Supplementary Information - Quantifying the effect of European Investment Bank financing on the low-carbon energy transition through 2050

Jacob Mannhardt[1], Paul Waidelich[2], Lukas Schmidt-Engelbertz[1], Jon Schätti[1], Bjarne Steffen[2*] and Giovanni Sansavini[1*]

[1]Institute of Energy and Process Engineering, ETH Zurich, Leonhardstrasse 21, Zurich, 8092, Switzerland.
[2]Energy and Technology Policy Group, ETH Zurich, Clausiusstrasse 37, City, Zurich, 8092, Switzerland.

*Corresponding author(s). E-mail(s): bjarne.steffen@gess.ethz.ch; sansavig@ethz.ch;

1 Supplemental Figures

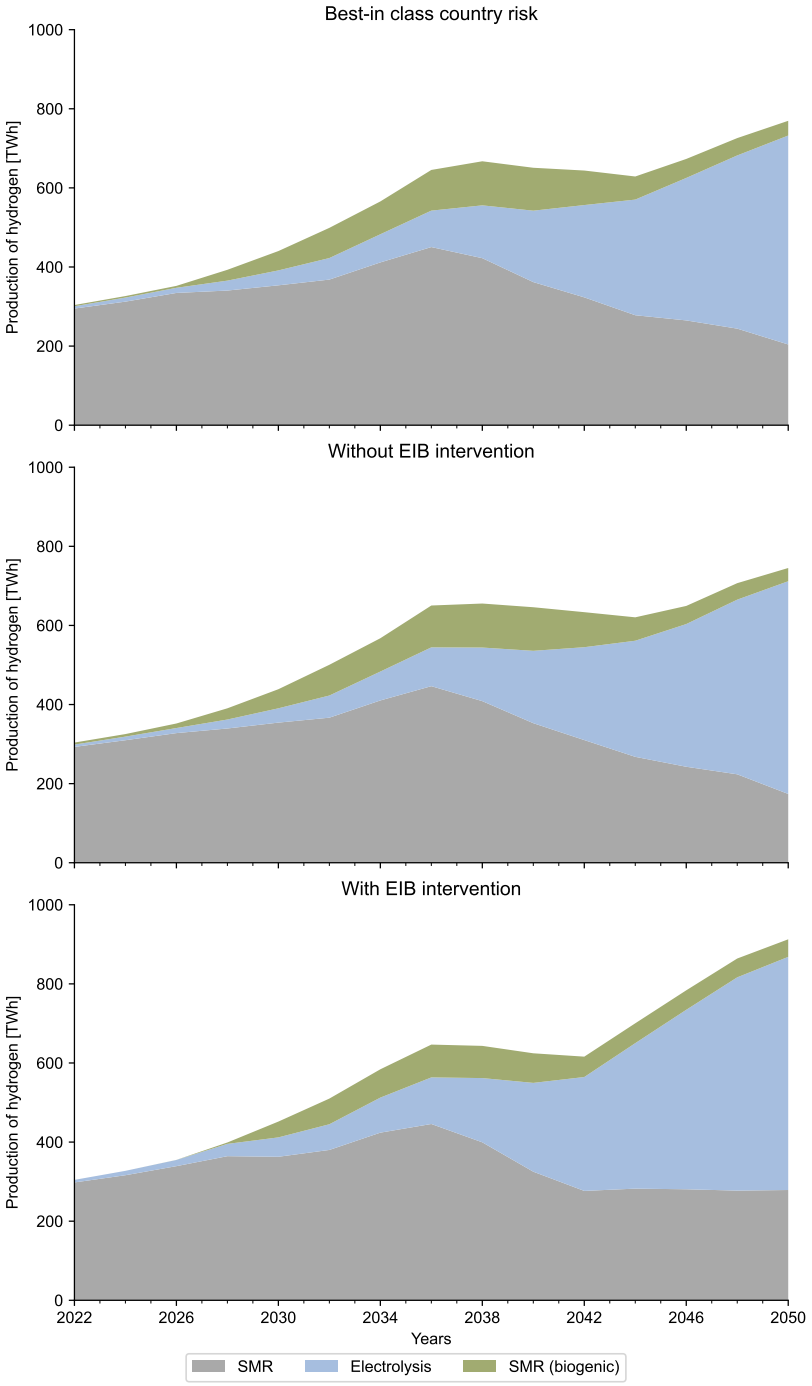

Fig. S1 Hydrogen production by technology from 2022 until 2050 for "Best-in class country risk", "Without EIB intervention", and "With EIB intervention".

