Estimating support cost savings from de-risking renewables in Europe

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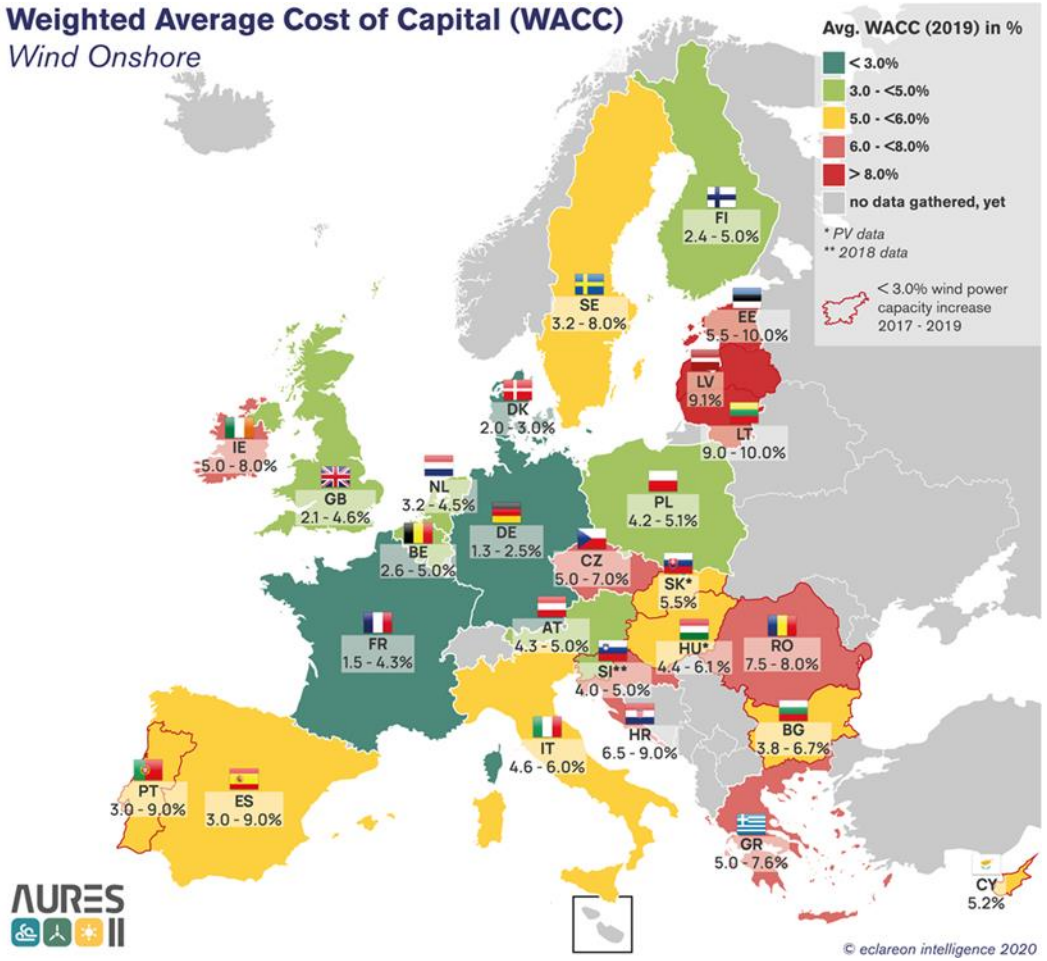
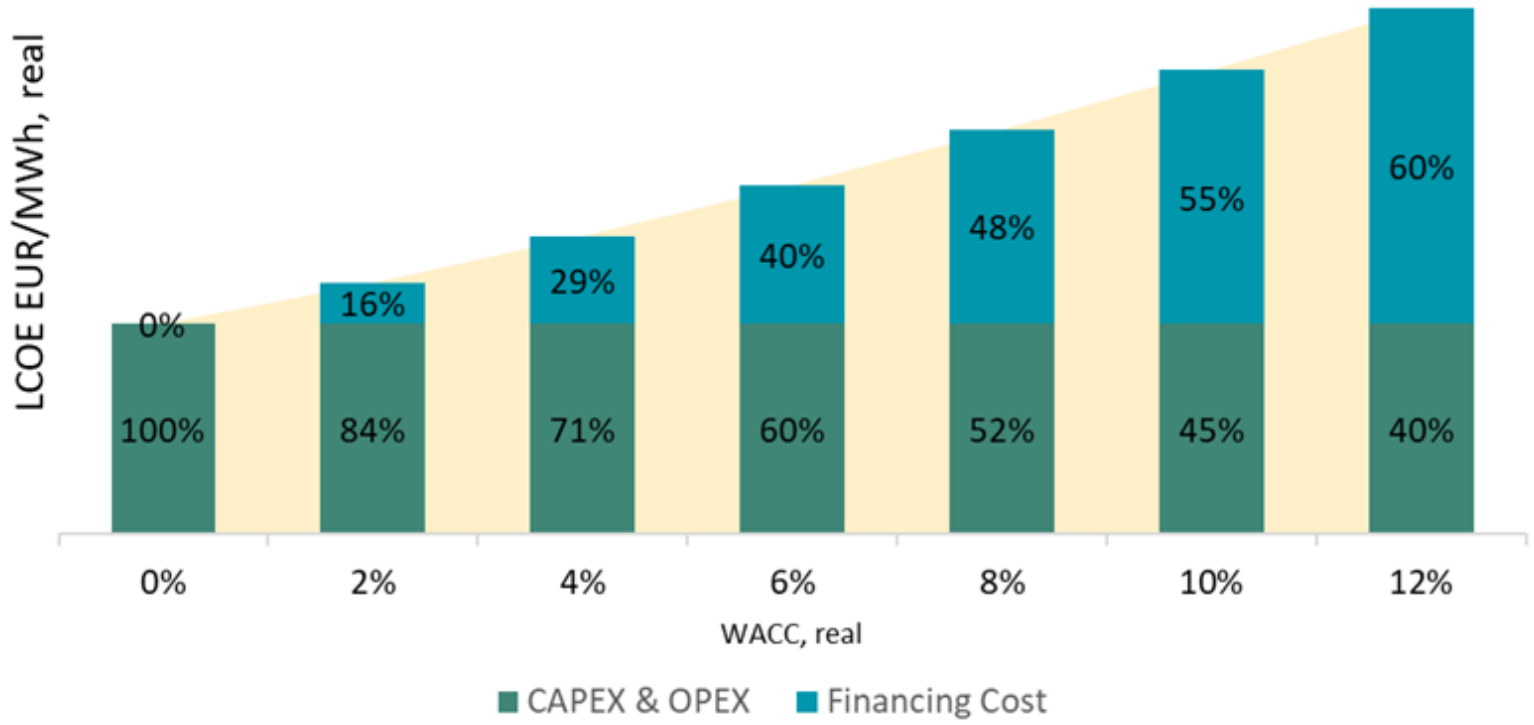
Main motivation (1)



