Closing the emission price gap

A multiple dividend approach to carbon pricing

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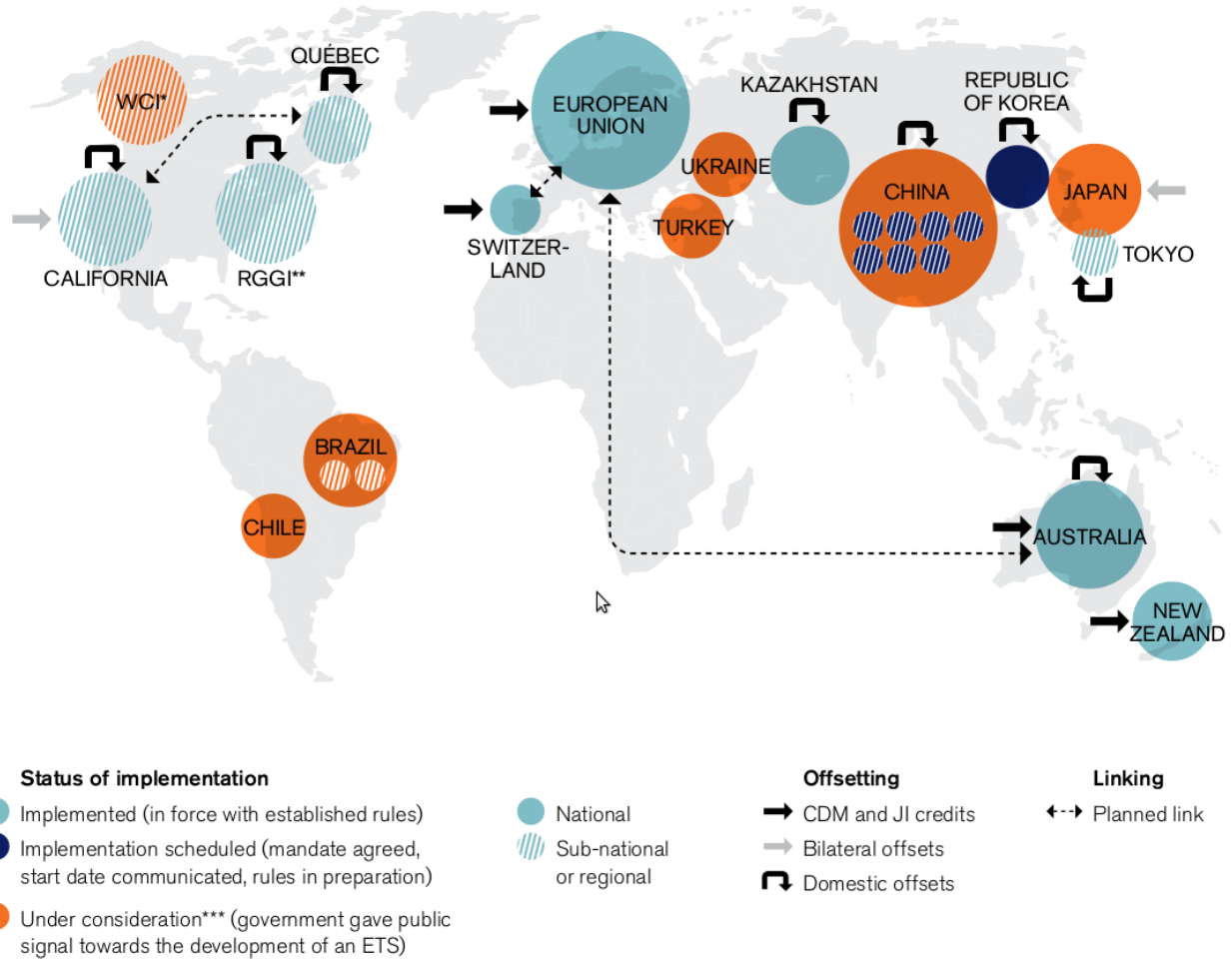
Potsdam Institute for Climate Impact Research (PIK)

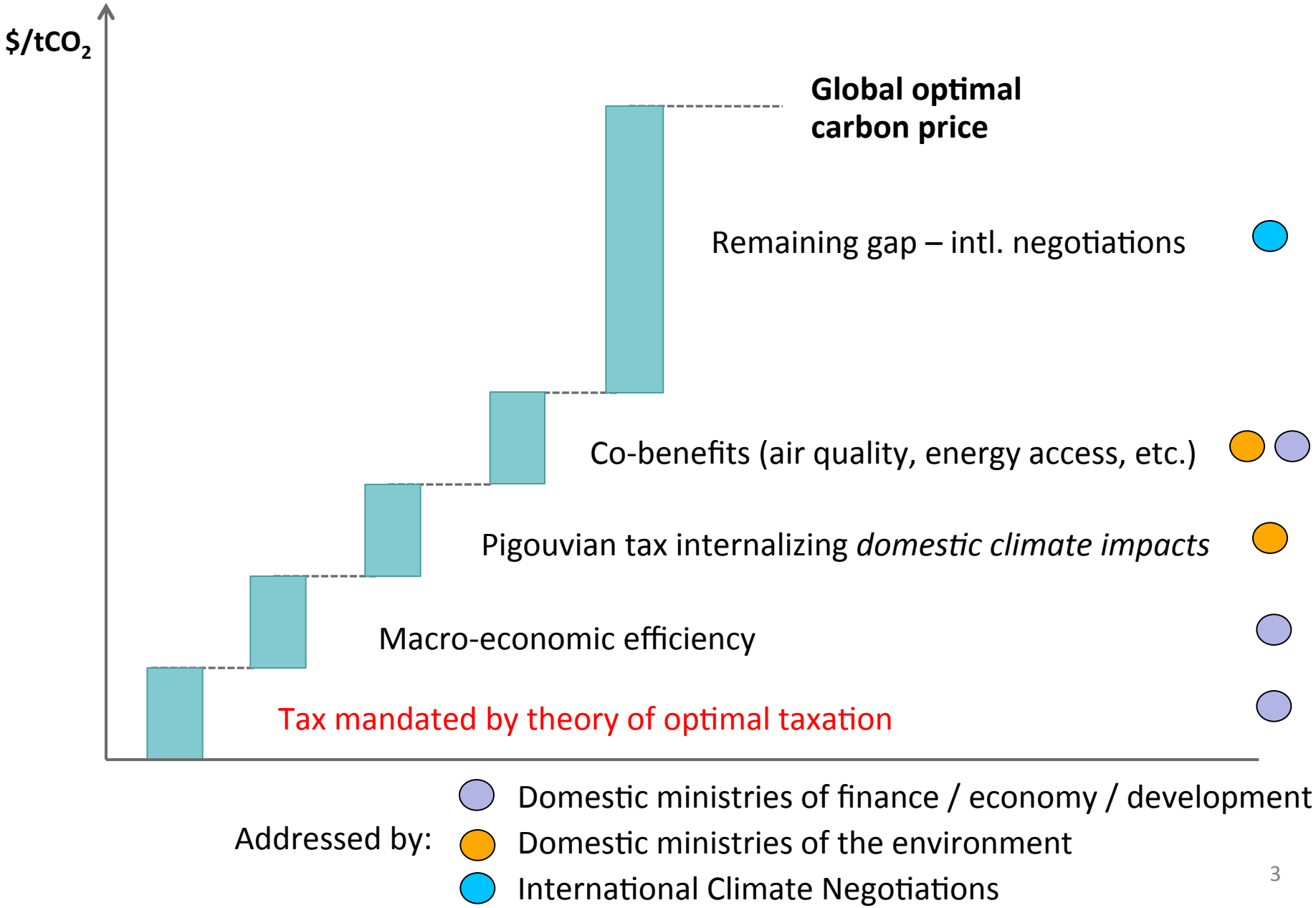
The emerging landscape of carbon pricing

Figure 1: Map of existing, emerging, and potential emissions trading schemes



Source: World Bank (2013), Mapping Carbon Pricing Initiatives, Carbon Finance at the World Bank, Ecofys

