



Understanding overlapping climate policies

Robert A. Ritz

Energy Policy Research Group (EPRG)

Judge Business School

University of Cambridge

r.ritz@jbs.cam.ac.uk

EPRG/FTI-Compass Lexecon 2019 Spring Seminar

Cambridge, 10 May 2019

Research paper

This talk is mostly based on a recent EPRG research paper:

“Understanding overlapping policies: Internal carbon leakage and the punctured waterbed”, March 2019

With Grischa Perino (Hamburg) & Arthur van Benthem (Wharton)

EPRG Working Paper 1910 & NBER Working Paper 25643
<https://www.eprg.group.cam.ac.uk/eprg-working-paper-1910/>

EU climate policy: EU ETS + overlapping policies

2018 EU ETS reforms

- Market Stability Reserve (MSR) started in 2019
 - MSR from 2023 will cancel fraction of “excess” EUAs
 - From “plain vanilla” ETS to complex “hybrid” instrument
- ⇒ Long-run emissions cap now depends on market outcomes

EU climate policy: EU ETS + overlapping policies

2018 EU ETS reforms

- Market Stability Reserve (MSR) started in 2019
 - MSR from 2023 will cancel fraction of “excess” EUAs
 - From “plain vanilla” ETS to complex “hybrid” instrument
- ⇒ Long-run emissions cap now depends on market outcomes

Overlapping climate policies

- Many additional policies by individual EU countries
- Often apply to individual sector also covered by EU ETS
 - Carbon price floor, renewables support, energy efficiency

EU climate policy: EU ETS + overlapping policies

2018 EU ETS reforms

- Market Stability Reserve (MSR) started in 2019
 - MSR from 2023 will cancel fraction of “excess” EUAs
 - From “plain vanilla” ETS to complex “hybrid” instrument
- ⇒ Long-run emissions cap now depends on market outcomes

Overlapping climate policies

- Many additional policies by individual EU countries
 - Often apply to individual sector also covered by EU ETS
 - Carbon price floor, renewables support, energy efficiency
- ⇒ **Key question:** What is the climate benefit of such unilateral overlapping policies?

“Waterbed effect” inside the EU ETS

Old EU ETS (fixed cap)

- Say overlapping policy cuts EU emissions demand by 1 tCO₂
 - Fixed cap: 1 tCO₂ more emissions elsewhere in EU ETS
- ⇒ Waterbed effect always 100%

“Waterbed effect” inside the EU ETS

Old EU ETS (fixed cap)

- Say overlapping policy cuts EU emissions demand by 1 tCO₂
 - Fixed cap: 1 tCO₂ more emissions elsewhere in EU ETS
- ⇒ Waterbed effect always 100%

New EU ETS (with MSR)

- MSR’s EUA cancellation mechanism punctures waterbed
 - Unilateral action can now have global climate benefit
- ⇒ Waterbed effect < 50% for mid-term policies

“Waterbed effect” inside the EU ETS

Old EU ETS (fixed cap)

- Say overlapping policy cuts EU emissions demand by 1 tCO₂
 - Fixed cap: 1 tCO₂ more emissions elsewhere in EU ETS
- ⇒ Waterbed effect always 100%

New EU ETS (with MSR)

- MSR’s EUA cancellation mechanism punctures waterbed
 - Unilateral action can now have global climate benefit
- ⇒ Waterbed effect < 50% for mid-term policies

Missing link: By how much does overlapping policy actually reduce EU emissions demand?

- EU markets are interconnected... (e.g. electricity)

Plan for this talk

① Conceptual framework

② Internal carbon leakage

- Cost-raising policy
- Demand-reducing policy

③ Waterbed effect under new EU ETS MSR

④ Empirical estimates

- Europe
- North America

⑤ Conclusions

Conceptual framework: Waterbed & leakage

What is the equilibrium emissions impact of overlapping policy?

$$\Delta e_t^* = [1 - W_t] \times \underbrace{[1 - L_{it}] \times \overbrace{\Delta e_{it}}^{\text{= change in domestic emissions demand } < 0}}_{\text{= change in EU-wide emissions demand } \lesseqgtr 0?}$$

Conceptual framework: Waterbed & leakage

What is the equilibrium emissions impact of overlapping policy?

$$\Delta e_t^* = [1 - W_t] \times \underbrace{[1 - L_{it}] \times \overbrace{\Delta e_{it}}^{\text{= change in domestic emissions demand } < 0}}_{\text{= change in EU-wide emissions demand } \lesseqgtr 0?}$$

1. Plain vanilla ETS (fixed cap)

— Waterbed $W_t=1$ so no climate benefit

Conceptual framework: Waterbed & leakage

What is the equilibrium emissions impact of overlapping policy?