The costs of capital for wind energy projects vary 3x within Europe

9 – 10%	Latvia and Lithuania
4 – 6 %	Italy and Hungary
1 – 3%	Germany and Denmark

Main motivation (2)



Wind energy projects are capital intensive and so their LCOE is very sensitive to changes in costs of capital

Capital intensive – high share of capital expenditures and low share of operational costs in overall investment cost

Source – Effect of auctions on financing conditions for renewable energy, AURES II, 2019

Research questions

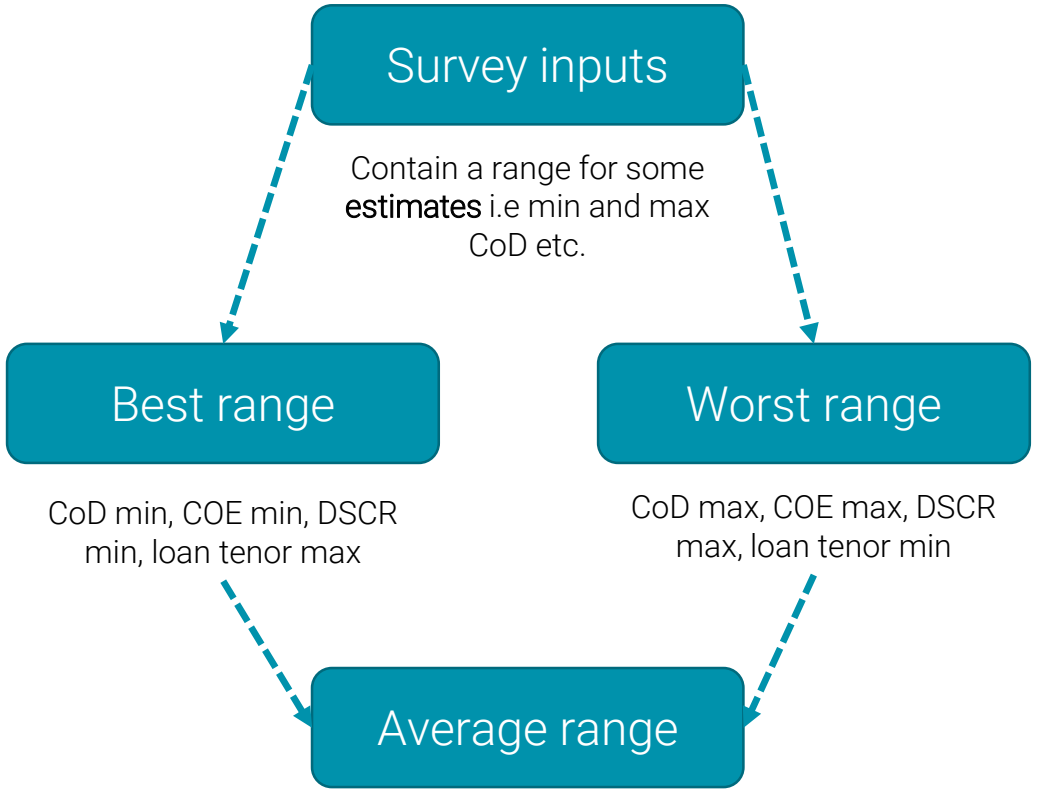
RQ1: Under the current financing conditions, what are the expected auction bid prices and support costs for onshore wind and solar PV projects?

