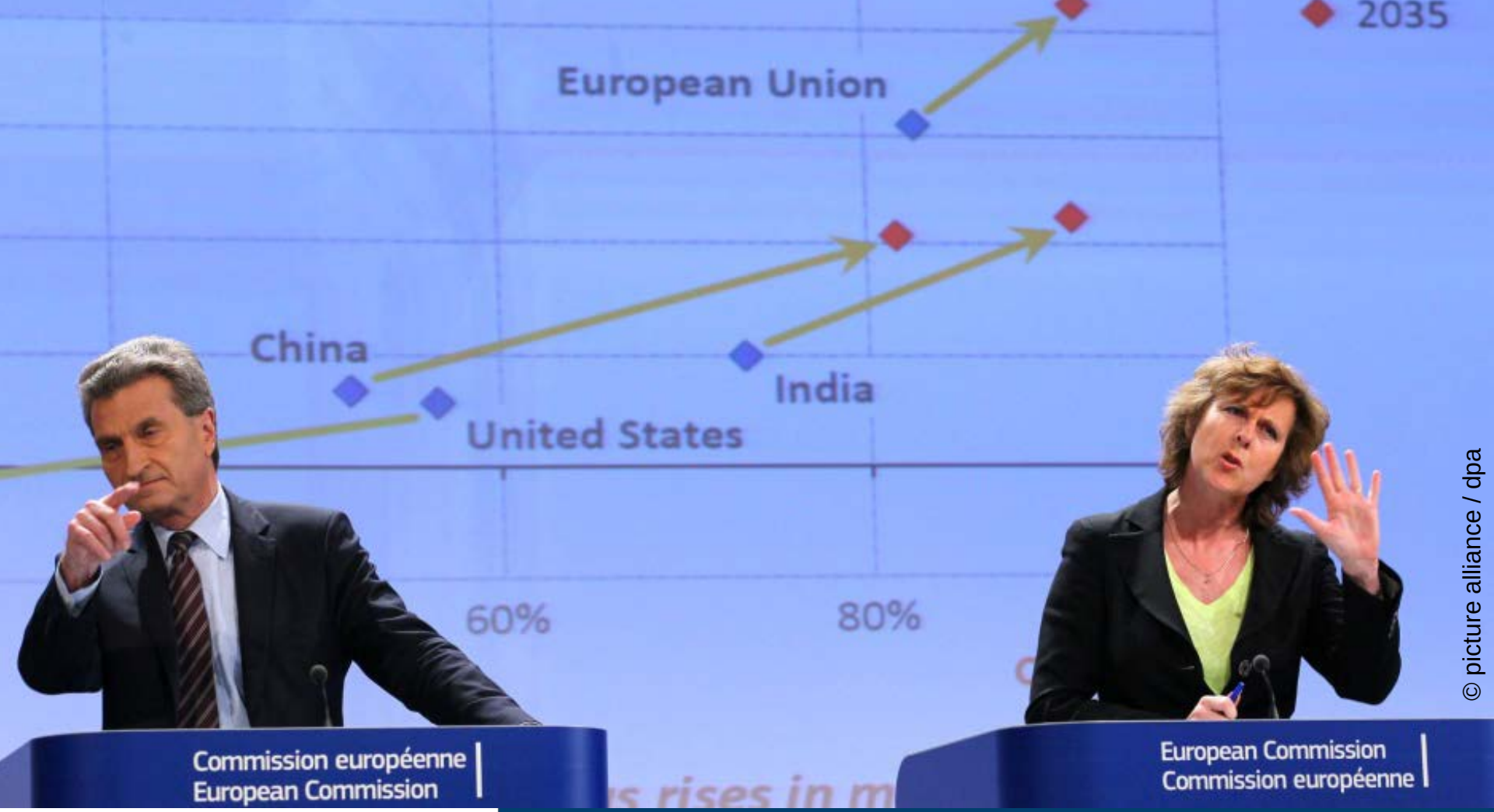

EU Climate and Energy Policy beyond 2020: How Many Targets and Instruments Are Necessary?