$$\Delta e_t^* = [1 - W_t] \times \underbrace{[1 - L_{it}] \times \overbrace{\Delta e_{it}}}_{\text{= change in EU-wide emissions demand } \lesseqgtr 0?}$$

= change in domestic emissions demand < 0

1. Plain vanilla ETS (fixed cap)

— Waterbed $W_t=1$ so no climate benefit

2. New EU ETS with MSR

— Punctured waterbed $W_t < 1$ so leakage L_{it} now critical

— Policy generates climate benefit—unless $L_{it} > 1$

Conceptual framework: Waterbed & leakage

What is the equilibrium emissions impact of overlapping policy?

$$\Delta e_t^* = [1 - W_t] \times \underbrace{[1 - L_{it}] \times \overbrace{\Delta e_{it}}^{\text{= change in domestic emissions demand } < 0}}_{\text{= change in EU-wide emissions demand } \lesseqgtr 0?}$$

1. Plain vanilla ETS (fixed cap)

— Waterbed $W_t=1$ so no climate benefit

2. New EU ETS with MSR

— Punctured waterbed $W_t < 1$ so leakage L_{it} now critical

— Policy generates climate benefit—unless $L_{it} > 1$

3. Plain vanilla carbon tax

— Zero waterbed $W_t=0$ because no emissions cap

Plan for this talk

- ① Conceptual framework
- ② **Internal carbon leakage**
 - **Cost-raising policy**
 - **Demand-reducing policy**
- ③ Waterbed effect under new EU ETS MSR
- ④ Empirical estimates
 - Europe
 - North America
- ⑤ Conclusions

Internal leakage for “cost-raising” policy

Overlapping policy imposes extra domestic carbon price

- National carbon price floor on power generation (GB, NL)

⇒ Asymmetric cost shock raises competitiveness of foreign firms

Internal leakage for “cost-raising” policy

Overlapping policy imposes extra domestic carbon price

- National carbon price floor on power generation (GB, NL)

⇒ Asymmetric cost shock raises competitiveness of foreign firms

Proposition 1

$$L_i^{\text{cost}} = \frac{\text{emissions intensity}_j}{\text{emissions intensity}_i} \left[\frac{\text{market share}_j}{\text{market share}_j + \frac{|\text{elasticity of demand}|}{\text{elasticity of } j\text{'s supply}}} \right] > 0$$

Internal leakage for “cost-raising” policy

Overlapping policy imposes extra domestic carbon price

- National carbon price floor on power generation (GB, NL)

⇒ Asymmetric cost shock raises competitiveness of foreign firms

Proposition 1

$$L_i^{\text{cost}} = \frac{\text{emissions intensity}_j}{\text{emissions intensity}_i} \left[\frac{\text{market share}_j}{\text{market share}_j + \frac{|\text{elasticity of demand}|}{\text{elasticity of } j\text{'s supply}}} \right] > 0$$

1. Leakage positive & above 100% if j 's firms (imports) very dirty
2. Rationale for regional carbon price floor:
Higher “domestic” market share so less internal leakage

Internal leakage for “demand-reducing” policy

Overlapping policy reduces domestic (residual) demand

- Renewables support in electricity generation
- Energy efficiency program

⇒ Policy directly affects both domestic & foreign firms

Internal leakage for “demand-reducing” policy

Overlapping policy reduces domestic (residual) demand

- Renewables support in electricity generation
- Energy efficiency program

⇒ Policy directly affects both domestic & foreign firms

Proposition 2

$$L_i^{\text{demand}} = - \frac{\text{emissions intensity}_j}{\text{emissions intensity}_i} \left[\frac{\text{market share}_j}{\text{market share}_i} \right] \left[\frac{\text{elasticity of } j\text{'s supply}}{\text{elasticity of } i\text{'s supply}} \right] < 0$$