RQ2: What are the expected support cost savings from de-risking debt and equity financing?

S-RQ: Are there any significant differences in support costs between different remuneration scheme designs?

Method (1) - the process

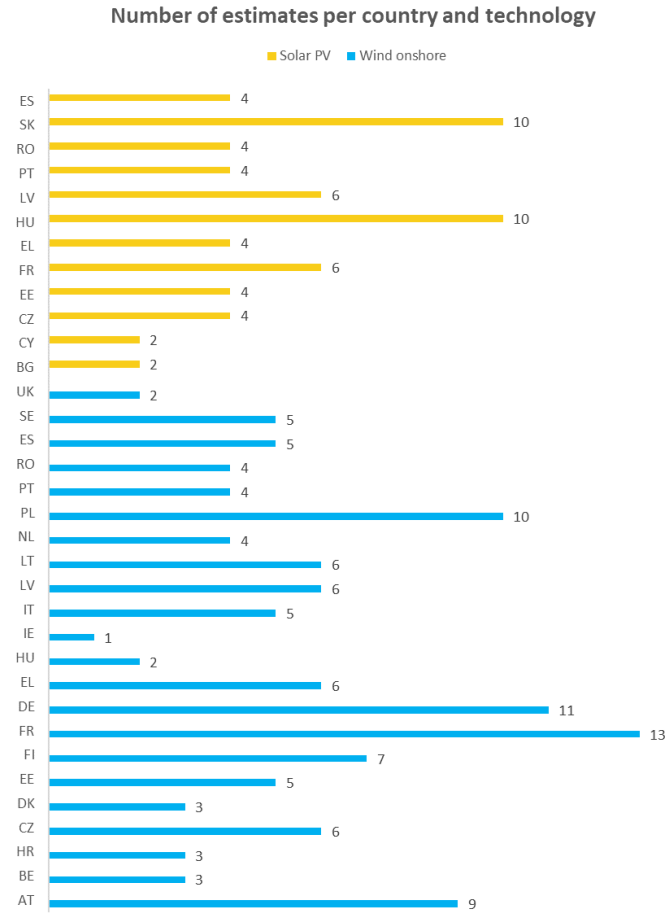
Method (2) – survey data treatment



187 estimates

561 sub-scenarios

each treated like an individual project



Method (3) – cash flow model

Expected Net Present Value (NPVe)

Scenario 1: Project realized on time – no penalties
90% probability

Scenario 2: Project delayed 1 year – penalty for delay
5% probability

Scenario 3: Project abandoned– penalty & support canceled
5% probability

NPVe = (Sc 1 x 90%) + (Sc 2 x 5%) + (Sc 3 x 5%)