P. Lehmann, E. Gawel, S. Strunz (UFZ, Economics Dept)
J. Sijm (Energy Research Centre of the Netherlands, ECN)
J.-P. Mercure, U. Chewpreecha, H. Pollitt (Cambridge Econometrics, Cambridge University)

ENERDAY, Dresden, April 11, 2014

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Outline

- Introduction
- Rationales for renewables targets
- Model
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EU Targets 2020 and 2030

	2020	2030 (COM proposal)
Greenhouse gas emissions (GHG) compared to 1990	- 20% allocated amongst Member States	- 40% allocated amongst Member States
Share of renewables energy sources (RES) in total energy consumption	+ 20% allocated amongst Member States	+ 27% 
Reduction in energy consumption compared to projections	- 20%	

➔ Justification: Additional targets impair the cost-effectiveness of GHG mitigation

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Contributions of our Paper

Literature …	Our paper …
… discusses the **welfare loss** of an additional RES policy in a **first-best** setting with a **GHG externality** only …	… discusses the **costs and benefits** of an additional RES policy in a **second-best** setting with **multiple market and policy failures** …
… for **2020** targets …	… for **2030** targets …
… using **optimization** models.	… using **theoretical** analysis and an **econometric** decision-making model.

(Bernard and Vielle, 2009; Boeters and Koornneef, 2011; Böhringer et al., 2009a,b; Capros et al., 2008; Kretschmer et al., 2009; Tol, 2012)

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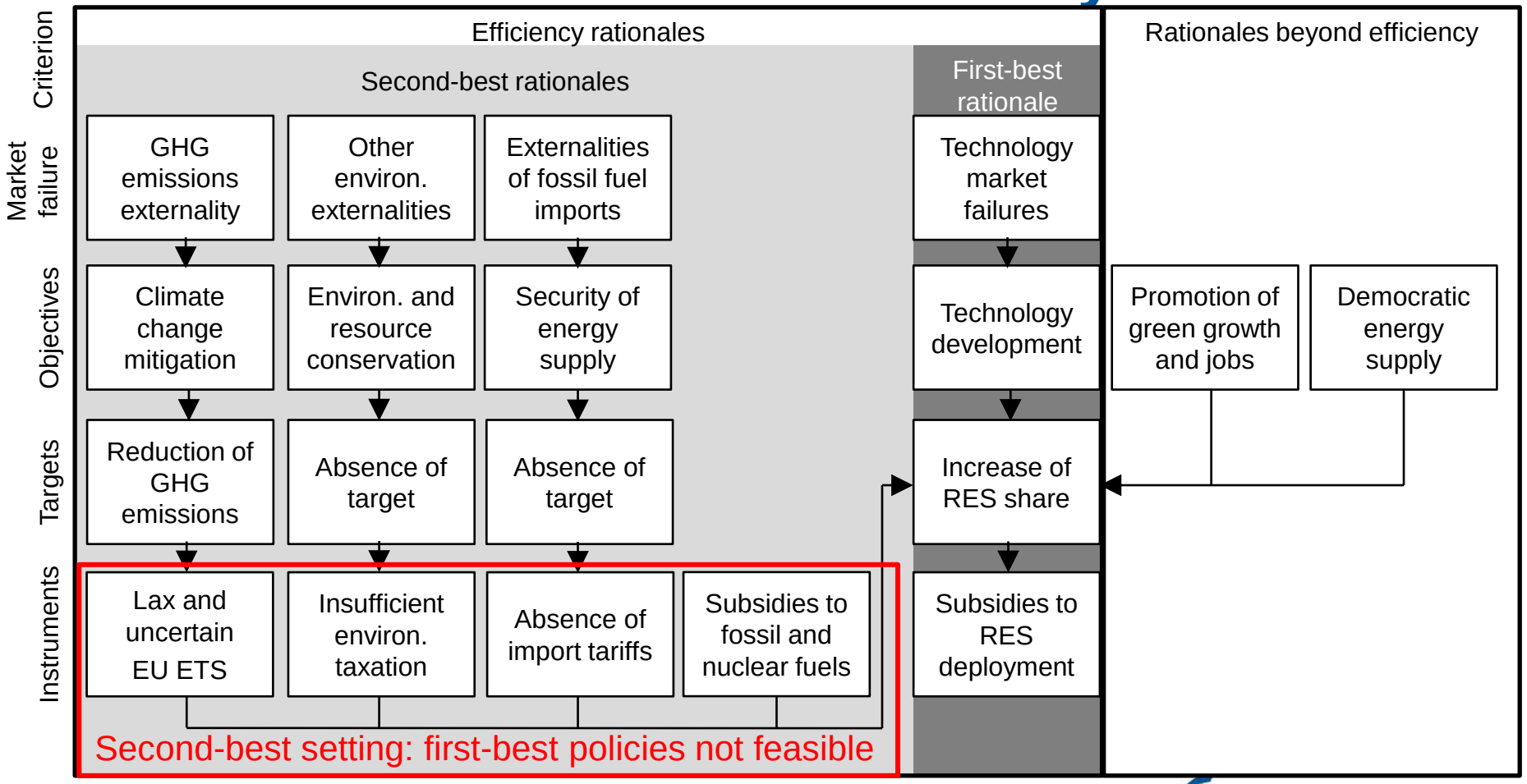
Rationales for Renewables Targets and Instruments in the Electricity Sector