Internal leakage for “demand-reducing” policy

Overlapping policy reduces domestic (residual) demand

- Renewables support in electricity generation
- Energy efficiency program

⇒ Policy directly affects both domestic & foreign firms

Proposition 2

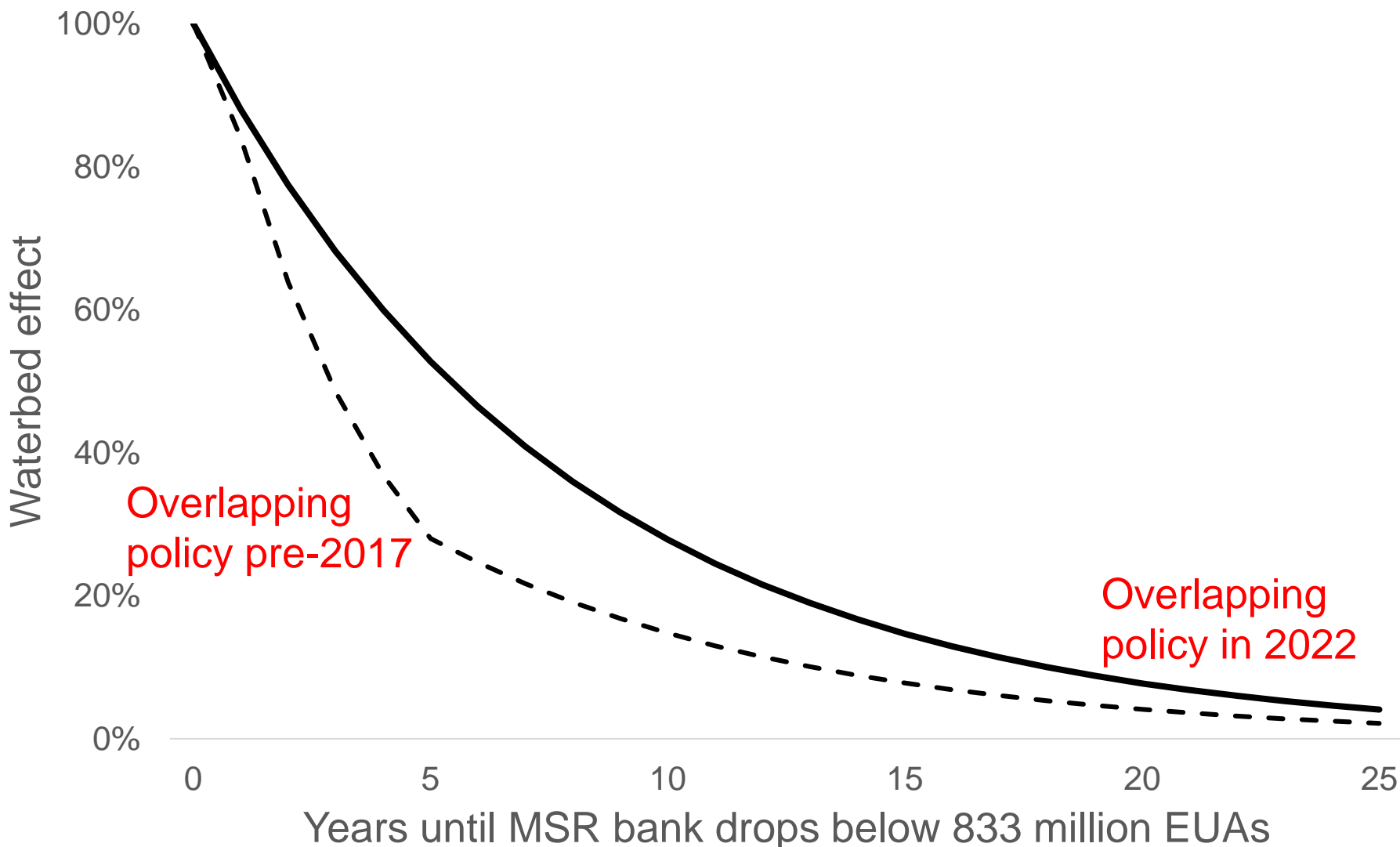
$$L_i^{\text{demand}} = - \frac{\text{emissions intensity}_j}{\text{emissions intensity}_i} \left[\frac{\text{market share}_j}{\text{market share}_i} \right] \left[\frac{\text{elasticity of } j\text{'s supply}}{\text{elasticity of } i\text{'s supply}} \right] < 0$$

1. Leakage always negative: foreign firms also cut emissions
 - Domestic renewables displace fossil-fuel imports

Plan for this talk

- ① Conceptual framework
- ② Internal carbon leakage
 - Cost-raising policy
 - Demand-reducing policy
- ③ **Waterbed effect under new EU ETS MSR**
- ④ Empirical estimates
 - Europe
 - North America
- ⑤ Conclusions