Excel Solver Optimization

Automated using VBA coding

Minimize bid level

NPVe = 0

Vary bid level and debt size

DSCR requirements as input and debt size as output

CONSTRAINTS

Debt share - $i \in D_S : 0 \leq i \leq 100$

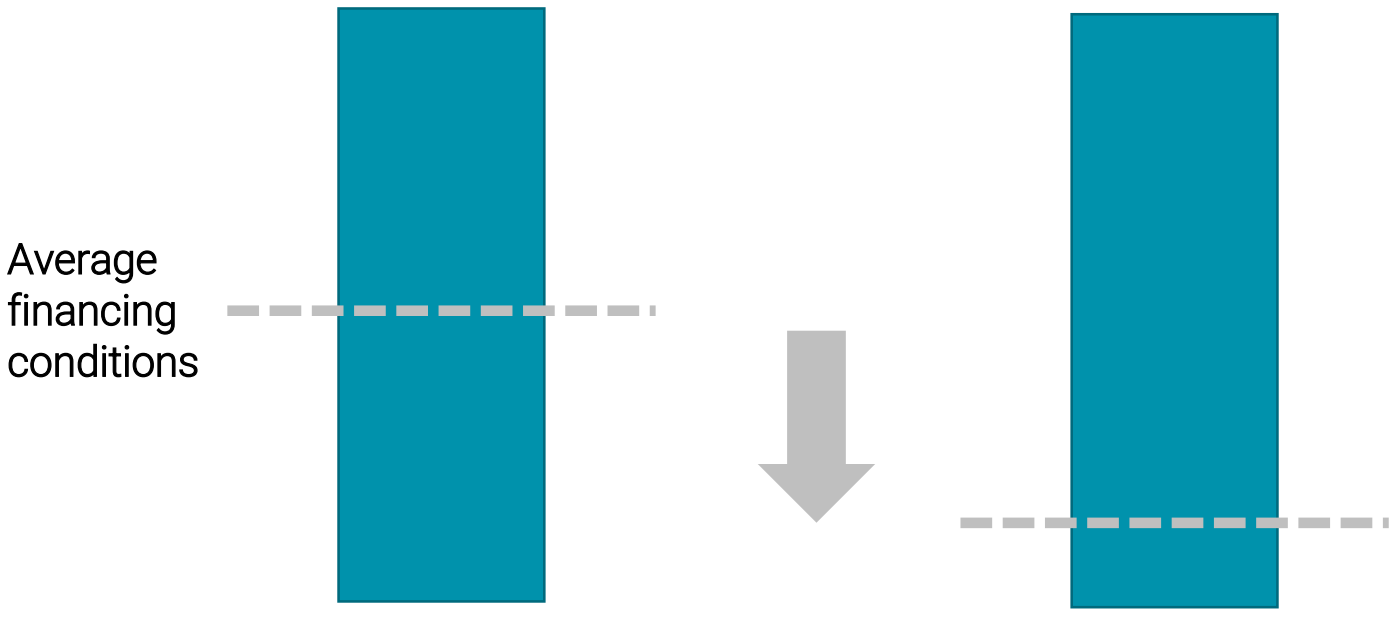
Balance at maturity - $B_{m \in D_a} = 0$

Balance at maturity - $B_{m \in D_b} = 0$

Net Present Value - NPV ≥ 0

Method (4)

De-risking potential [EUR/MWh] (sensitivity analysis)



Scenarios (from average to minimum surveyed)

1) All financing conditions
2) All debt financing
3) Cost of debt
4) Cost of equity
5) DSCR
6) Loan tenor

7) Investment variables
   - CAPEX
   - Capacity Factor
   - OPEX
   - Electricity price

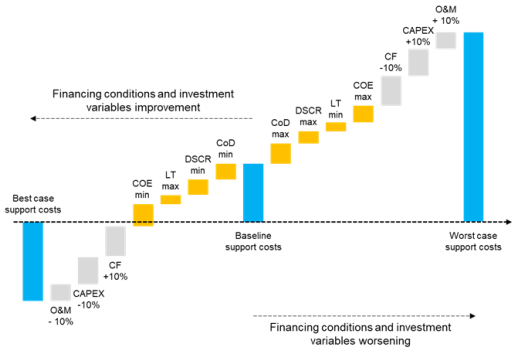
Method (4)

De-risking potential [EUR/MWh] (sensitivity analysis)

Two steps

1. All scenarios (vary individual variables or defined groups) for all 34 country-technology cases > HIGH level results

2. Waterfall model (vary individual variables one after another) for 4 country-technology cases (DE, DK, UK and EL) > SPECIFIC insights