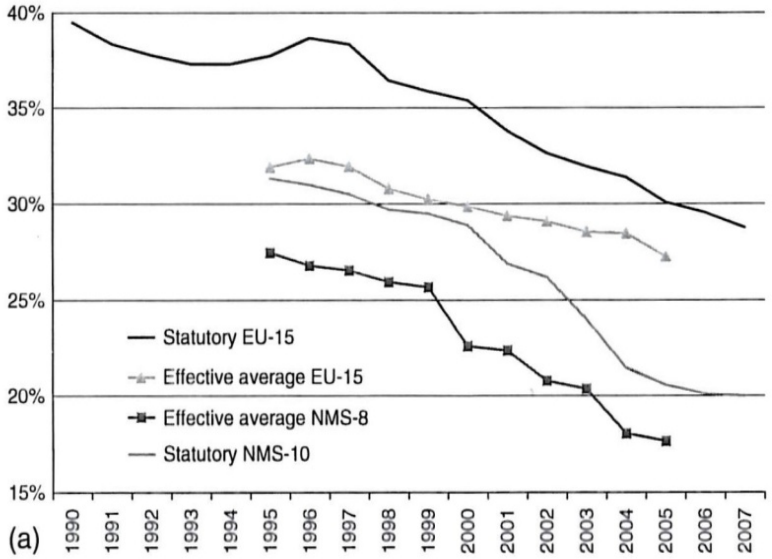
Closing the emission price gap



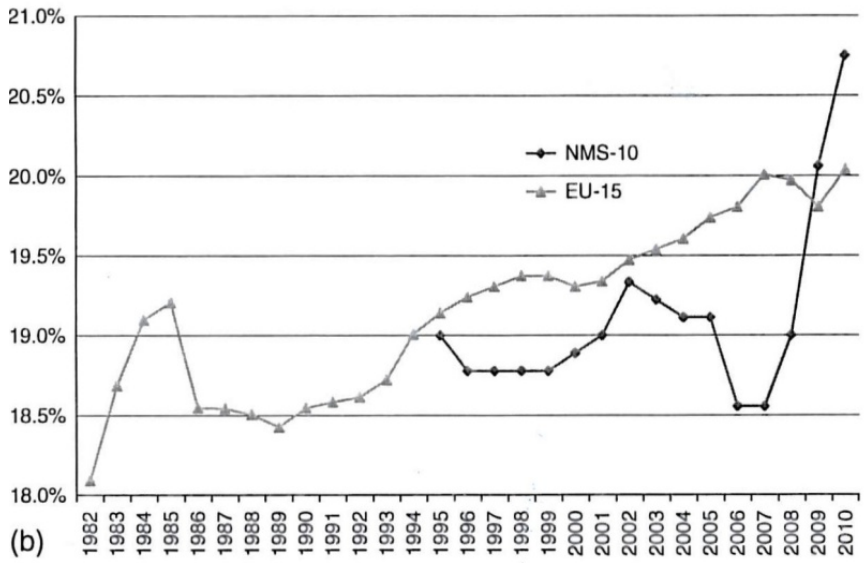
Ramsey Rule

- In order to raise a given amount of public income, all economic factors should be taxed inversely to their elasticity of supply (Ramsey Rule)
- Carbon tax would be mandated even if climate change were not an issue

EU corporate tax rate (1990-2007)



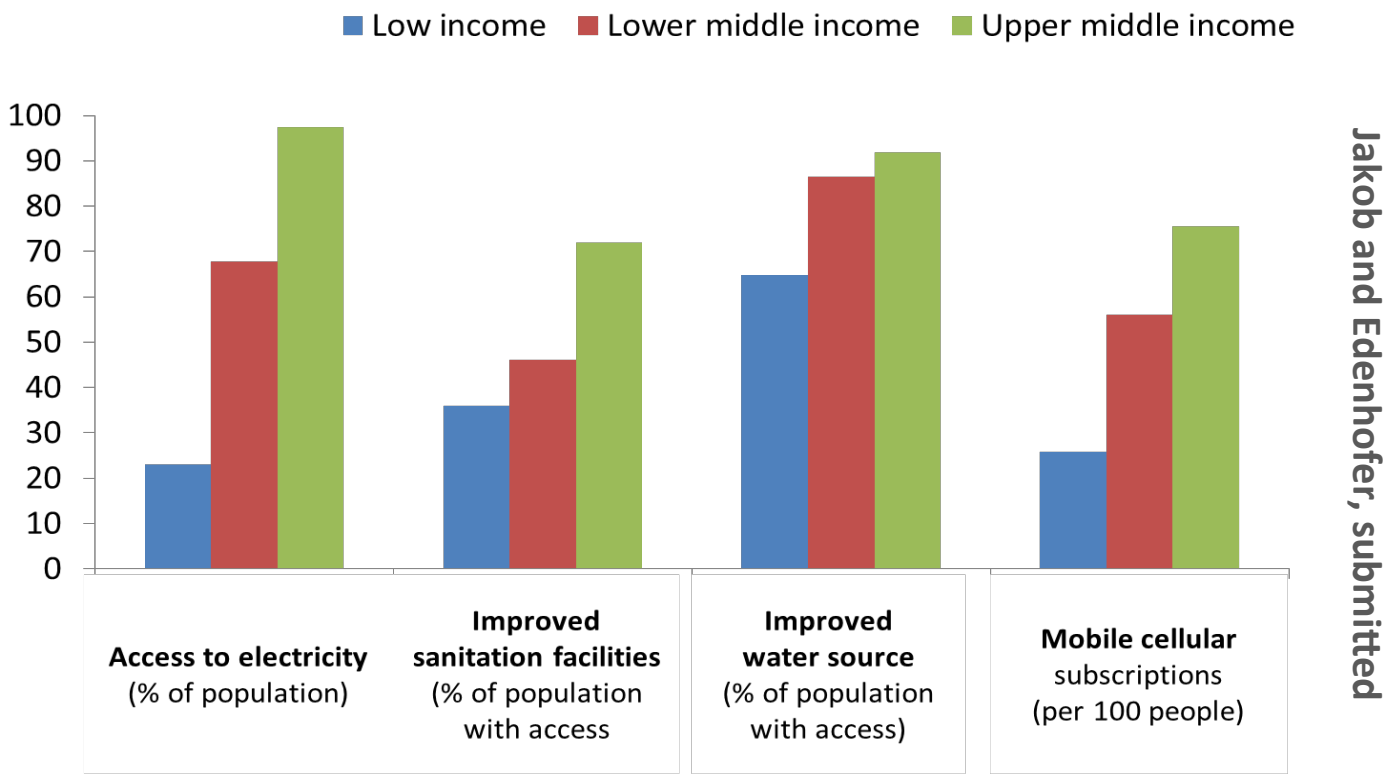
EU standard VAT rate (1982-2010)



Traditional „Double Dividend“

- Impose CO_2 tax and reduce labor and capital taxes
- Some indicate net benefit of this policy (e.g. Goulder 1995, Parry 1995)
- Could also be used to pay back public debt (Rauscher 2013) and broaden the tax base in countries with large informal sector (Markandya 2013)
- Problems:
    1) Upshot of scientific debate inconclusive
    2) Omits challenge for governments to deal with tax competition and maintain international competitiveness
    3) Productivity-enhancing infrastructure investments out of scope
- Given needs for infrastructure investments, probably not optimal to fully recycle carbon revenues by lowering other taxes