➔ Rationales strengthened by path dependencies and lock-ins (Unruh 2000, Kalkuhl et al. 2012)

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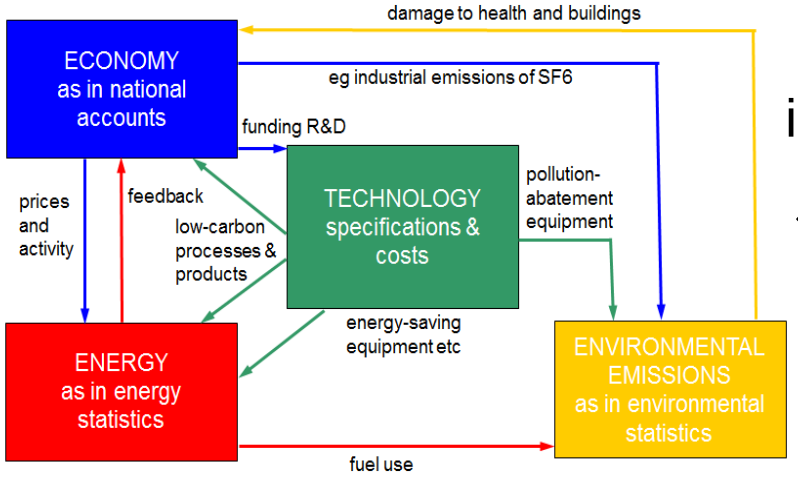
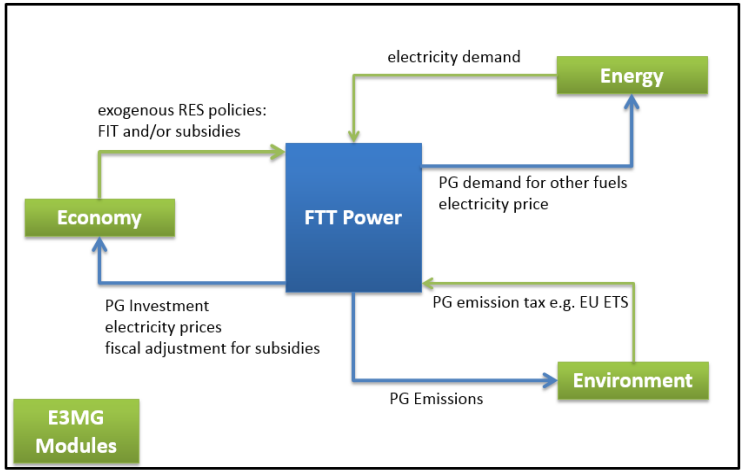
Modelling Approach

Energy-Environment-Economy Model at the Global level (E3MG)



fully integrated

FTT:Power Model



- Top-down macro-economic model
- Econometric model which allows for market inequilibria (in contrast to optimization models)

- Bottom-up, sector model
- Simulation model of technology diffusion
- Accounts for inertia/ path dependencies

- Data: PRIMES 2009 projections baseline scenario (EU), IEA World Energy Outlook 2012 „Current Policies Scenario“ (non-EU)

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Policy Scenarios

- Baseline scenario S0: PRIMES 2009 projections + IEA World Energy Outlook
- Targets under consideration derived from Knopf et al. (2013)

		S1	S2	S3	S4
Targets	GHG target	Yes	Yes	Yes	Yes
	ETS cap ($MtCO_2$)	1136	626	1136	1136
	RES target	No	Yes	Yes	Yes
	RES-E share	32	40	40	40
Instruments	EU ETS	Yes	Yes	Yes	Yes
	CO_2 price (€/CO_2)	100	440	53	41
	RES-E support	No	No	Tech. neutral	Tech. specific
	Average RES subsidy (€/MWh)	-	-	39	25