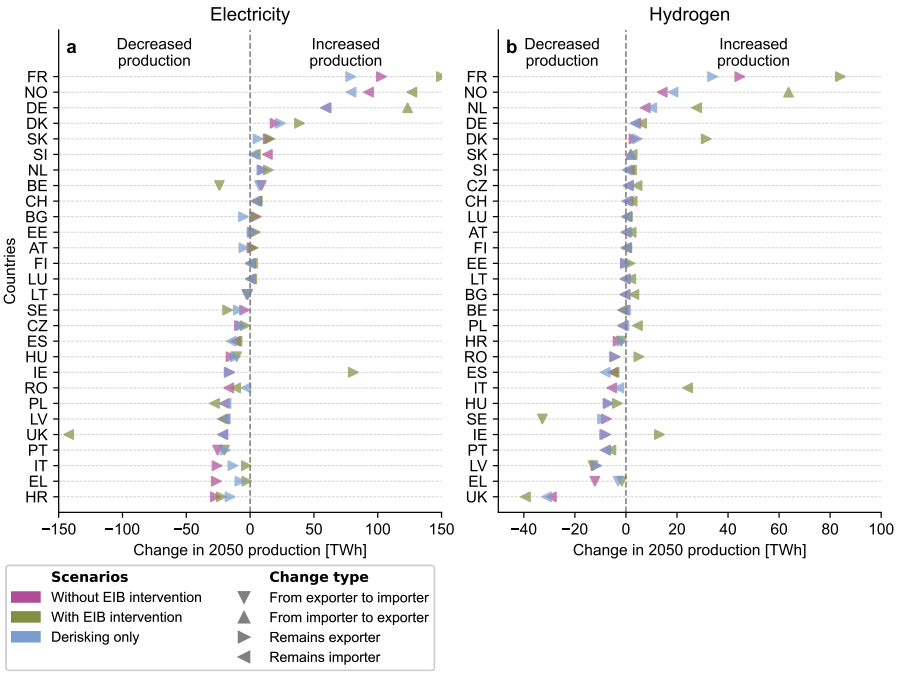

Fig. S2 Change in electricity and hydrogen production for each country without and with EIB intervention, and with derisking only in comparison to "Best-in-class country risk".

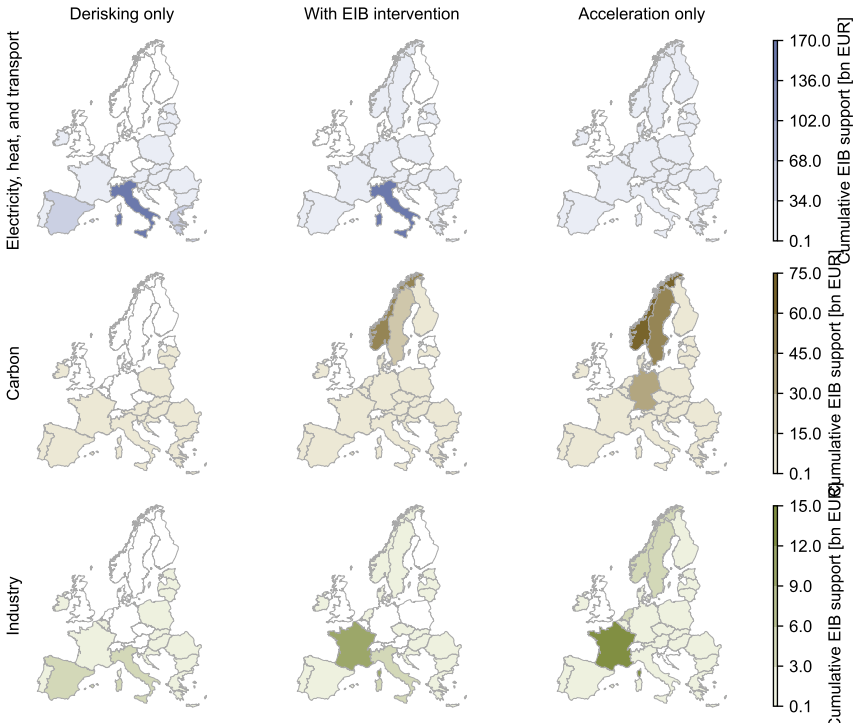

Fig. S3 Spatial depiction of EIB support under "Derisking only", "With EIB intervention", and "Acceleration only" for the three aggregated sectors "Electricity and heat", "Carbon", and "Industry".