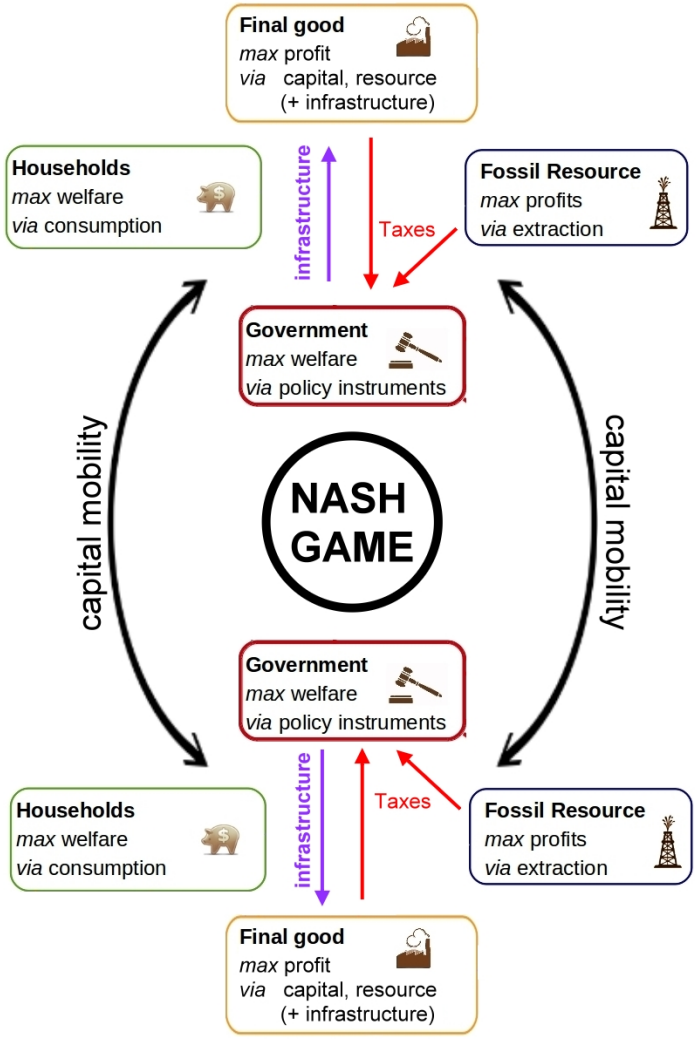
Infrastructure investment



- Achieve universal energy access by 2030: US$ 36-41 bln per year (Riahi et al. 2012)
- “Great convergence” of global health standards by 2035: about US$ 40 bln per year (Jameson et al. 2013)

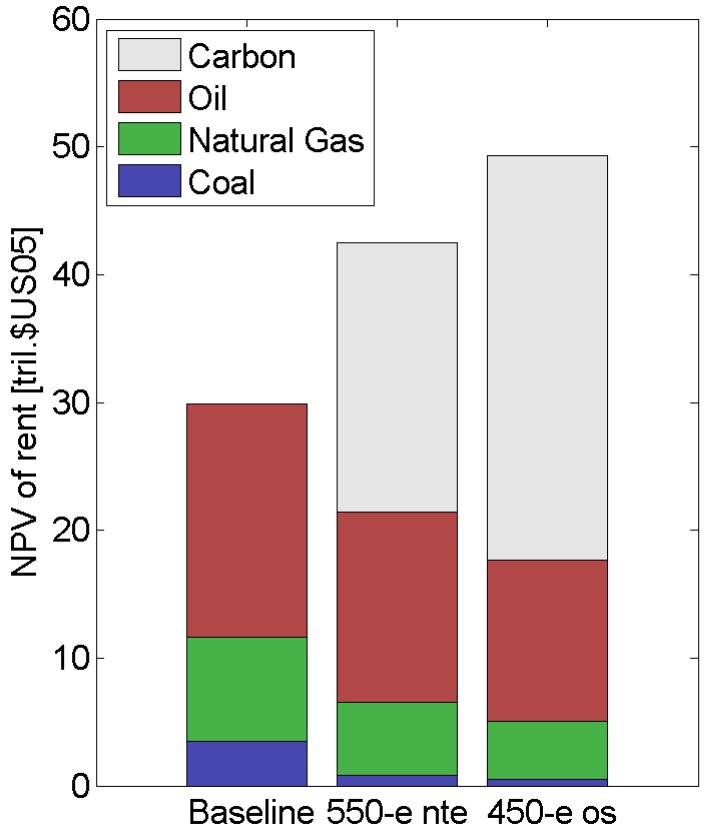
Taming tax competition

- Substitution elasticity determines „relative fixedness“ of fossil resources
- Factor taxes distort the *intertemporal* allocation
- Capital mobility distorts the *interregional* allocation through tax competition
- Capital tax more prone to tax competition than carbon tax under plausible parameters
- Infrastructure financed by carbon taxes attracts inflow of private capital and tames intertemporal and interregional distortions



Franks, Edenhofer and Lessmann (in preparation)

Magnitude of carbon rent



Bauer et al. (2013)

- Fossil resource rents decrease with climate policy ambition
- For a globally optimal carbon price, over-compensation by carbon rent (=permit price or tax * emissions)
- Carbon rent appropriated domestically via auctioned permits or tax
- Would also provide resources to address climate issues not tackled by a carbon price, e.g. technology policy and adaptation

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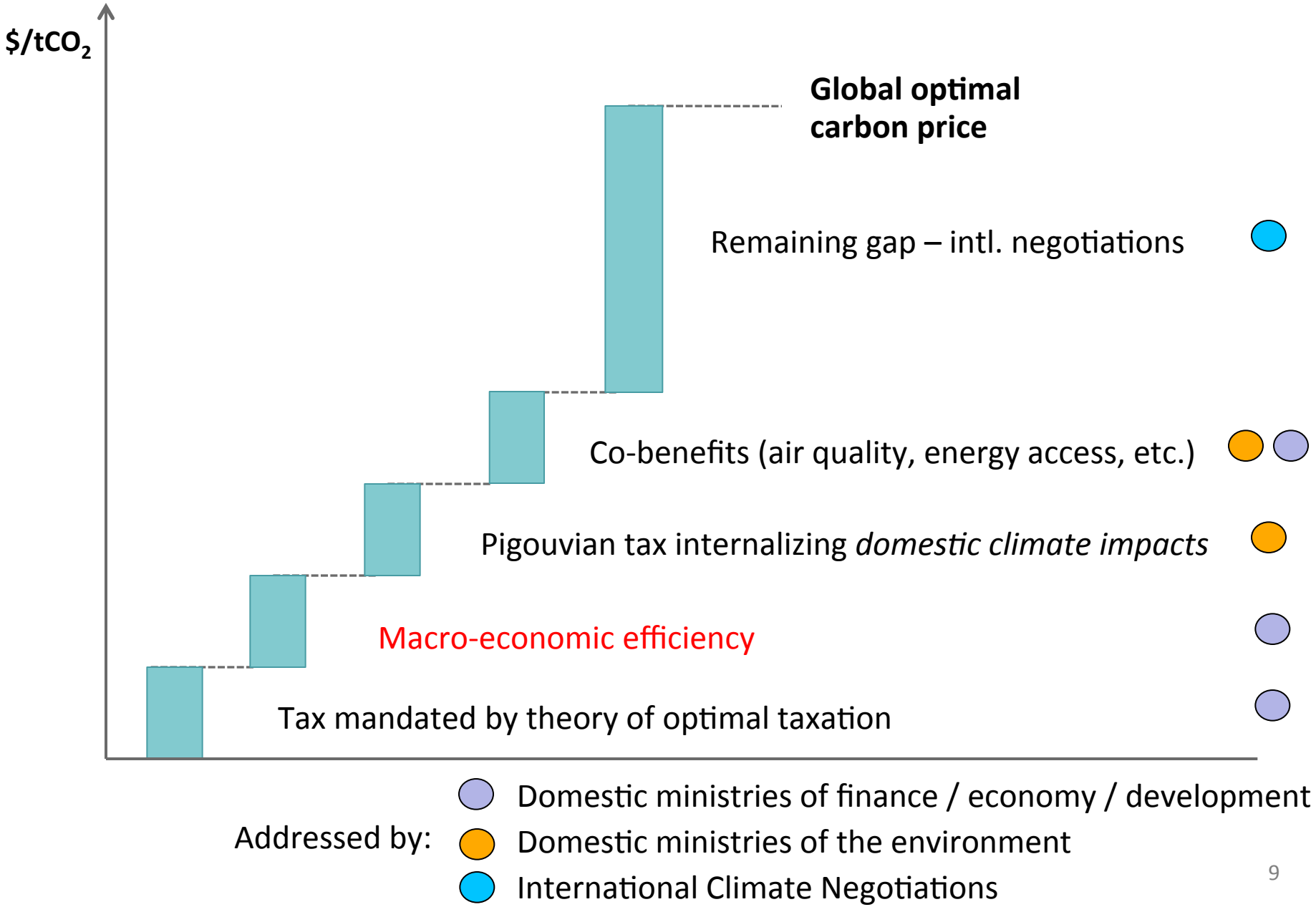


Enhancing macro-economic efficiency – the portfolio effect

- Agents over-invest in fixed (rent-bearing) factors (such as fossil fuels, land) and underinvest in productive capital formation (Edenhofer et al. 2013)
- This distortion creates economic inefficiencies and slows down economic growth (Mattauch et al. 2013)
- Hence, taxation of carbon emission and/or land can reduce this inefficiency (Siegmeier et al. in preparation) to achieve optimal balance of portfolio
- **Optimality: Pure rate of time preference equal to returns of risk-free asset, social, private, natural, and human capital**

$$\rho = r = F_{KS}(K_S, K_P, K_H, K_N) - \delta K_S = F_{KP}(K_S, K_P, K_H, K_N) - \delta K_P = \frac{l}{p} + \frac{p}{p} = h$$

Social rate of return equal for all forms of capital (i.e. "no arbitrage condition"), otherwise there is over- or under-investment.