Exogenously set values

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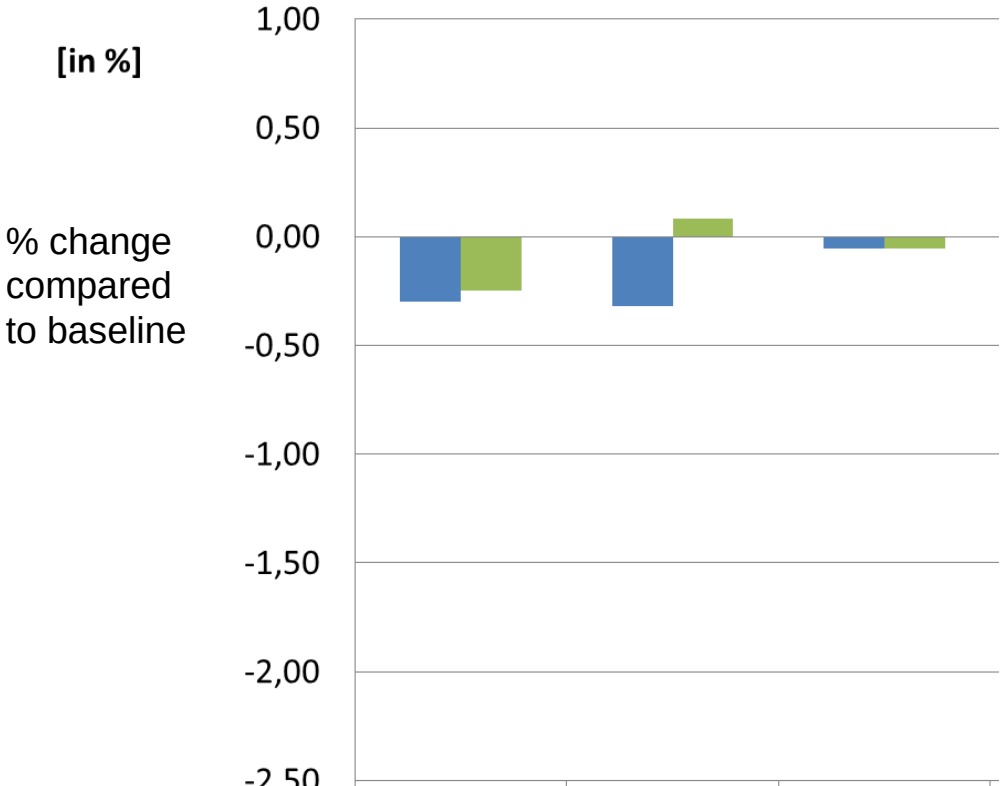
Costs of an Additional RES Target

Macro-Economic Outcomes



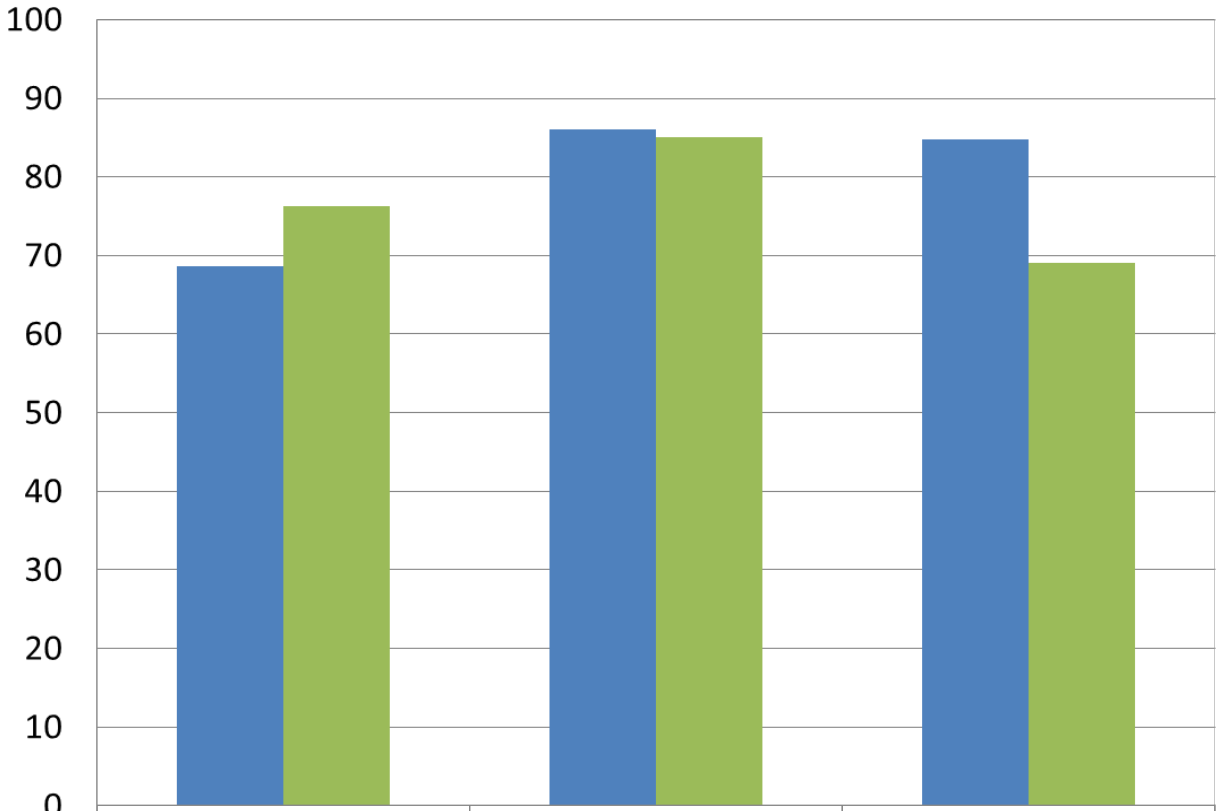
	GDP	Investment	Employ-ment
S1 (CO2/ETS only)	-0,30	-0,32	-0,06
S3 (CO2 and RES-E1)	-0,25	0,08	-0,06