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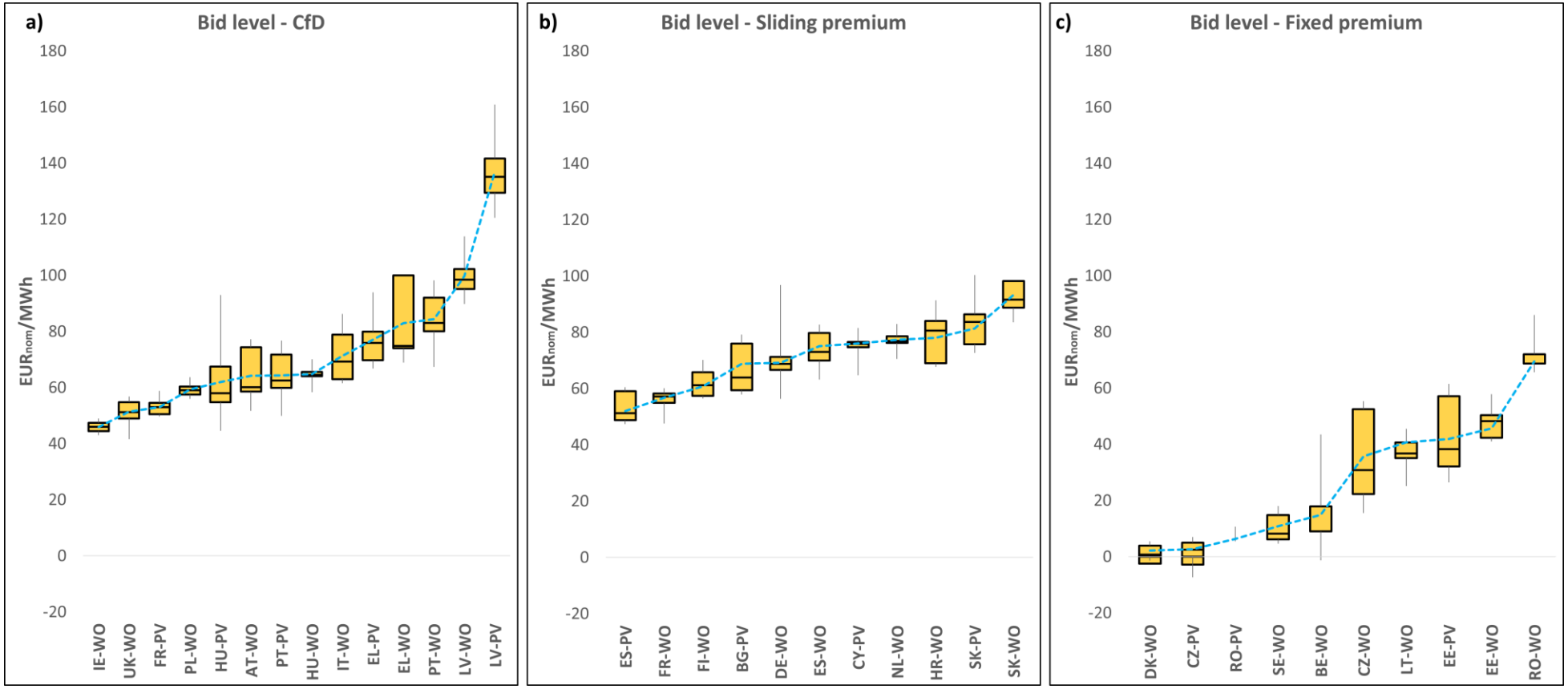
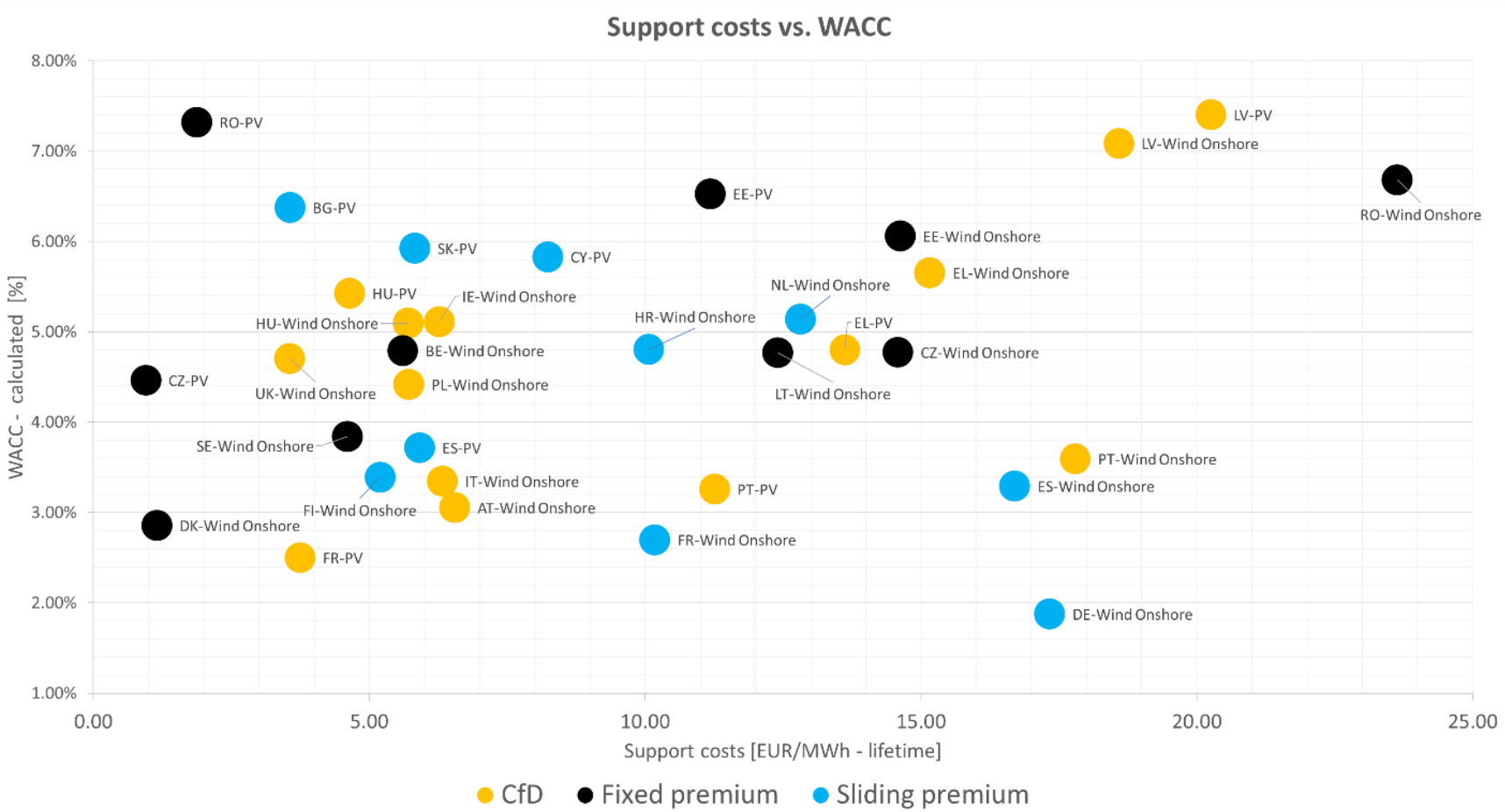
Results: Expected bid levels
(all 561 scenarios)