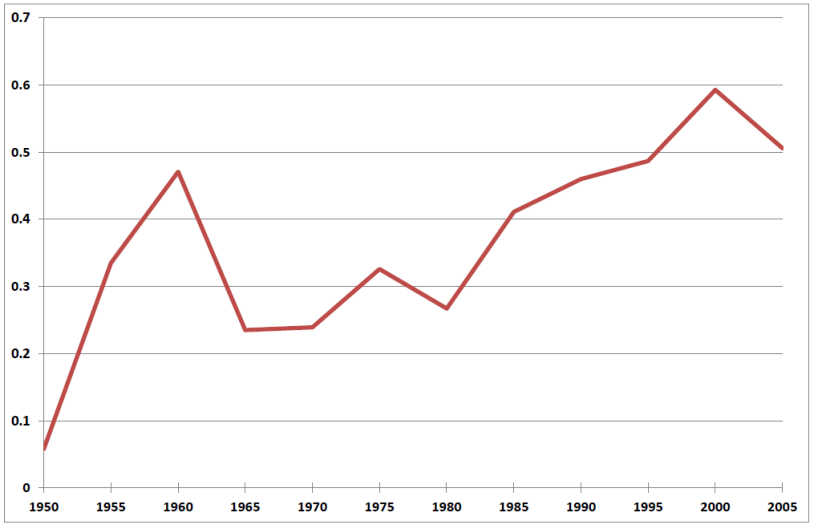
Enhancing macro-economic efficiency – the spillover argument

- An optimistic perspective regards green technologies as a potential basis for a 'Green Industrial Revolution' (Stern 2009)
- Recent evidence suggest higher technology spill-overs of green technologies (Dechezleprêtre et al. 2013)

	Clean	Dirty	Diff.
Citations received	3.358	2.286	1.072***
	(9.186)	(5.922)	[0.015]
Citations received within 5-years	1.863	1.070	0.793***
	(5.257)	(3.126)	[0.008]

Notes: The first two columns report the mean values and standard deviation in parentheses. The last column is reports a t-test for the difference in means with the standard error in parentheses. *** indicates significance at 0.1% level.

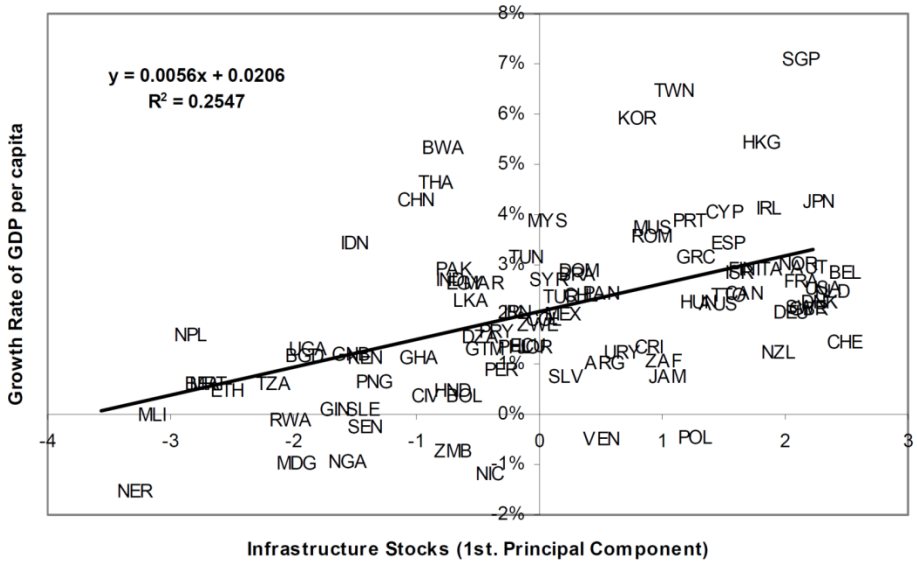
Gap between clean and dirty spill-overs over time



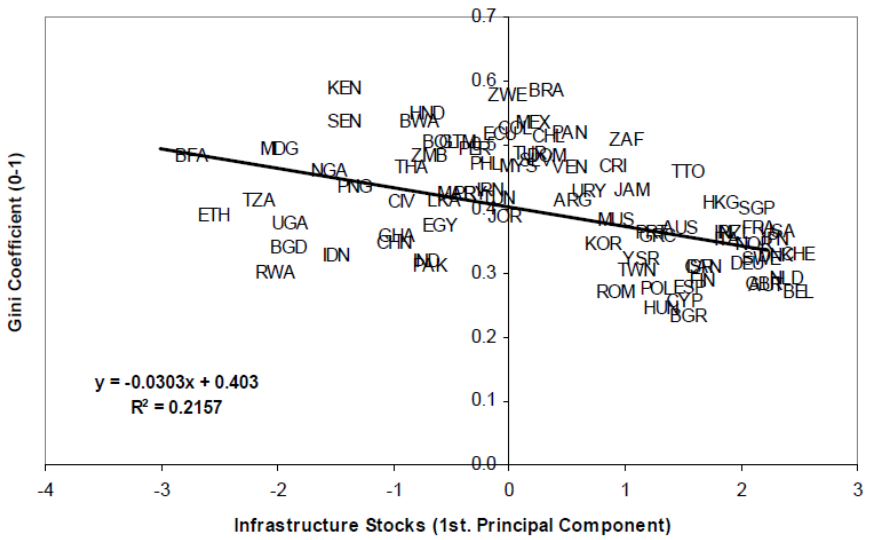
(Dechezleprêtre et al. 2013)

Social returns of infrastructure investments

Infrastructure Stocks versus Economic Growth



Infrastructure Stocks versus Income Inequality



Calderón & Servén 2004

- Even though infrastructure is underprovided by the market, this under-provision does not necessarily need to be addressed by public ownership
- Alternative arrangements include e.g. subsidies, vouchers, auctioning of contracts…
- Empirical evidence of efficiency of public vs. private infrastructure mixed