Waterbed effect under new EU ETS MSR

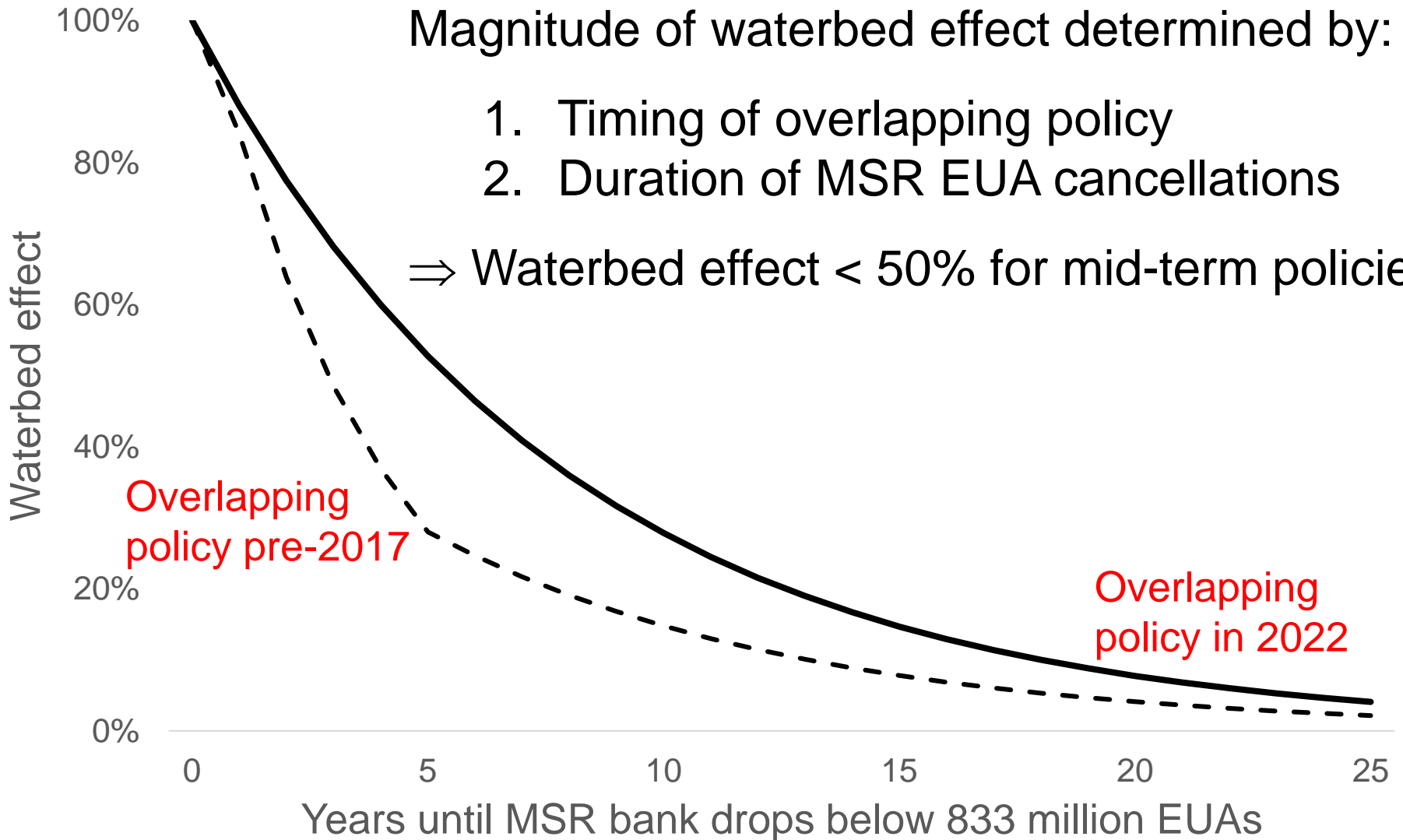


Waterbed effect under new EU ETS MSR

Magnitude of waterbed effect determined by:

1. Timing of overlapping policy
2. Duration of MSR EUA cancellations

⇒ Waterbed effect < 50% for mid-term policies

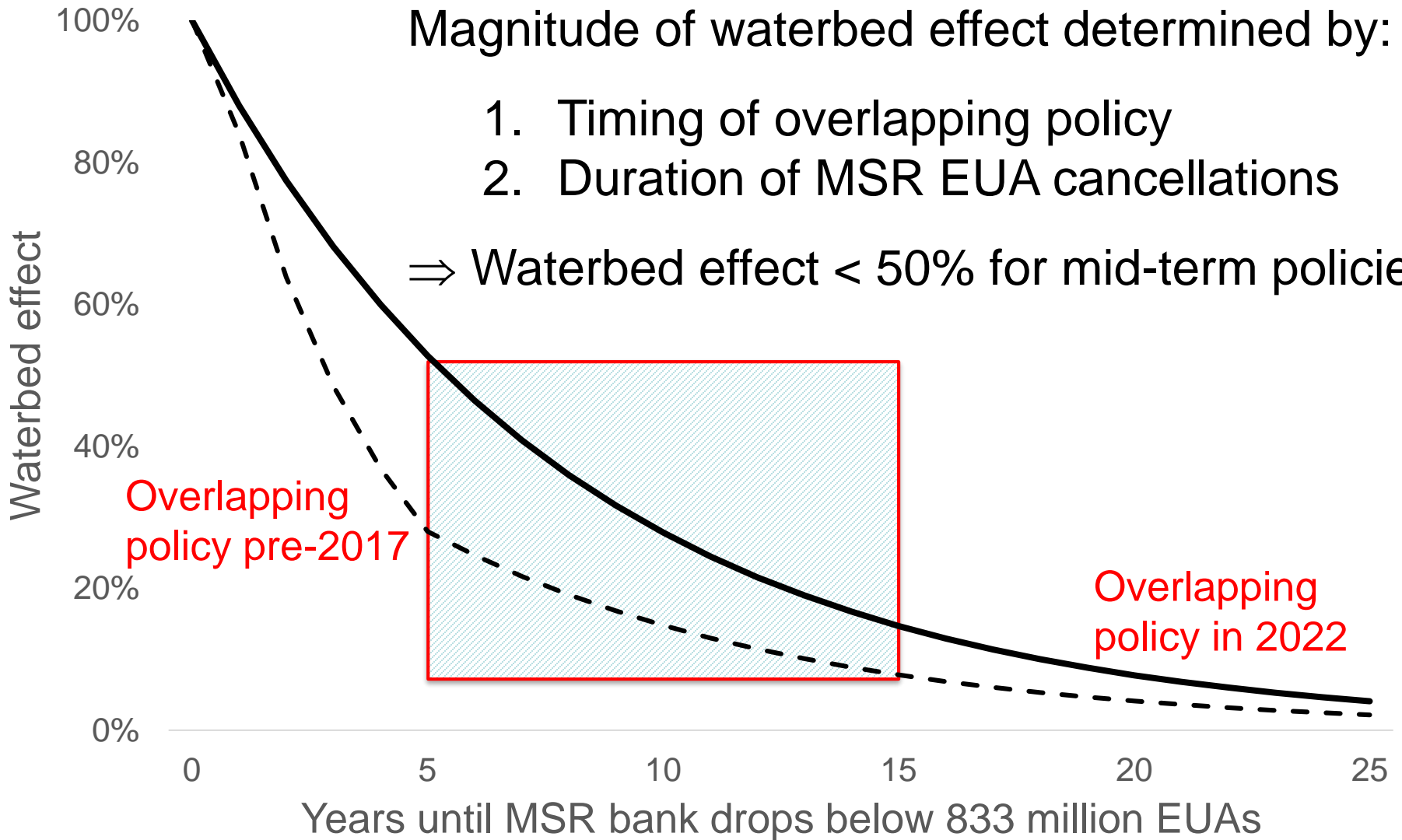


Waterbed effect under new EU ETS MSR

Magnitude of waterbed effect determined by:

1. Timing of overlapping policy
2. Duration of MSR EUA cancellations

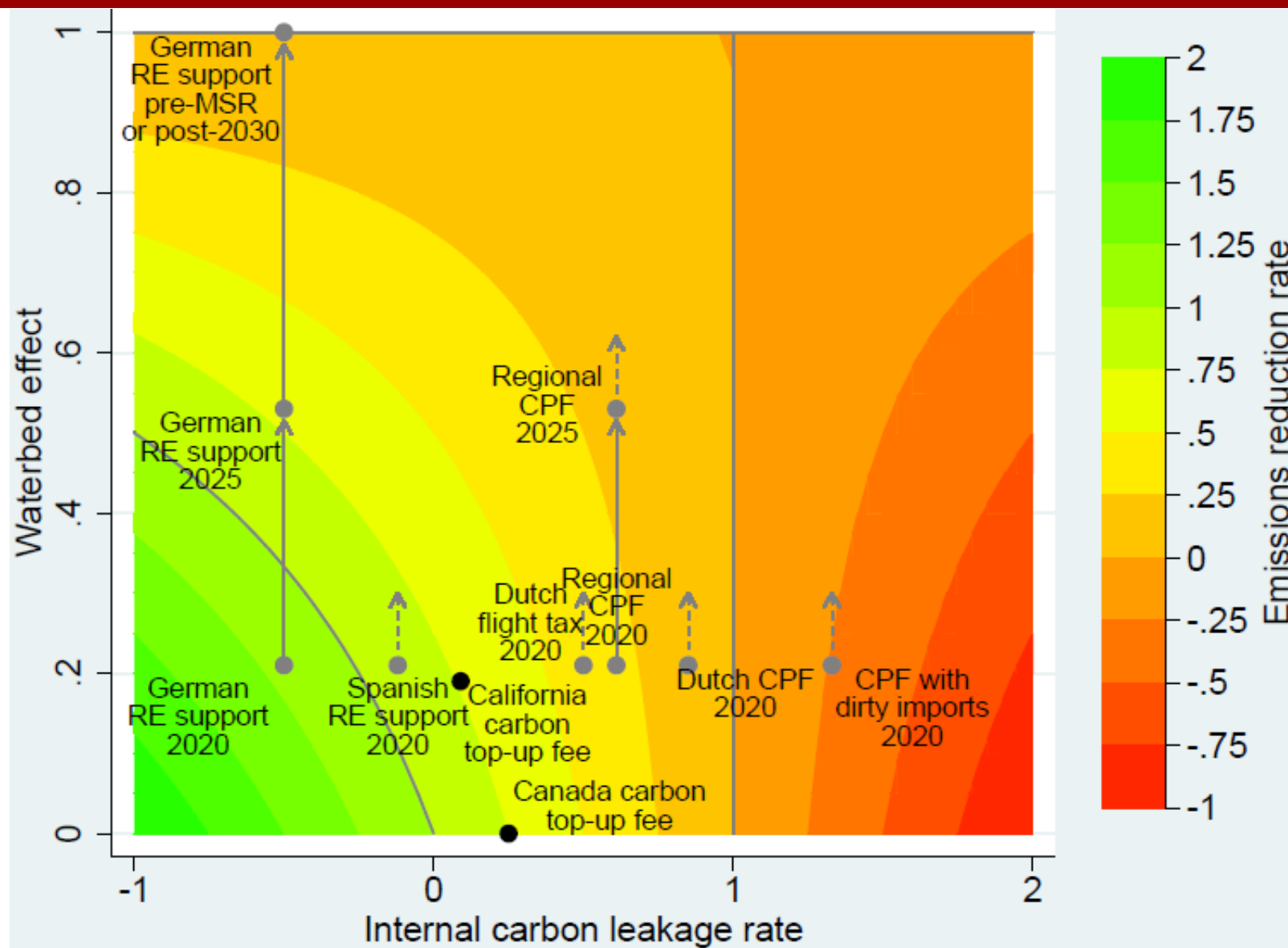
⇒ Waterbed effect < 50% for mid-term policies