- Effects generally small and even positive
- Reasons:
  - Small share of ETS sectors in GDP
  - Small share of energy and CO_2 costs in total costs of manufacturers
  - Unemployed resources

Costs of an Additional RES Target

Average Levelized Costs of Electricity

[in €/MWh, 2010 prices]

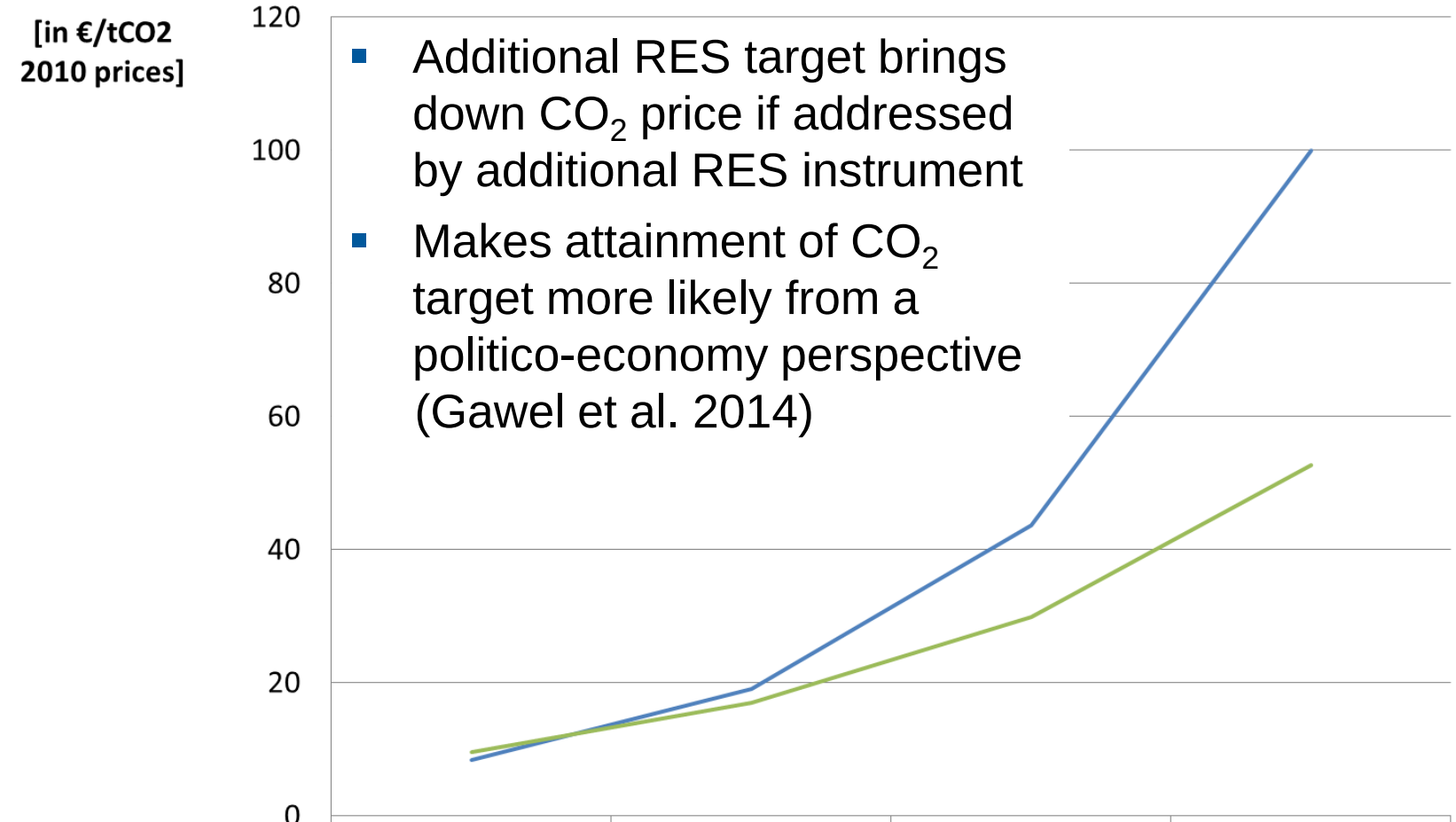


	Average LCOE, excluding carbon costs and RES-E subsidies	Average LCOE, including carbon costs	Average LCOE, including carbon costs and RES-E subsidies
S1 (CO2/ETS only)	69	86	85