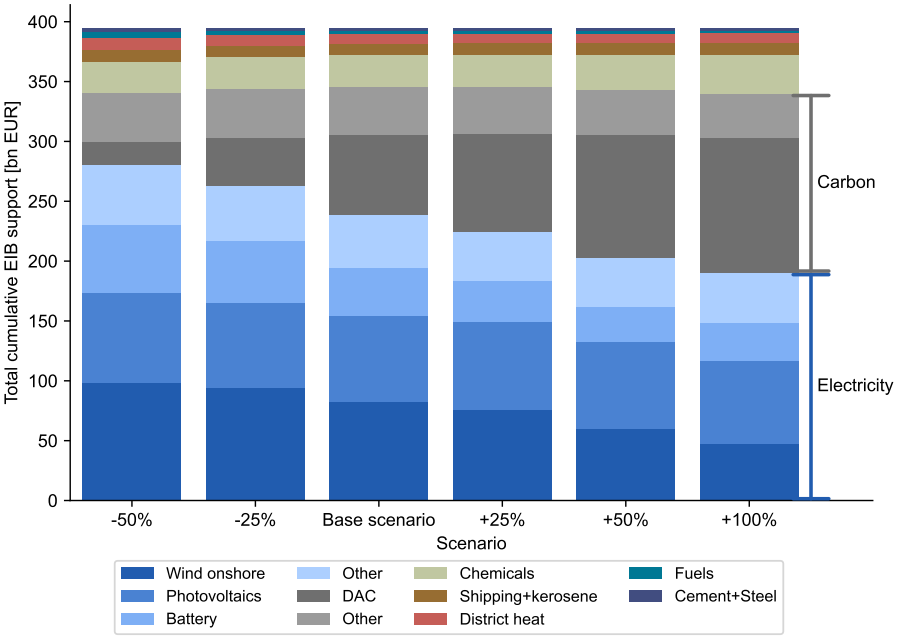

Fig. S4 Sensitivity of EIB support for varying deployment acceleration factors (from -50% to +100%).

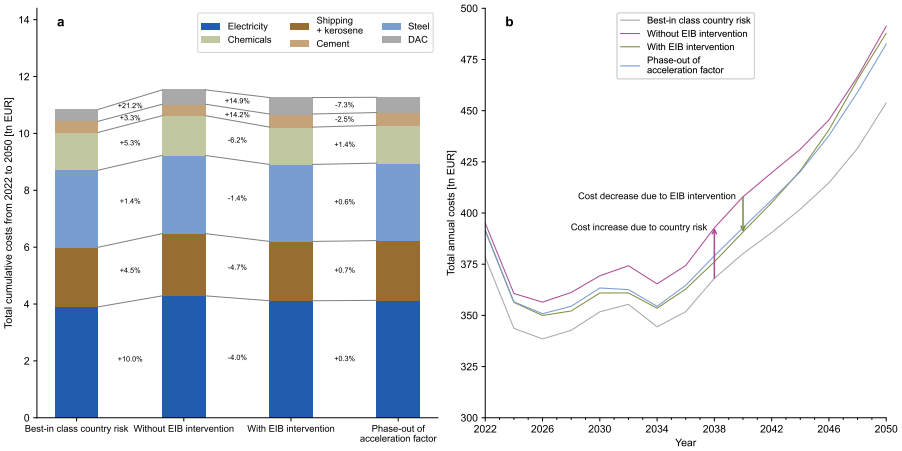

Fig. S5 Cumulative and annual costs when considering a decreasing deployment acceleration factor ("Phase-out of acceleration factor") in comparison to the other scenarios from Figure 2. The cumulative costs are 0.08% higher than "With EIB intervention". Annual costs diverge after 2044 due to reduced DAC support (Fig. S6). The decreased deployment acceleration factor $\rho_{t,y}$ is calculated ex-post from the scenario "Without EIB intervention" with the installed capacity $\sum_{n\in\mathcal{N}} C_{t,n,y}$ as $\rho_{t,y} = 1 - \frac{\sum_{n\in\mathcal{N}} C_{t,n,y}}{\max(\sum_{n\in\mathcal{N}} C_{t,n,y})}$. Afterwards, the optimization is run again with the decreased deployment acceleration factor.