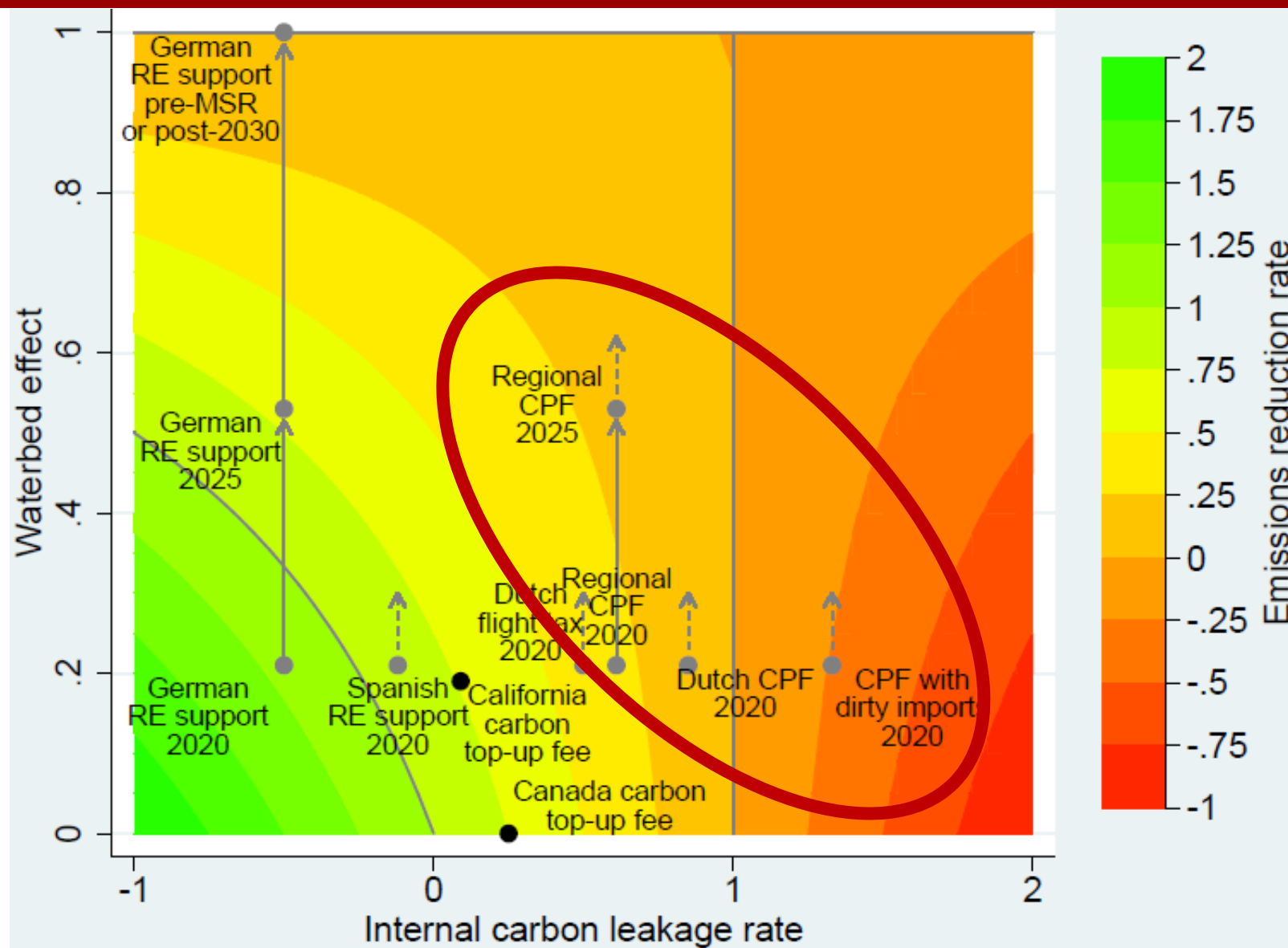
Plan for this talk

- ① Conceptual framework
- ② Internal carbon leakage
 - Cost-raising policy
 - Demand-reducing policy
- ③ Waterbed effect under new EU ETS MSR