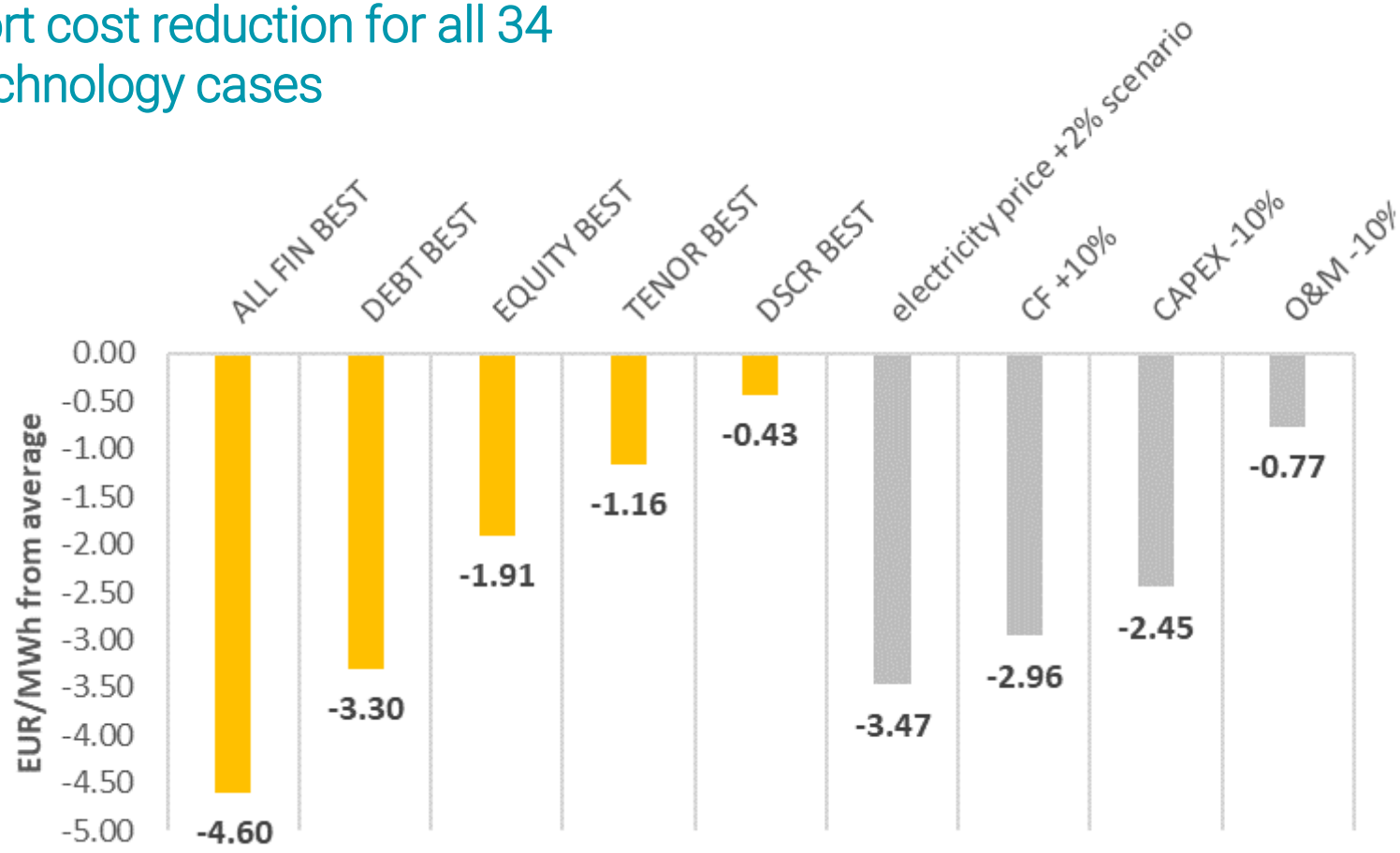


Results (1): Support costs vs. WACC