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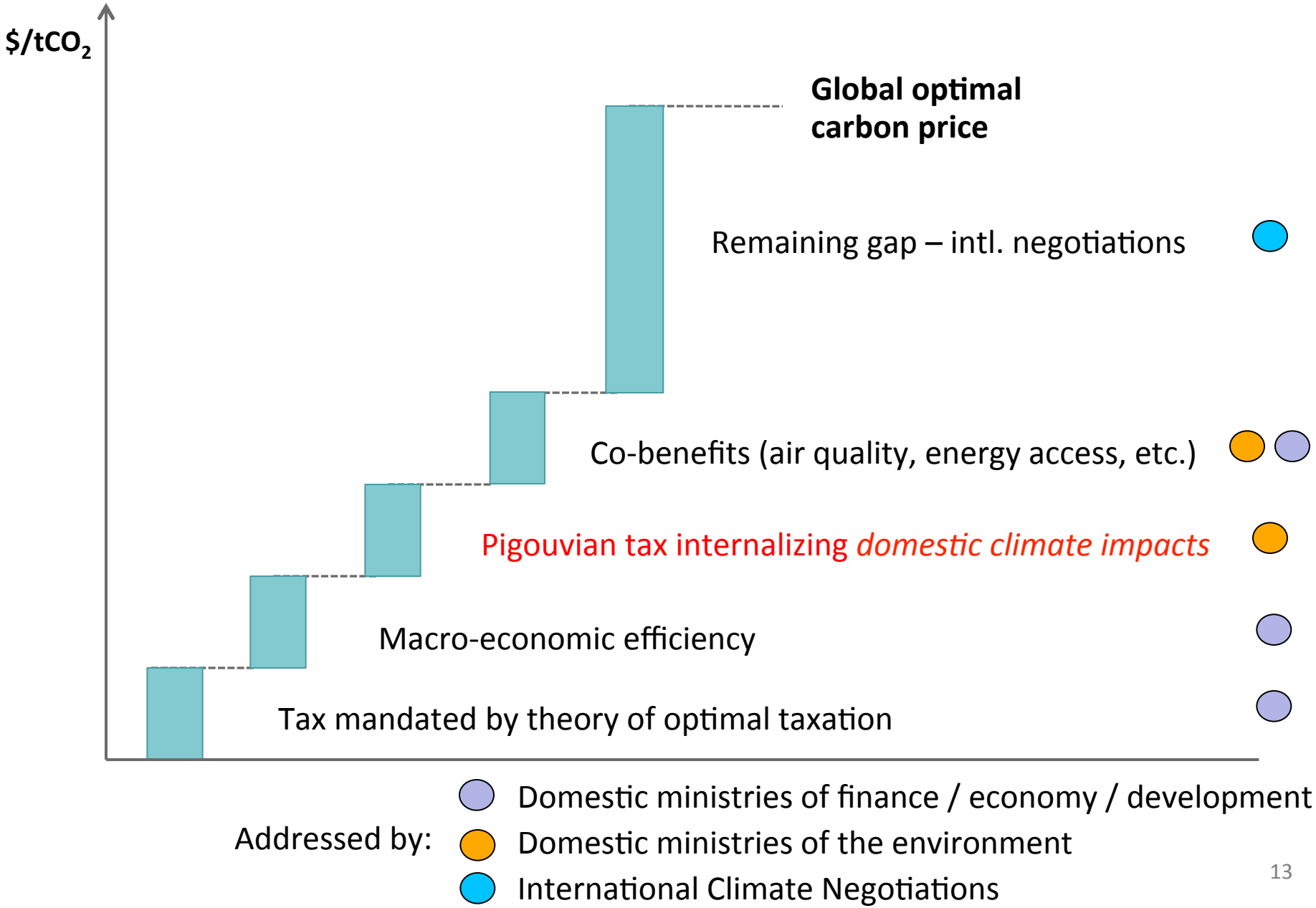
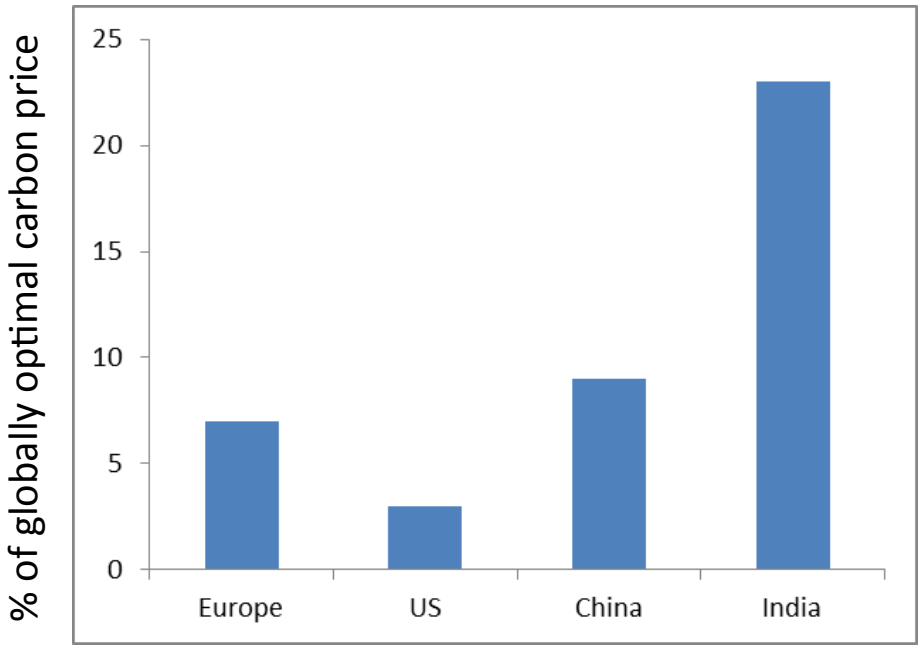


Internalizing domestic impacts

- Even if countries behave in a purely selfish manner, they would optimally impose a price on carbon to internalize the damage their emissions inflict on themselves

- The higher the damages, i. e. the richer or the more populous a country, the higher the resulting carbon price



(Lessmann, unpublished)

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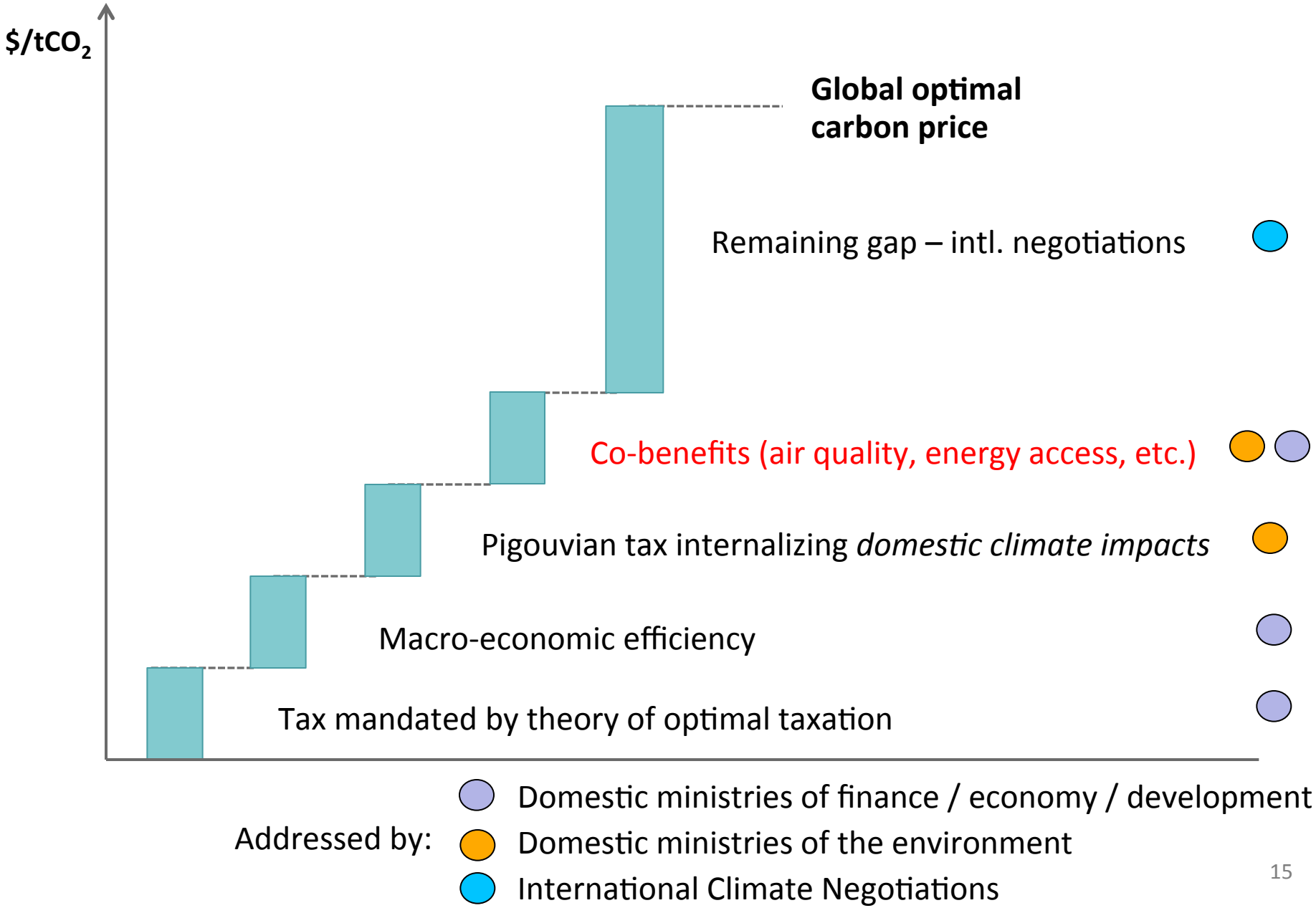
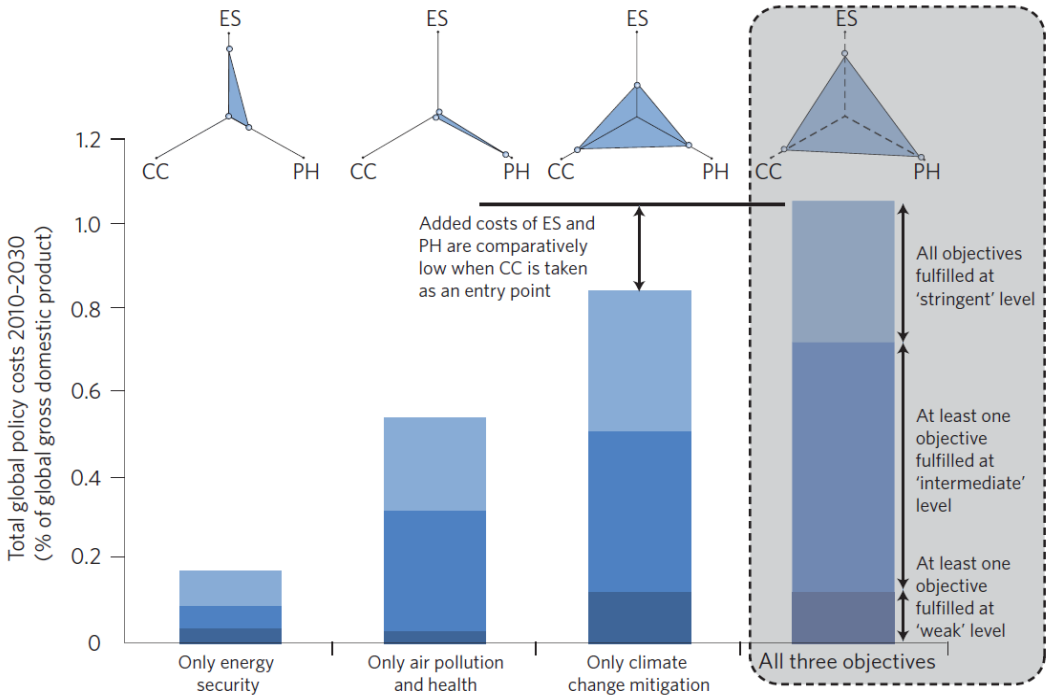