- ④ **Empirical estimates**
 - **Europe**
 - **North America**
- ⑤ Conclusions

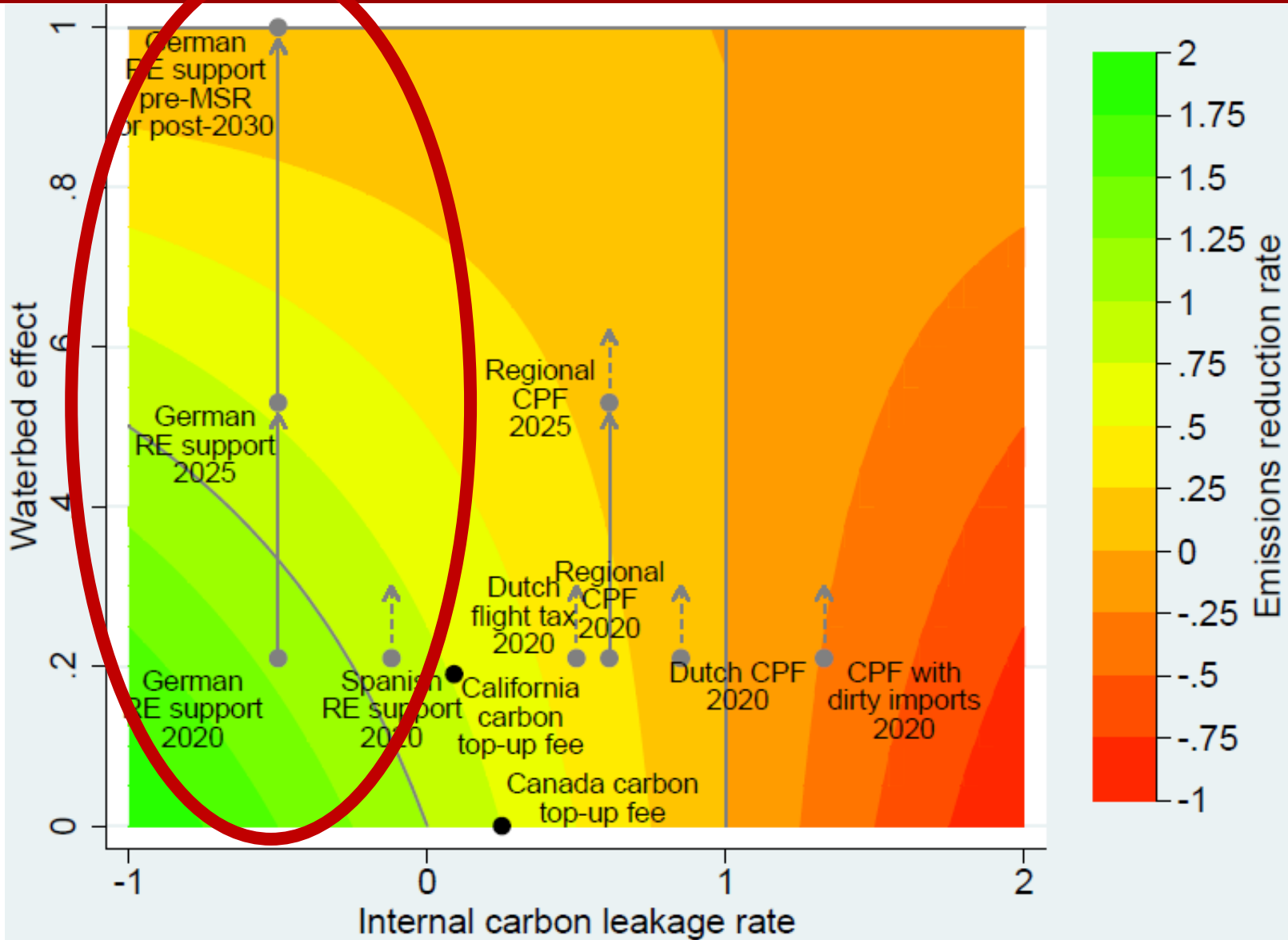
Empirical estimates of waterbed & leakage