S3 (CO2 and RES-E1)	76	85	69

Benefits of an Additional RES Target

Second-Best Means for CO_2 Mitigation?

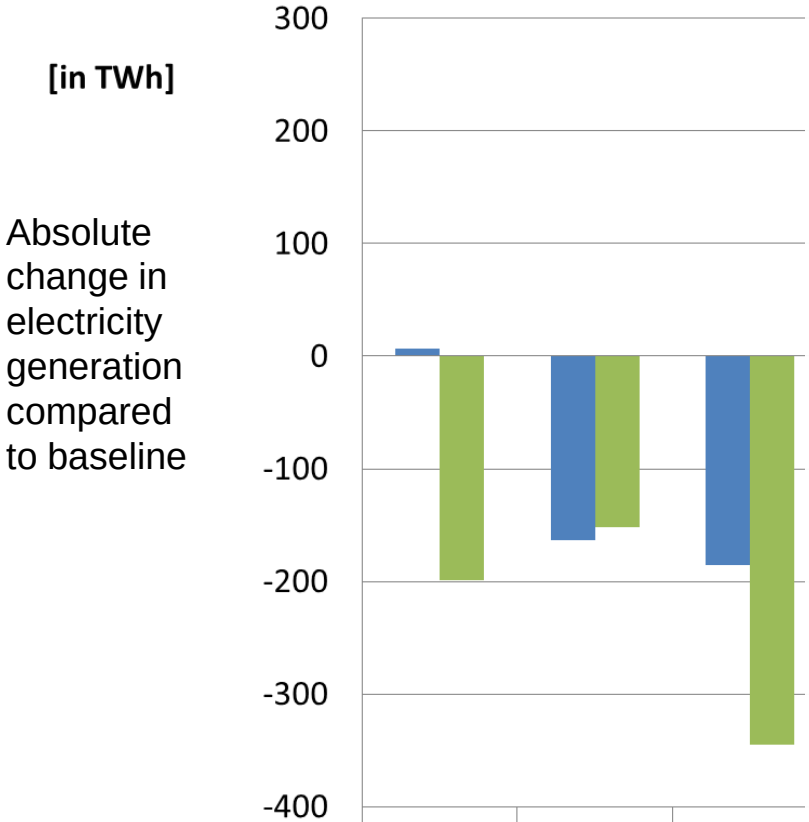
- Additional RES target brings down CO_2 price if addressed by additional RES instrument
- Makes attainment of CO_2 target more likely from a politico-economy perspective (Gawel et al. 2014)



	2015	2020	2025	2030
S1 (CO2/ETS only)	8	19	44	100
S3 (CO2 and RES-E1)	10	17	30	53

Benefits of an Additional RES Target

Second-Best Means for Environmental Protection?