Co-benefits

- Besides reducing GHG emissions, several additional benefits:
  - Ambient air quality (Nemet 2010)
  - Public transport, reduce congestion and urban sprawl (Creutzig and He 2008)
  - Technology spill-overs (Jaffe and Stavins 2005)

- Case study evidence suggests that for many countries these motivations were more important than environmental concerns for the adoption of climate policy, e.g.
  - India: Energy security (Dubash 2013)
  - Vietnam: Energy efficiency, economic restructuring (Zimmer, Jakob, Steckel, submitted)

Multi-dividend perspective – Synergistic policies



McCollum, et al. (2013)

- Multiple objectives, e.g. climate change (CC), fiscal benefits, energy security (ES), pollution/health (PH)
- Synergistic relationships
- Reduced added costs of supplementary policies for other objectives
- Climate mitigation is strategic entry point to achieve an array of goals

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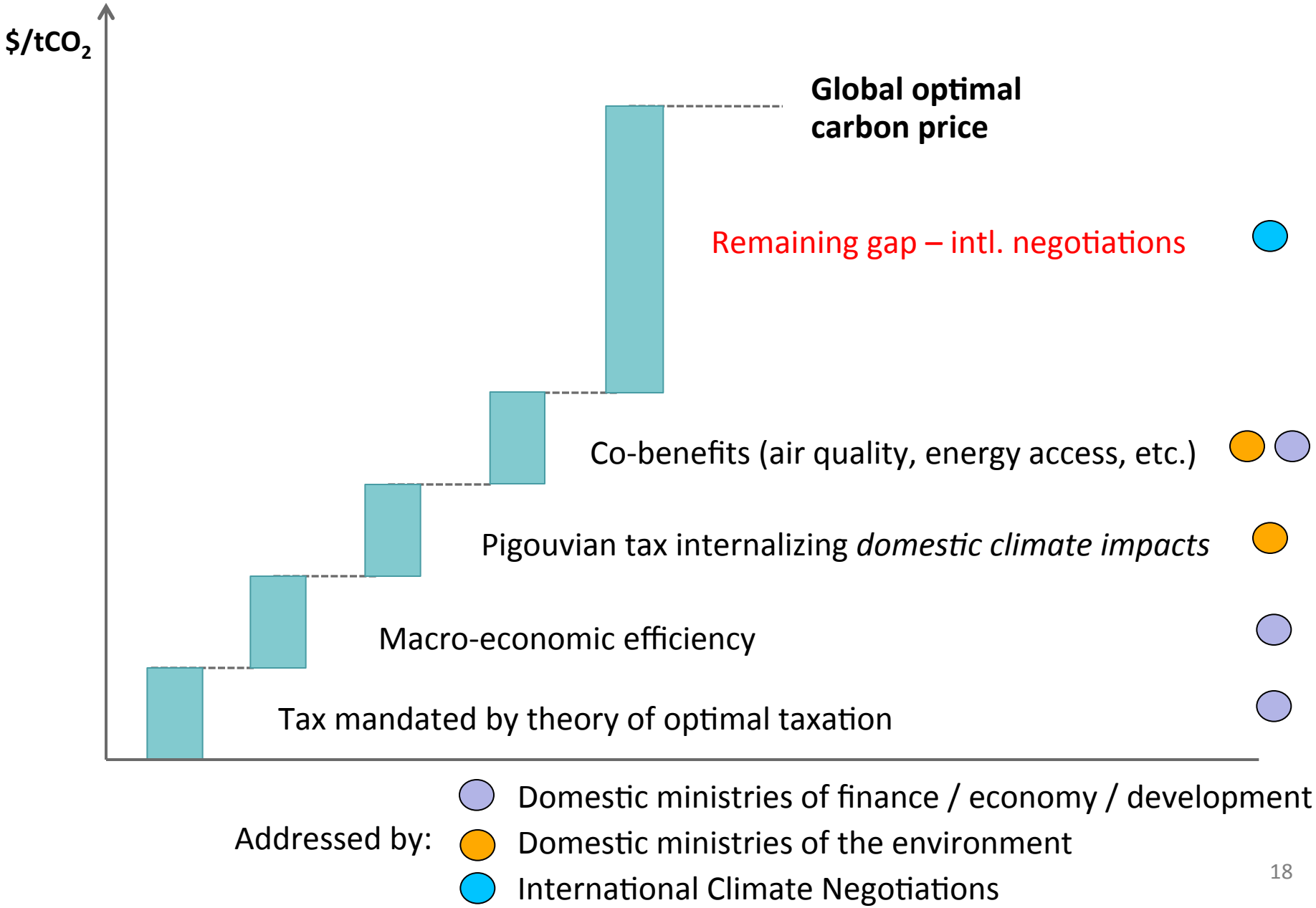
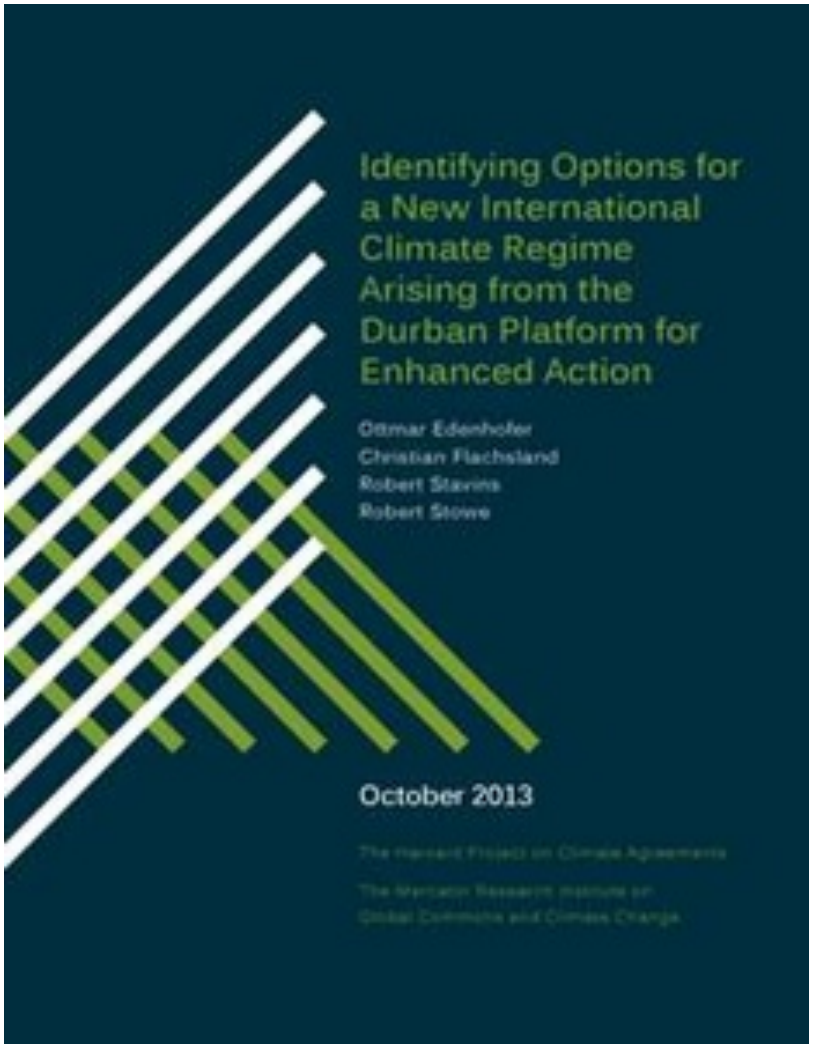