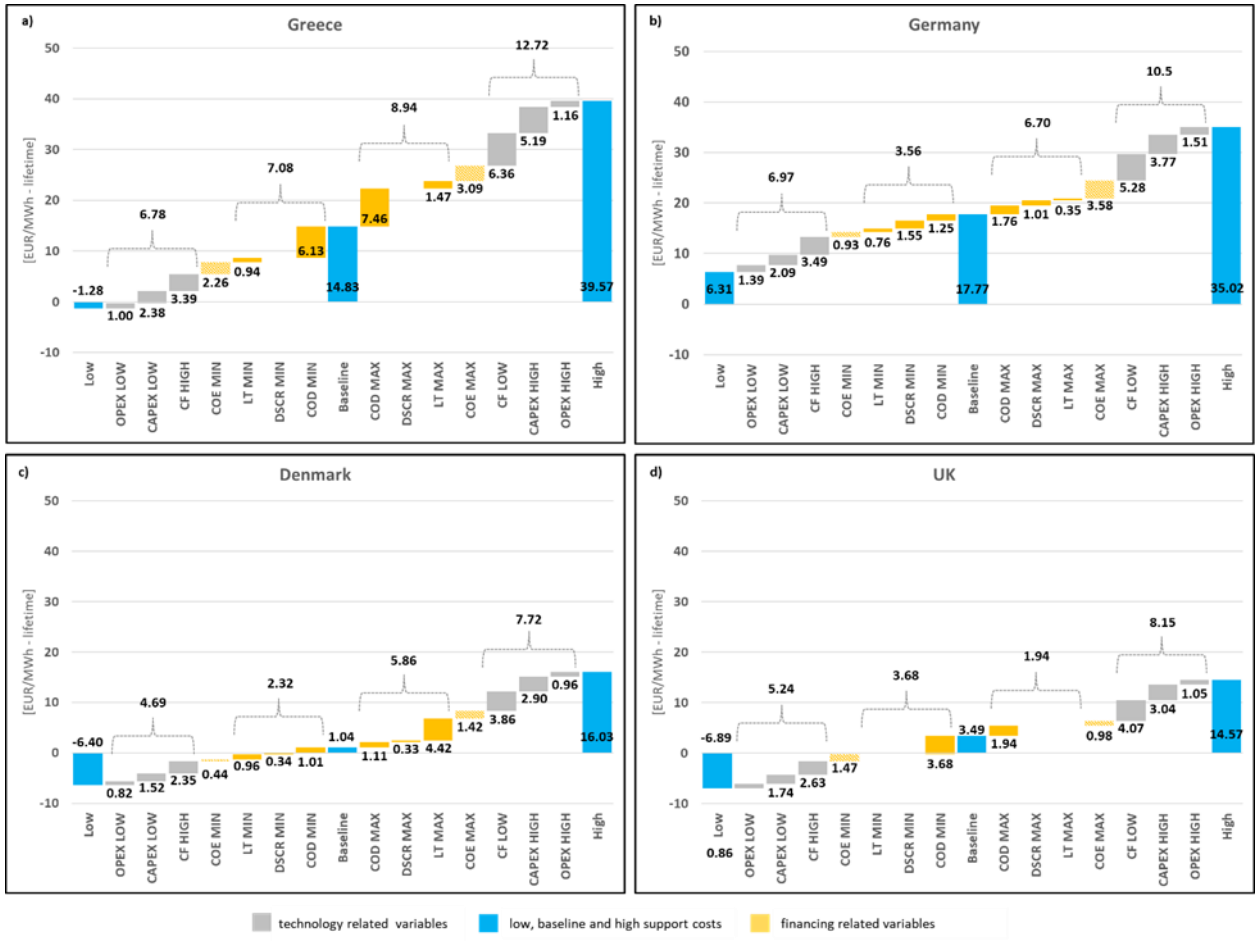


Results (2): De-risking potentials (1)

