Source: Authors' analysis.