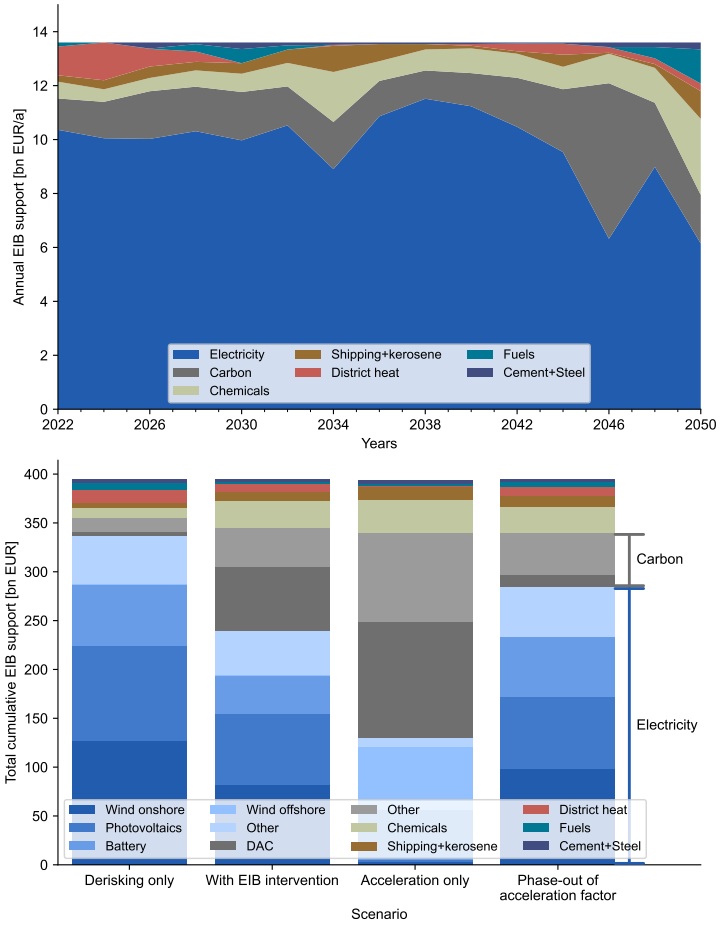

Fig. S6 Annual EIB support for "Phase-out of acceleration factor" and comparison to cumulative EIB support of the other scenarios from Figure 2. The reduced acceleration factor decreases the support for DAC in 2048 and 2050. The decreased deployment acceleration factor $\rho_{t,y}$ is calculated ex-post from the scenario "Without EIB intervention" with the installed capacity $\sum_{n\in\mathcal{N}} C_{t,n,y}$ as $\rho_{t,y} = 1 - \frac{\sum_{n\in\mathcal{N}} C_{t,n,y}}{\max(\sum_{n\in\mathcal{N}} C_{t,n,y})}$. Afterwards, the optimization is run again with the decreased deployment acceleration factor.

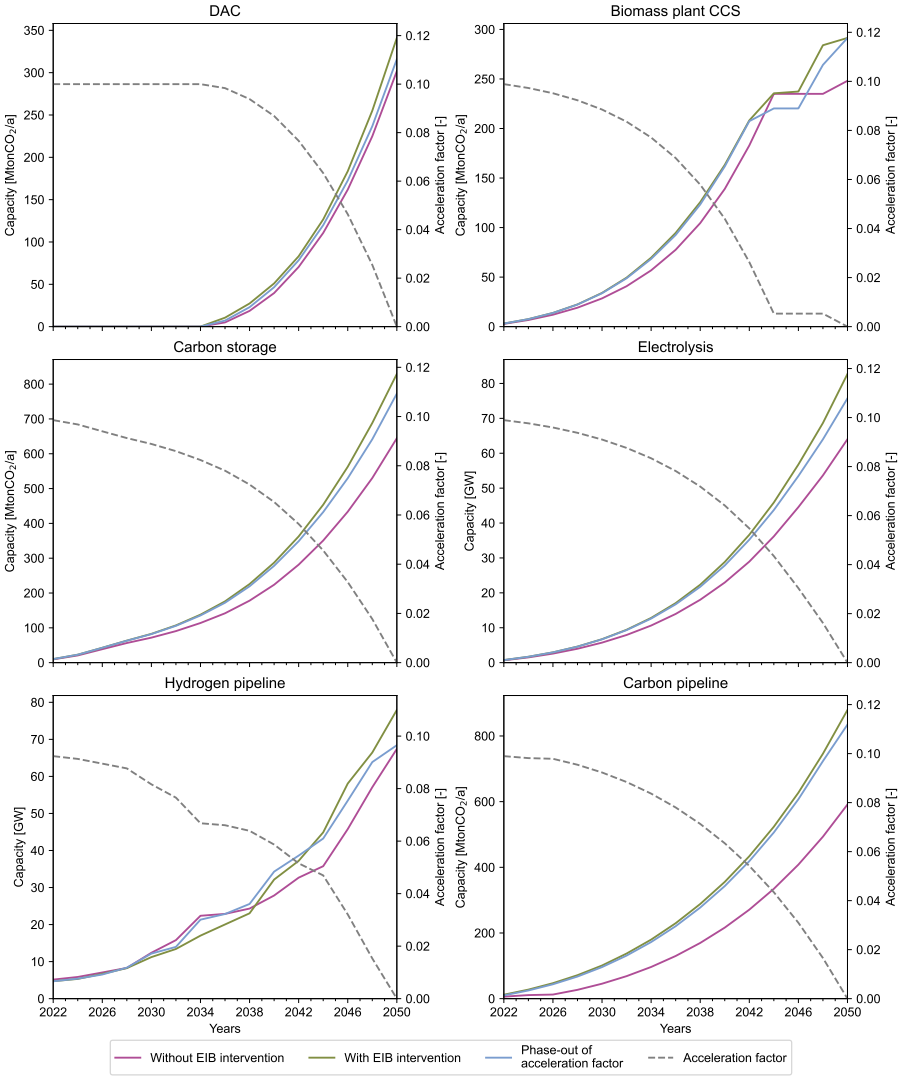

Fig. S7 Capacity of relevant emerging technologies "With EIB intervention", "Without EIB intervention", and "Phase-out of acceleration factor". The decreased deployment acceleration factor $\rho_{t,y}$ is calculated ex-post from the scenario "Without EIB intervention" with the installed capacity $\sum_{n\in\mathcal{N}} C_{t,n,y}$ as $\rho_{t,y} = 1 - \frac{\sum_{n\in\mathcal{N}} C_{t,n,y}}{\max(\sum_{n\in\mathcal{N}} C_{t,n,y})}$. Afterwards, the optimization is run again with the decreased deployment acceleration factor. The deployment acceleration factor is shown as a grey dashed line.