Average support cost reduction for all 34 country and technology cases



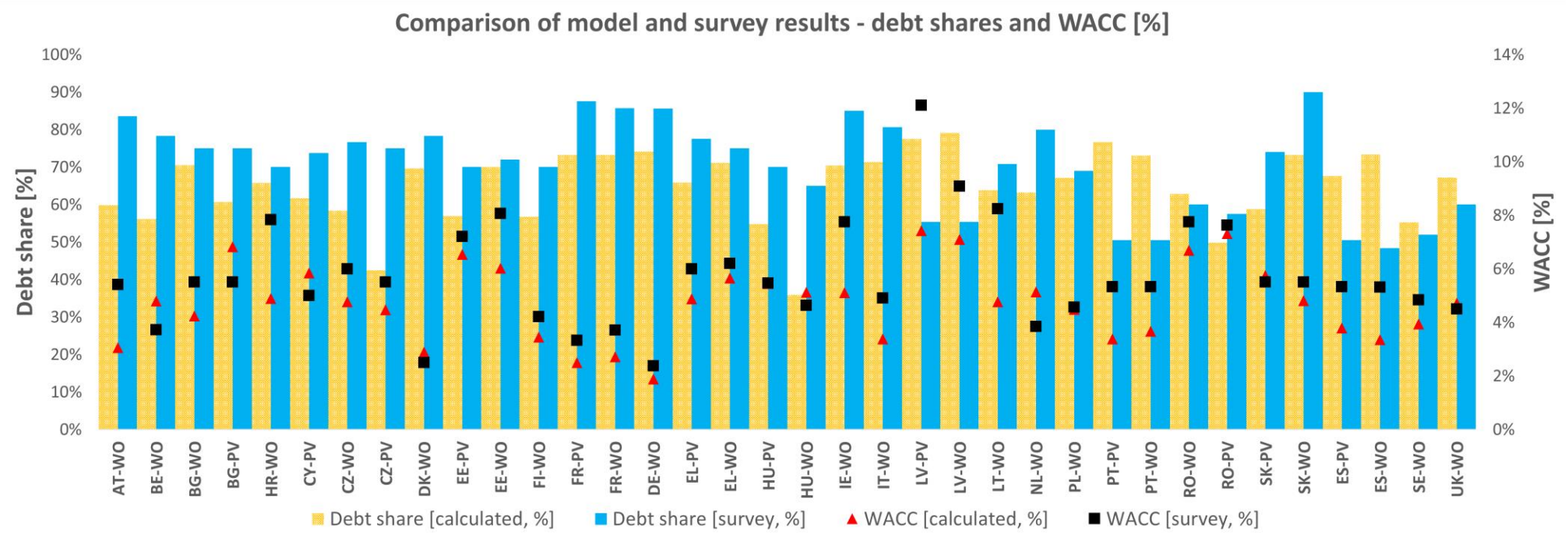
Results (2): De-risking potentials (2)



Support cost reduction for onshore wind in Greece, Denmark, Germany and UK – per investment variable

- Negative support costs in Denmark and UK only be de-risking
- Debt de-risking effects vary
  - 7.08 EUR/MWh in Greece
  - 2.32 EUR/MWh in Denmark
- CAPEX & capacity factors
  - larger relative impact in “low risk” countries

Modelled vs. surveyed debt share & WACC



Modelled vs. actual bid levels

	Adjusted average awarded price	Low – baseline *	High – baseline *	Low – waterfall **	High – waterfall **
	[EUR/MWh,2019]	[EUR/MWh]	[EUR/MWh]	[EUR/MWh]	[EUR/MWh]
HU-PV	65.00	44.51	92.99		
IT-Wind Onshore	63.43	61.57	86.21		
EL-Wind Onshore	53.53	68.83	99.92	51.73	129.23
EL-PV	49.31	66.70	93.87		
DK-Wind Onshore	2.00	-3.15	14.04	-11.78	29.53
DE-Wind Onshore	60.10	62.78	74.28	48.80	101.68

* average of all financing survey inputs and average investment values

** best financing and investment values

*** worst financing and investment values

Conclusions and discussion

- Largest benefit from debt de-risking implies policymakers should focus on revenue stabilisation mechanisms (like two sided CfD's)
- Our cross country study does not find evidence that countries with CfD's have lower costs of capital. Instead country risk is the main risk driver (Greece with two sided CfD has a 2.7% higher WACC on average than Denmark with a fixed premium)
- De-risking CoE has lesser impact so policymakers should conduct measures that relax auction designs in the pre-biding stage only as means of achieving goals other than cost-efficiency
- Other market conditions have a very large impact on support costs – such as site conditions, technology costs and electricity price expectations (increasing electricity price expectations from 1% increase per year to 2% leads to slightly greater support cost savings than de-risking debt financing)

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AURES II

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