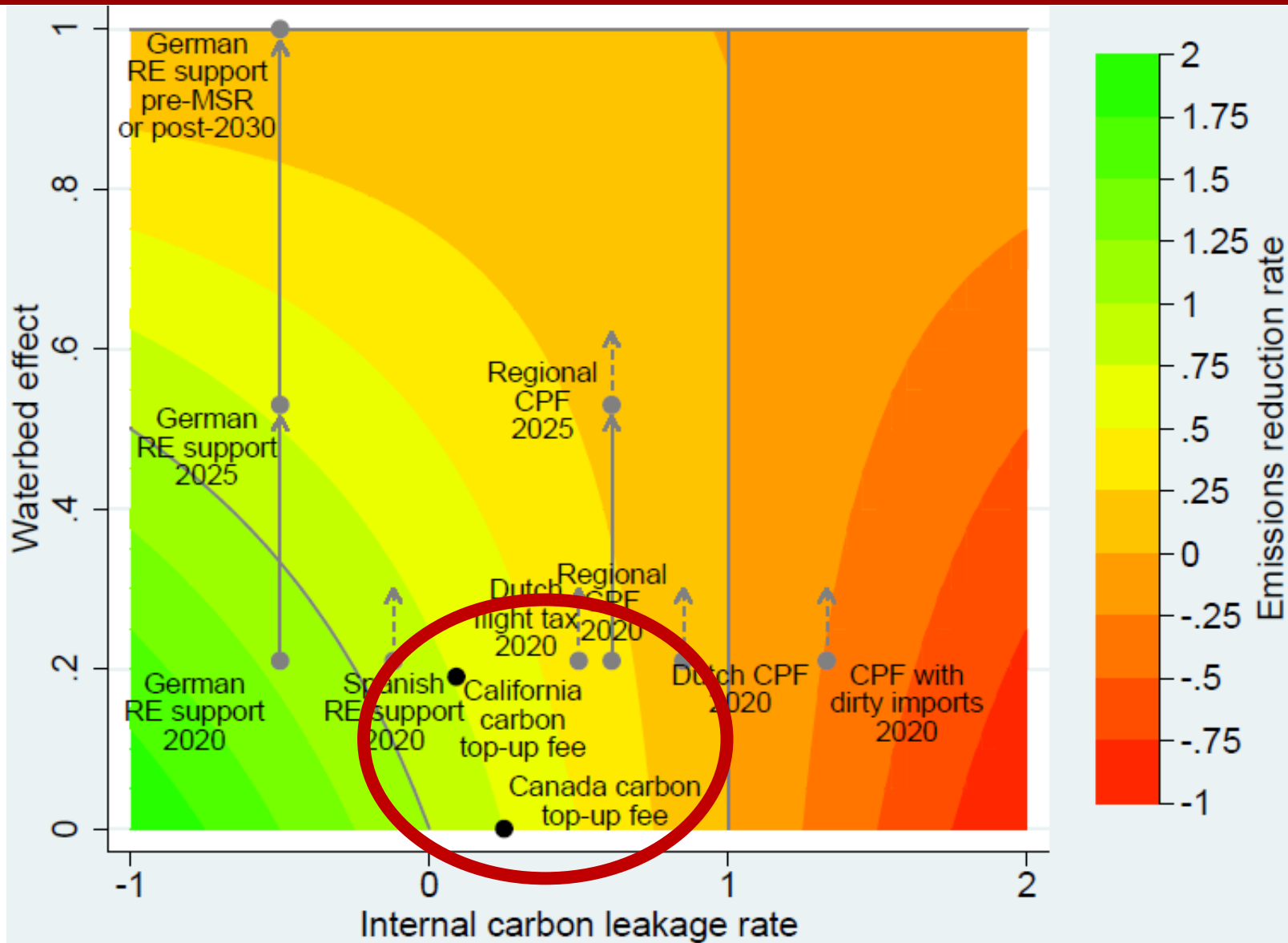
EU: National & regional carbon price floors



EU: Renewables support mechanisms



North America: Carbon top-up fees



Plan for this talk

- ① Conceptual framework
- ② Internal carbon leakage
 - Cost-raising policy
 - Demand-reducing policy
- ③ Waterbed effect under new EU ETS MSR
- ④ Empirical estimates
 - Europe
 - North America
- ⑤ **Conclusions**

Conclusions

- ① **EU ETS new MSR raises stakes for overlapping policies:**
well-designed policy has climate benefit, others backfire
- ② **Devil is in the details:**
 - *Timing* (affects waterbed)
 - *Instrument* (affects leakage)
 - *Location* (country/sector affects leakage)
- ③ **Reformed EU ETS with MSR now very complex:**
about as complex as regulating a local pollutant...
 - [*EU carbon price floor = simpler & better!*]
- ④ **Need more empirical evidence on internal carbon leakage**
within EU & for other jurisdictions using carbon pricing