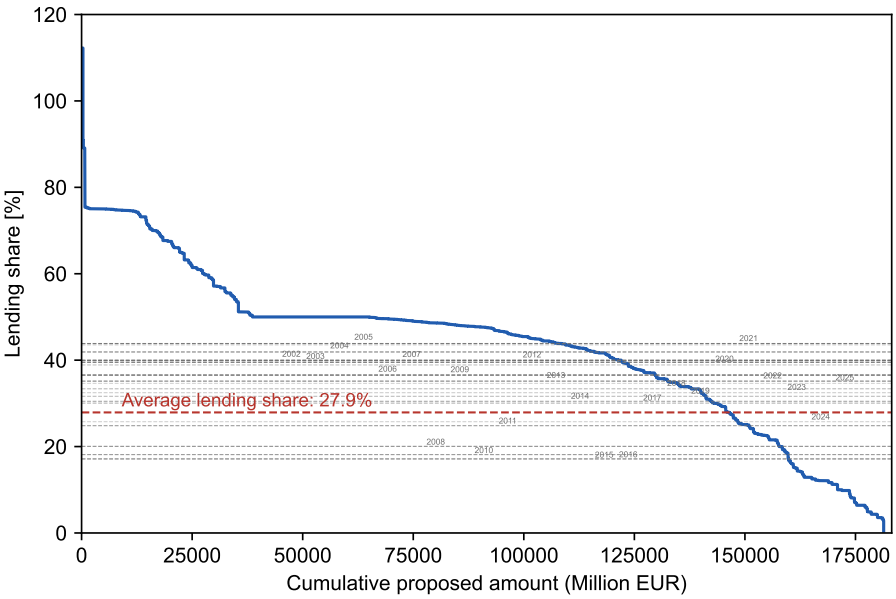

Fig. S8 Estimation of real lending share for all energy-related projects financed by the EIB from [1]. 763 projects from 2002 to 2025 with a parsable proposed EIB support and total investment volume are extracted. The cumulative proposed EIB support is 181.4 bn. Euro. The average lending shares for each year (grey) and for 2002 – 2025 (red) are shown as dashed lines.

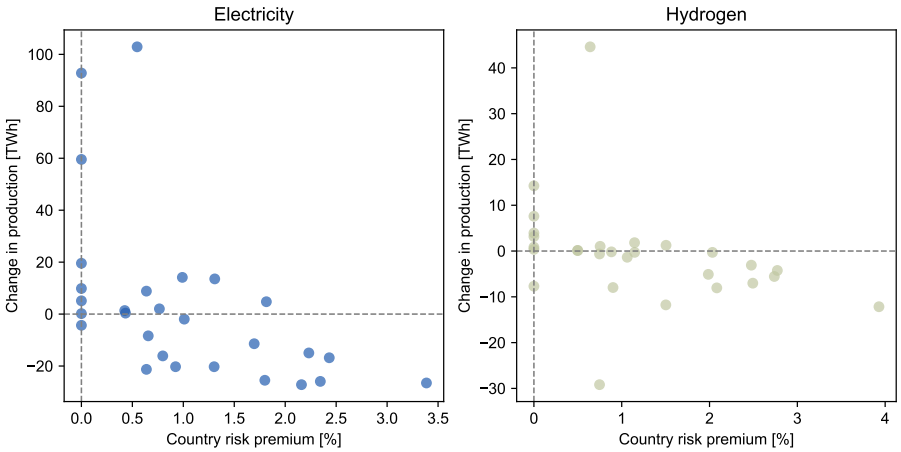

Fig. S9 Change in 2050 electricity and hydrogen production without EIB intervention in comparison to the "Best-in-class country risk" scenario, compared to country risk premium. Higher country risk premiums generally lead to a decline in production, and vice versa.

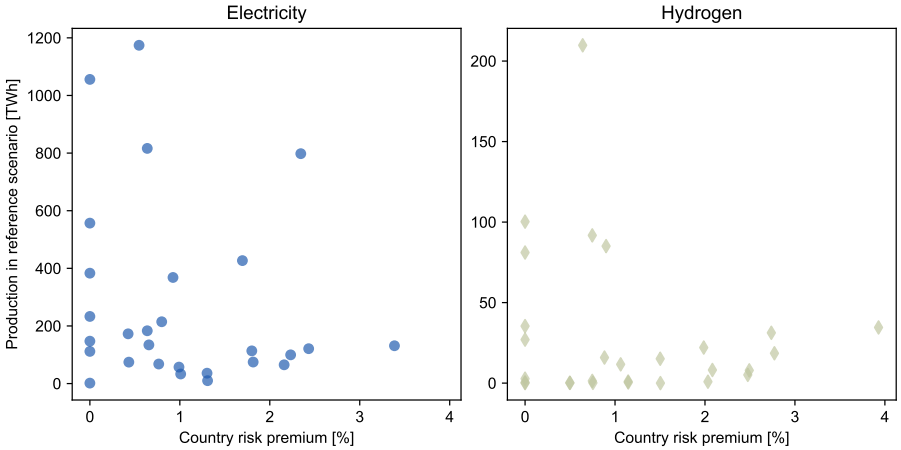

Fig. S10 Electricity and hydrogen production per country in the reference scenario "Only sector risk", compared to country risk premium. The national productions and country risk premia show no strong correlation.