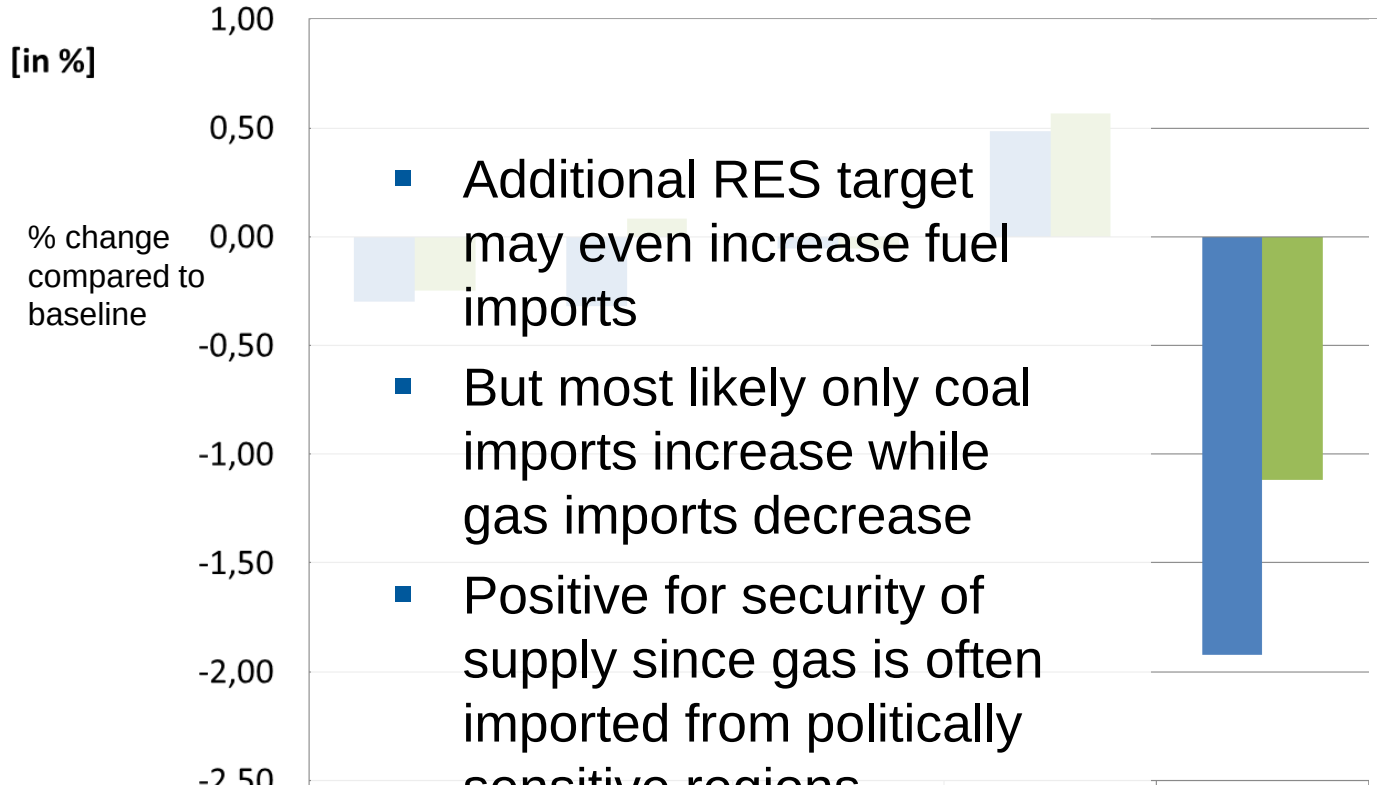
	Nuclear	Coal	CCGT
S1 (CO2/ETS only)	7	-163	-186
S3 (CO2 and RES-E1)	-199	-152	-346

- Ambiguous effects
  - Nuclear is further reduced
  - Coal increases, gas decreases
- Explanations:
  - Reduced elec. consumption
  - „Green serves the dirtiest“

Solid biomass	Large hydro	Wind onshore	Wind offshore	Solar PV
20	21	111	-9	-13
141	223	139	-46	-45

Benefits of an Additional RES Target

Second-Best Means for Energy Security?