International negotiations

- Often argued that unilateral action is countered by free-riding (Barrett 1994, Carraro and Siniscalco 1993)
- Recent research has shown that first mover emission reductions can be strategic complements instead of substitutes (Edenhofer et al. 2013)
  - Technology spill-overs and learning by doing (Heal and Tarui 2008)
  - (Imperfect) altruism and reciprocity (Lange and Vogt 2003)
  - Signaling of willingness to pay (Jakob and Lessman 2012)
- Conditionality rules could act as an incentive to increase ambition

International negotiation



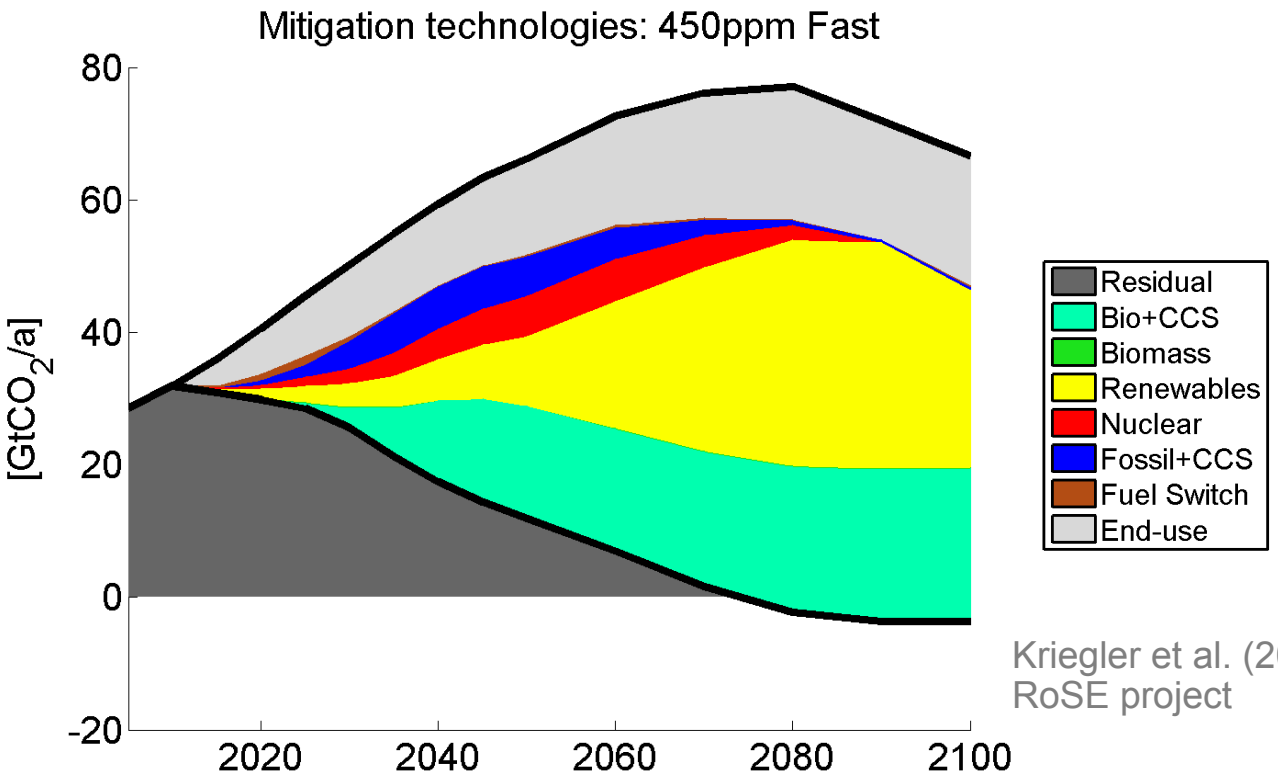
- By iterative processes, unilateral actions might result in more global cooperation (Edenhofer, Flachsland, Stavins, Stowe 2013)
- Unilateral actions could form the basis of a hybrid agreement (Edenhofer et al. 2013)
- International agreement as institution to coordinate national policies, share information, and act as a focal point for expectations
- Conditionality could act as an incentive to increase ambition

Edenhofer, Flachsland, Stavins, Stowe 2013

X-Cut I: First mover challenges

- **Carbon Leakage**: Recent research finds
  - Böhringer et al. (2012): 5-19% (median 12%)
  - Also negative leakage possible
    - Positive technology spill-overs (Bossetti et al. 2009)
    - Crowding out of dirty capital (Carbone et al. 2013)
    - Inter-fuel substitution in third countries (Bauer et al. 2013)
  - Tailored policies can reduce leakage
    - Trade measures (Jakob, Steckel, Edenhofer, forthcoming)
    - Free allocation of some emission permits (Hepburn 2013)
- **Costs:**
  - Modeling indicates moderate costs from a period of moderate unilateral carbon pricing
  - Delaying global agreement by 15 years would raise costs of achieving 450ppm CO_2-only by at least half (Jakob et al. 2012)