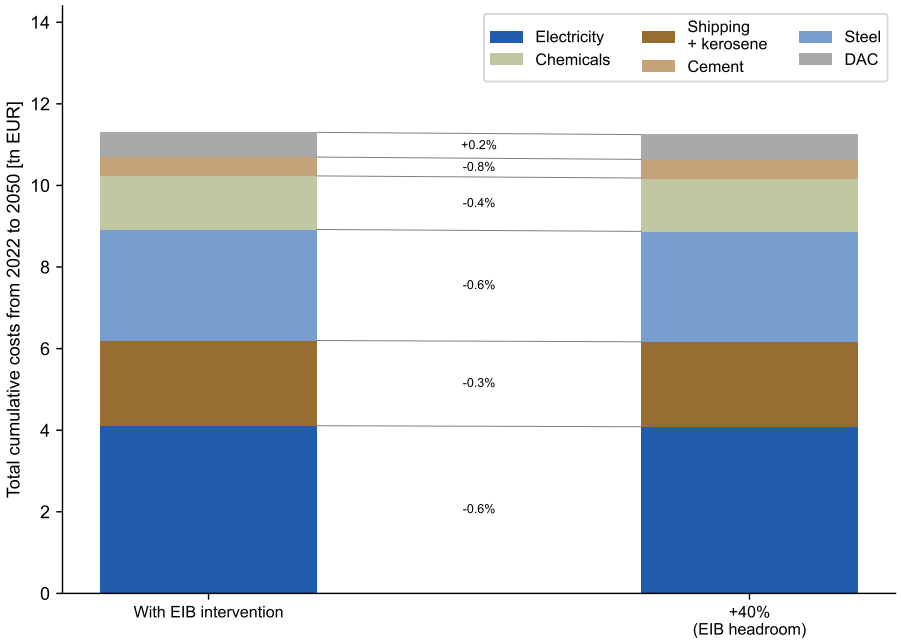

Fig. S11 Sectoral cumulative cost (2022–2050) for "EIB intervention" and an increased EIB lending budget by 40% (right hatches), following Paduano [2]. EIB-ineligible sectors, i.e., heat and road transport, are excluded.

2 Supplemental Methods

S1 EIB eligibility by technology

Table S1: Matching of each technology with a corresponding sector, and indication whether the technology is eligible for the two EIB interventions, derisking and deployment acceleration. BEV: battery-electric vehicle; BF BOF: blast furnace basic-oxygen furnace; CCS: carbon capture and storage; DAC: direct air capture; EAF: electric arc furnace; DH: district heating; DRI: direct reduced iron; HDT: heavy-duty truck; BET: battery-electric truck; FC(EV): fuel cell (electric vehicle); ICE: internal combustion engine; LNG: liquefied natural gas; SMR: steam-methane reforming.

Technology	Matching sector	Eligible for derisking	Eligible for deployment acceleration
ammonia ICE ship	Heat generation	No	No
ammonia pipeline	Oil & gas pipelines	Yes	Yes
anaerobic digestion	Bioenergy, production	Yes	No
battery	Power, higher-risk tech (project finance)	Yes	Yes
BEV	Heat generation	No	No
BF BOF	Iron and steel	No	No
BF BOF CCS	Iron and steel	Yes	Yes
biomass boiler	Heat generation	No	No
biomass boiler DH	Heat generation	Yes	No
biomass plant	Power generation	Yes	No
biomass plant CCS	Power, higher-risk tech (project finance)	Yes	Yes
biomass to cement fuel	Heat generation	No	No
biomethane conversion	Bioenergy, production	Yes	No
carbon pipeline	Oil & gas pipelines	Yes	Yes
carbon storage	Hydrogen, generation	Yes	Yes
cement kiln	Hydrogen, generation	No	No
cement post comb	Cement	Yes	Yes
coal to cement fuel	Heat generation	No	No
DAC	Hydrogen, generation	Yes	Yes
diesel ICE ship	Heat generation	No	No
district heating grid	Heat generation	Yes	No
EAF	Iron and steel	Yes	No
electrode boiler	Heat generation	No	No
electrode boiler DH	Heat generation	Yes	Yes
electrolysis	Hydrogen, generation	Yes	Yes
fischer tropsch	Oil & gas	Yes	Yes