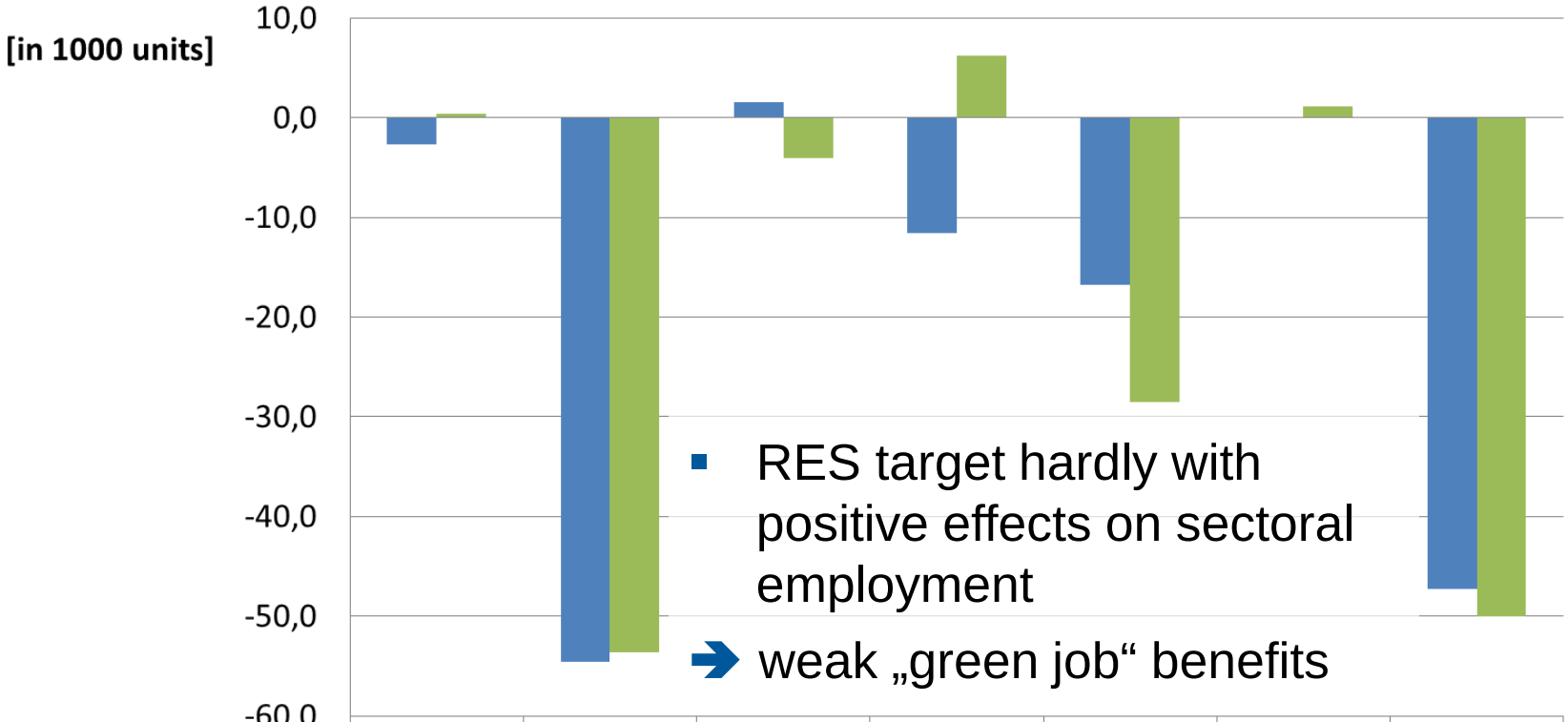
- Additional RES target may even increase fuel imports
- But most likely only coal imports increase while gas imports decrease
- Positive for security of supply since gas is often imported from politically sensitive regions

	GDP	Investment	Employ-ment	Consumer prices	EU imports of fossil fuels
S1 (CO2/ETS only)	-0,30	-0,32	-0,06	0,48	-1,92
S3 (CO2 and RES-E1)	-0,25	0,08	-0,06	0,57	-1,12

Benefits of an Additional RES Target

Beyond Efficiency: Changes in Employment

EU sectoral employment 2030 (absolute differences from baseline)



	Agri-culture	Utilities mining	Manuf. industry	Const-ruction	Distrib. and retails	Trans-port	Busin. services
S1 (CO2/ETS only)	-2,7	-54,6	1,6	-11,6	-16,8	0,1	-47,3
S3 (CO2 and RES-E1)	0,4	-53,6	-4,1	6,2	-28,5	1,1	-50,0

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Conclusions

- There are **multiple possible rationales** for implementing RES targets and instruments in addition to GHG targets and instruments in the EU.
- Quantitative assessment confirms several but not all **second-best benefits**.
- The economic assessment is constrained by **uncertainties** und hinges on **individual preferences** of the decision maker.
- Therefore, the **eventual decision** can only be **taken politically**.

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Thank you!

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