X-Cut II: The role of technology



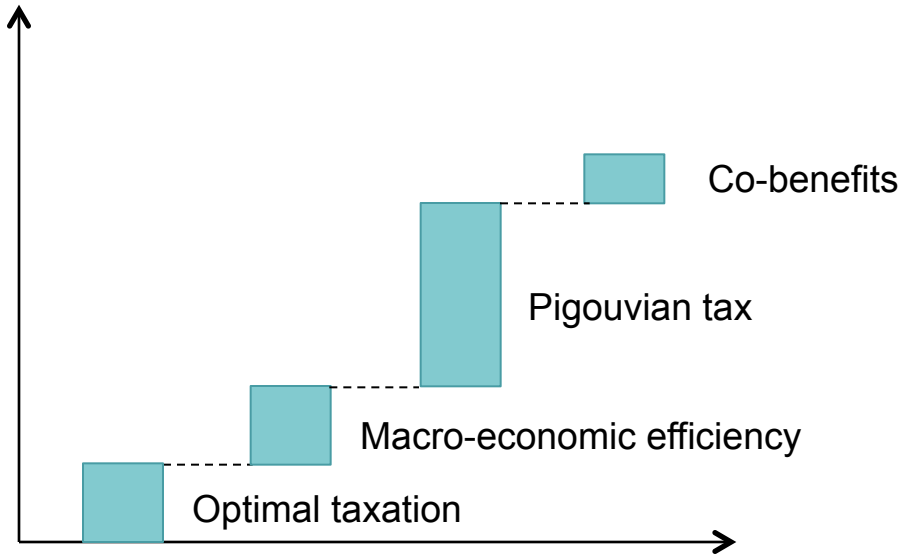
Kriegler et al. (2013)
RoSE project

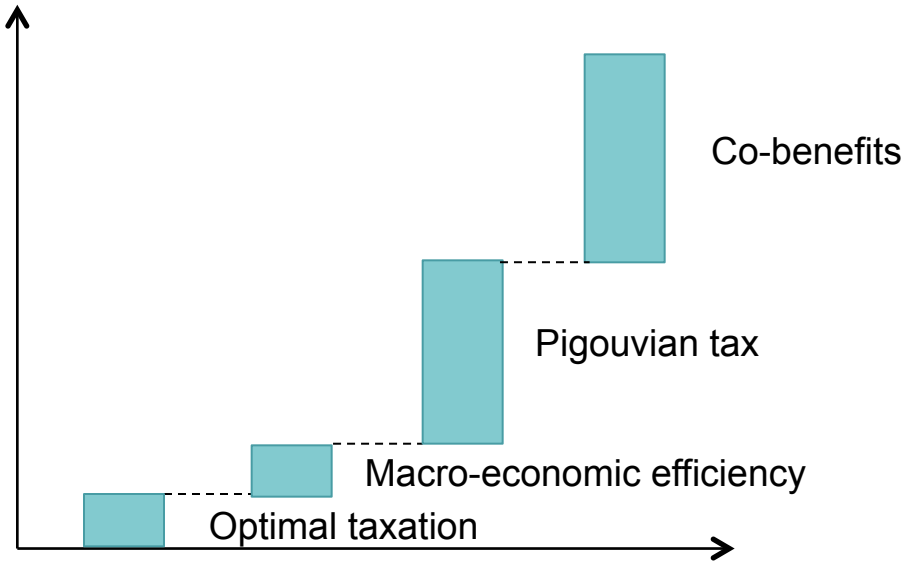
- Development of new technologies and learning effects crucial for technology portfolio and mitigation costs
- A price on carbon is necessary, but not sufficient – optimally complemented by technology policies

X-Cut III: Some political economy considerations

- **Energy-intensive industries** - some compensation for losers?
- **Carbon price impacts on equity**:
  - Carbon price not necessarily regressive (Rausch 2011)
  - Can be made progressive by lowering taxes in a way that benefits low earners (Metcalf et al. 2010) or provide infrastructure that benefits them more than others
  - Ensure buy-in of key stakeholders by ownership, e.g. inspired by property owning democracy (Meade 1946)
- Benefits of carbon pricing should be examined in a **multi-objective framework** rooted in welfare theory (Jakob and Edenhofer, submitted)

Strength of the narrative



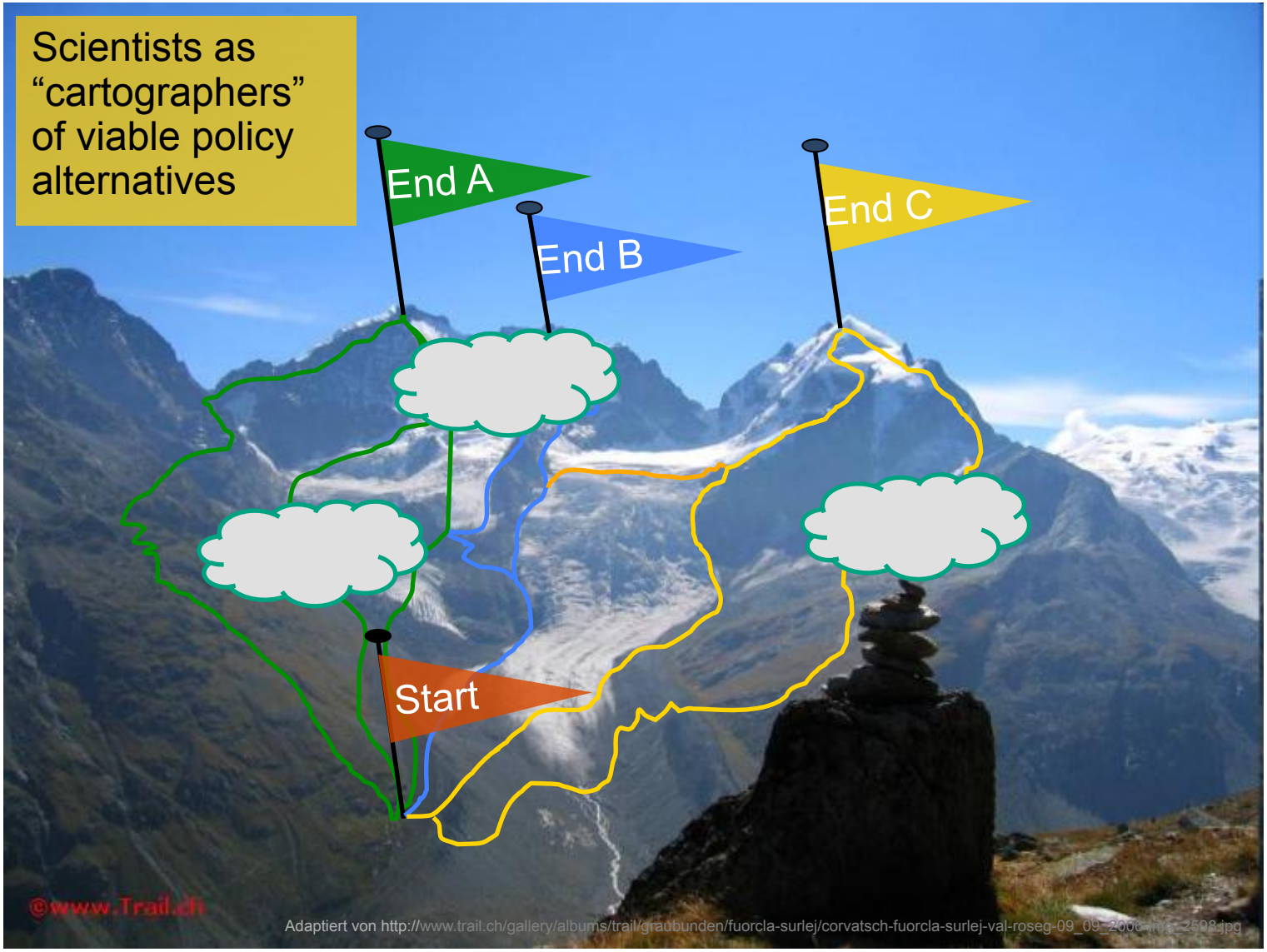


"[T]he carbon tax is not a free lunch. However, …, it still might be a meal worth paying for!" (Goulder 2013)

"$100–600 billion annually by 2030 in reduced pollution control and energy security expenditures." (McCollum et. al 2012)

- Different people may have very different assumptions of physical and economic mechanisms as well as different preferences
- Yet, they still may agree on a more or less similar carbon price
- Elaboration of benefits in multiple dimensions allow identifying range of acceptable prices and does not need to rely on a single 'killer argument'

The importance of robust scientific policy advice



Conclusions

- **Ambition of international climate policy rooted in domestic ambitions**
- **Domestic climate policy embedded in broader public policy concerns**
- **Domestic multi-dividend perspective:**
  - Optimal taxation, double dividend, taming capital tax competition
  - Improving macro-economic efficiency, investment of revenue in areas with highest social return
  - Reduction of CO_2 emissions mitigates climate change
  - Positive synergies with other issues such as air pollution and technology spill-overs
- **These considerations might not achieve globally optimal carbon price, but help to close the gap and advance international negotiations**
- **Robust scientific policy advice that outlines the option space and identifies winners and losers is crucial**