fuel cell	Power, higher-risk tech (project finance)	Yes	Yes
gasification	Bioenergy, production	Yes	Yes
H2 DRI	Iron and steel	Yes	Yes
haber bosch	Bioenergy, production	Yes	No
hard coal boiler DH	Heat generation	No	No
hard coal plant	Power generation	No	No
HDT BET	Heat generation	No	No
HDT diesel	Heat generation	No	No
HDT FCEV	Heat generation	No	No
heat pump	Heat generation	No	No
heat pump DH	Heat generation	Yes	Yes
hydrogen FC ship	Heat generation	No	No
hydrogen pipeline	Oil & gas pipelines	Yes	Yes
hydrogen to cement fuel	Heat generation	No	No
ICE diesel	Heat generation	No	No
ICE petrol	Heat generation	No	No
industrial gas consumer	Heat generation	No	No
lignite coal plant	Power generation	No	No
LNG terminal	Oil & gas	No	No
methanation	Oil & gas	Yes	Yes
methanol from biomass	Platform chemicals	Yes	Yes
methanol from hydrogen	Platform chemicals	Yes	Yes
methanol from natural gas	Platform chemicals	No	No
methanol ICE ship	Heat generation	No	No
methanol pipeline	Oil & gas pipelines	Yes	Yes
natural gas boiler	Heat generation	No	No
natural gas boiler DH	Heat generation	No	No
natural gas pipeline	Oil & gas pipelines	No	No
natural gas storage	Oil & gas	No	No
natural gas turbine	Power generation	No	No
natural gas turbine CCS	Power, higher-risk tech (project finance)	Yes	Yes
NG DRI	Iron and steel	No	No
NG DRI CCS	Iron and steel	Yes	Yes
nuclear	Power generation	No	No
oil boiler	Heat generation	No	No
oil boiler DH	Heat generation	No	No
oil pipeline	Oil & gas pipelines	No	No
oil plant	Power generation	No	No
oil storage	Oil & gas	No	No
oil to diesel conversion	Heat generation	No	No
oil to gasoline conversion	Heat generation	No	No
oil to kerosene conversion	Heat generation	No	No
oil to naphtha conversion	Heat generation	No	No
olefin from methanol	Platform chemicals	Yes	Yes

olefin from naphtha	Platform chemicals	No	No
olefin pipeline	Oil & gas pipelines	Yes	Yes
photovoltaics	Power generation	Yes	No
power line	Electricity grids	Yes	No
pumped hydro	Power generation	Yes	No
pyrolysis	Bioenergy, production	Yes	Yes
refining	Oil & gas	No	No
reservoir hydro	Power generation	Yes	No
run-of-river hydro	Power generation	Yes	No
salt cavern storage	Hydrogen, generation	Yes	Yes
SMR	Hydrogen, generation	No	No
SMR CCS	Hydrogen, generation	Yes	Yes
waste boiler DH	Heat generation	Yes	No
waste plant	Power generation	Yes	No
waste to cement fuel	Heat generation	No	No
wind offshore	Power, higher-risk tech (project finance)	Yes	Yes
wind onshore	Power generation	Yes	No

Table S2 Values for cost of capital (CoC) for each considered sector and European country before and after derisking from [3] for countries AT - HU [%].

Sector	Derisking	AT	BE	BG	CH	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU
Bioenergy, production	Before	6.49	6.69	8.32	6.26	6.86	5.87	6.07	6.96	9.77	7.86	6.59	6.59	8.52	8.79
	After	6.02	5.99	6.38	6.26	6.15	5.87	6.07	6.12	6.07	5.99	6.12	5.99	6.17	6.41
Cement	Before	6.78	7.00	8.59	6.51	7.14	6.17	6.35	7.24	10.14	8.19	6.87	6.90	8.83	9.07
	After	6.30	6.28	6.62	6.51	6.42	6.17	6.35	6.39	6.35	6.28	6.39	6.28	6.44	6.64
Electricity grids	Before	4.98	5.16	6.79	4.84	5.36	4.37	4.61	5.44	8.00	6.22	5.11	5.07	6.89	7.23
	After	4.55	4.52	4.97	4.84	4.70	4.37	4.61	4.67	4.61	4.52	4.67	4.52	4.73	5.00
Heat generation	Before	4.98	5.16	6.79	4.84	5.36	4.37	4.61	5.44	8.00	6.22	5.11	5.07	6.89	7.23
	After	4.55	4.52	4.97	4.84	4.70	4.37	4.61	4.67	4.61	4.52	4.67	4.52	4.73	5.00
Hydrogen, generation	Before	7.39	7.63	9.17	7.06	7.74	6.79	6.93	7.85	10.86	8.87	7.47	7.52	9.48	9.65
	After	6.90	6.88	7.14	7.06	6.98	6.79	6.93	6.97	6.93	6.88	6.97	6.88	7.00	7.16
Iron and steel	Before	7.02	7.22	8.90	6.84	7.42	6.38	6.62	7.50	10.27	8.37	7.15	7.12	9.05	9.37
	After	6.56	6.53	6.98	6.84	6.71	6.38	6.62	6.68	6.62	6.53	6.68	6.53	6.74	7.01
Oil & gas	Before	7.02	7.26	8.77	6.66	7.36	6.44	6.55	7.47	10.53	8.52	7.08	7.16	9.11	9.25
	After	6.52	6.51	6.72	6.66	6.59	6.44	6.55	6.58	6.55	6.51	6.58	6.51	6.61	6.74
Oil & gas pipelines	Before	5.36	5.56	7.17	5.15	5.73	4.75	4.96	5.82	8.54	6.68	5.47	5.46	7.34	7.62
	After	4.91	4.88	5.27	5.15	5.04	4.75	4.96	5.01	4.96	4.88	5.01	4.88	5.06	5.30
Platform chemicals	Before	6.99	7.19	8.87	6.81	7.38	6.35	6.59	7.47	10.23	8.33	7.11	7.09	9.02	9.34
	After	6.53	6.50	6.95	6.81	6.68	6.35	6.59	6.65	6.59	6.50	6.65	6.50	6.71	6.98
Power generation	Before	4.98	5.16	6.79	4.84	5.36	4.37	4.61	5.44	8.00	6.22	5.11	5.07	6.89	7.23
	After	4.55	4.52	4.97	4.84	4.70	4.37	4.61	4.67	4.61	4.52	4.67	4.52	4.73	5.00
Power, higher-risk tech	Before	5.78	5.96	7.59	5.64	6.16	5.17	5.41	6.24	8.80	7.02	5.91	5.87	7.69	8.03
	After	5.35	5.32	5.77	5.64	5.50	5.17	5.41	5.47	5.41	5.32	5.47	5.32	5.53	5.80

Table S3 Values for cost of capital (CoC) for each considered sector and European country before and after derisking from [3] for countries IE - UK [%].

Sector	Derisking	IE	IT	LT	LU	LV	NL	NO	PL	PT	RO	SE	SI	SK	UK
Bioenergy, production	Before	7.17	8.59	7.34	6.00	7.54	5.97	6.07	7.15	8.06	8.85	6.11	7.57	7.18	6.69
	After	6.32	6.02	6.25	6.00	6.12	5.97	6.07	6.15	6.10	6.23	6.11	6.15	6.10	5.99
Cement	Before	7.44	8.94	7.62	6.28	7.84	6.26	6.35	7.44	8.38	9.17	6.38	7.87	7.48	7.00
	After	6.56	6.30	6.51	6.28	6.39	6.26	6.35	6.42	6.37	6.48	6.38	6.42	6.37	6.28
Electricity grids	Before	5.70	6.90	5.83	4.53	5.98	4.50	4.61	5.63	6.44	7.23	4.66	6.01	5.63	5.16
	After	4.90	4.55	4.82	4.53	4.67	4.50	4.61	4.70	4.64	4.79	4.66	4.70	4.64	4.52
Heat generation	Before	5.70	6.90	5.83	4.53	5.98	4.50	4.61	5.63	6.44	7.23	4.66	6.01	5.63	5.16
	After	4.90	4.55	4.82	4.53	4.67	4.50	4.61	4.70	4.64	4.79	4.66	4.70	4.64	4.52
Hydrogen, generation	Before	8.00	9.63	8.20	6.88	8.47	6.87	6.93	8.05	9.03	9.81	6.96	8.49	8.09	7.63
	After	7.10	6.90	7.05	6.88	6.97	6.87	6.93	6.98	6.95	7.03	6.96	6.98	6.95	6.88
Iron and steel	Before	7.75	9.10	7.91	6.53	8.08	6.51	6.62	7.70	8.59	9.40	6.66	8.12	7.72	7.22
	After	6.91	6.56	6.83	6.53	6.68	6.51	6.62	6.71	6.65	6.80	6.66	6.71	6.65	6.53
Oil & gas	Before	7.60	9.29	7.81	6.51	8.10	6.50	6.55	7.67	8.67	9.44	6.57	8.12	7.72	7.26
	After	6.69	6.52	6.65	6.51	6.58	6.50	6.55	6.59	6.56	6.64	6.57	6.59	6.56	6.51
Oil & gas pipelines	Before	6.04	7.39	6.20	4.88	6.39	4.86	4.96	6.01	6.89	7.67	5.00	6.42	6.03	5.56
	After	5.21	4.91	5.14	4.88	5.01	4.86	4.96	5.04	4.99	5.12	5.00	5.04	4.99	4.88
Platform chemicals	Before	7.72	9.06	7.88	6.50	8.05	6.47	6.59	7.67	8.55	9.36	6.63	8.08	7.68	7.19
	After	6.88	6.53	6.80	6.50	6.65	6.47	6.59	6.68	6.62	6.77	6.63	6.68	6.62	6.50
Power generation	Before	5.70	6.90	5.83	4.53	5.98	4.50	4.61	5.63	6.44	7.23	4.66	6.01	5.63	5.16
	After	4.90	4.55	4.82	4.53	4.67	4.50	4.61	4.70	4.64	4.79	4.66	4.70	4.64	4.52
Power, higher-risk tech	Before	6.50	7.70	6.63	5.33	6.78	5.30	5.41	6.43	7.24	8.03	5.46	6.81	6.43	5.96
	After	5.70	5.35	5.62	5.33	5.47	5.30	5.41	5.50	5.44	5.59	5.46	5.50	5.44	5.32

References

[1] European Investment Bank: Financed projects (2025). https://www.eib.org/en/projects/loans/index Accessed 2025-11-04

[2] Paduano, S.: Financing Europe: A Balance Sheet Analysis of the European Investment Bank (2025). https://findevlab.org/financing-europe-a-balance-sheet-analysis-of-the-european-investment-bank/ Accessed 2026-02-10

[3] Waidelich, P., Crassier, C., Boer, H.S.d., Tautorat, P., Steffen, B., Vuuren, D.v.: The impact of financing conditions on global deep decarbonization. Research Square. ISSN: 2693-5015 (2025). https://doi.org/10.21203/rs.3.rs-7921923/v1. https://www.researchsquare.com/article/rs-7921923/v1 Accessed 2025-11-03