

## **From G8 to L20**

# **EMF 22: Subgroup Transitional Climate Policy**

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# From G8 to L20

## **Kyoto framework**

- 160-nation bureaucracy of the UN process
- Too inclusive for effective negotiation process

## **Key idea of L20 approach (e.g. Victor 2004, Kopp 2005)**

- Leverage on negotiation outcomes by focusing on a small number of countries (key players) – at least initially
- Game-theoretic analogon: “narrow and deep versus broad and shallow”

## **Research questions**

- Composition of L20: selection criteria (ex ante)
- Political feasibility of L20: cost incidence of L20 leadership (ex-post)

# L-20 Summary Statistics

*Table 1: TOP 20 in CO<sub>2</sub> emissions, GDP, and population (% in world Total)*

	Shares for data in 2001*			Shares for data between 2000-2030**		
	GDP	Population	Emissions	GDP	Population	Emissions
EU-30	24.2	8.0	18.1	20.5	6.6	14.2
USA	35.1	4.5	23.5	34.6	4.2	21.2
Japan	12.4	2.1	5.3	9.8	1.7	4.0
Russia	0.9	2.4	6.1	1.1	1.9	5.2
Brazil	1.5	2.8	1.4	1.6	2.7	1.6
Mexico	2.1	1.6	1.6	2.3	1.6	1.6
China	3.7	20.8	13.4	6.5	19.1	19.5
India	1.7	16.4	4.1	2.6	16.5	4.8
Indonesia	0.5	3.5	1.2	0.7	3.4	1.3
Total	82.1	62.1	74.7	79.7	57.7	73.4

\* Based on GTAP6 (Dimaranan, and McDougall, 2006)

\*\* Based on GTAP6 and IEO2005 (DOE, 2005)

# Scenarios – Assumptions

## Reference scenario (“doing-nothing case”)

- *BaU*: Business-as-Usual reference scenario

## Climate policy scenarios (Cap & Trade)

- Global emissions cap: 30 Gt of CO<sub>2</sub> from 2015 onwards
- Comprehensive “where-flexibility”
- Regional participation:
  - Leader (L20)
  - ROW (Rest of the World)

*N.B.: Regions which do not participate obtain BaU emissions!*

# Scenarios – Dimensions of Analysis

## Allocation rule

<b>ega</b>	Egalitarian	Entitlement based on population
<b>atp</b>	Ability to pay	Reduction based on GDP*
<b>ppa</b>	Polluter pays	Reduction based on emissions

*N.B.: ATP is equivalent to sovereignty (SOV) rule.*

## Timing of Participation

	<b>Leader</b>	<b>ROW</b>
<b>Global</b>	> 2015	> 2015
<b>L20trans</b>	> 2015	> 2035
<b>L20eternal</b>	> 2015	never

# Analytical Framework

## Key features:

- Multi-sector, multi-region computable general equilibrium (CGE) model:
- Intertemporal framework (time horizon: 2030): Ramsey-type growth model

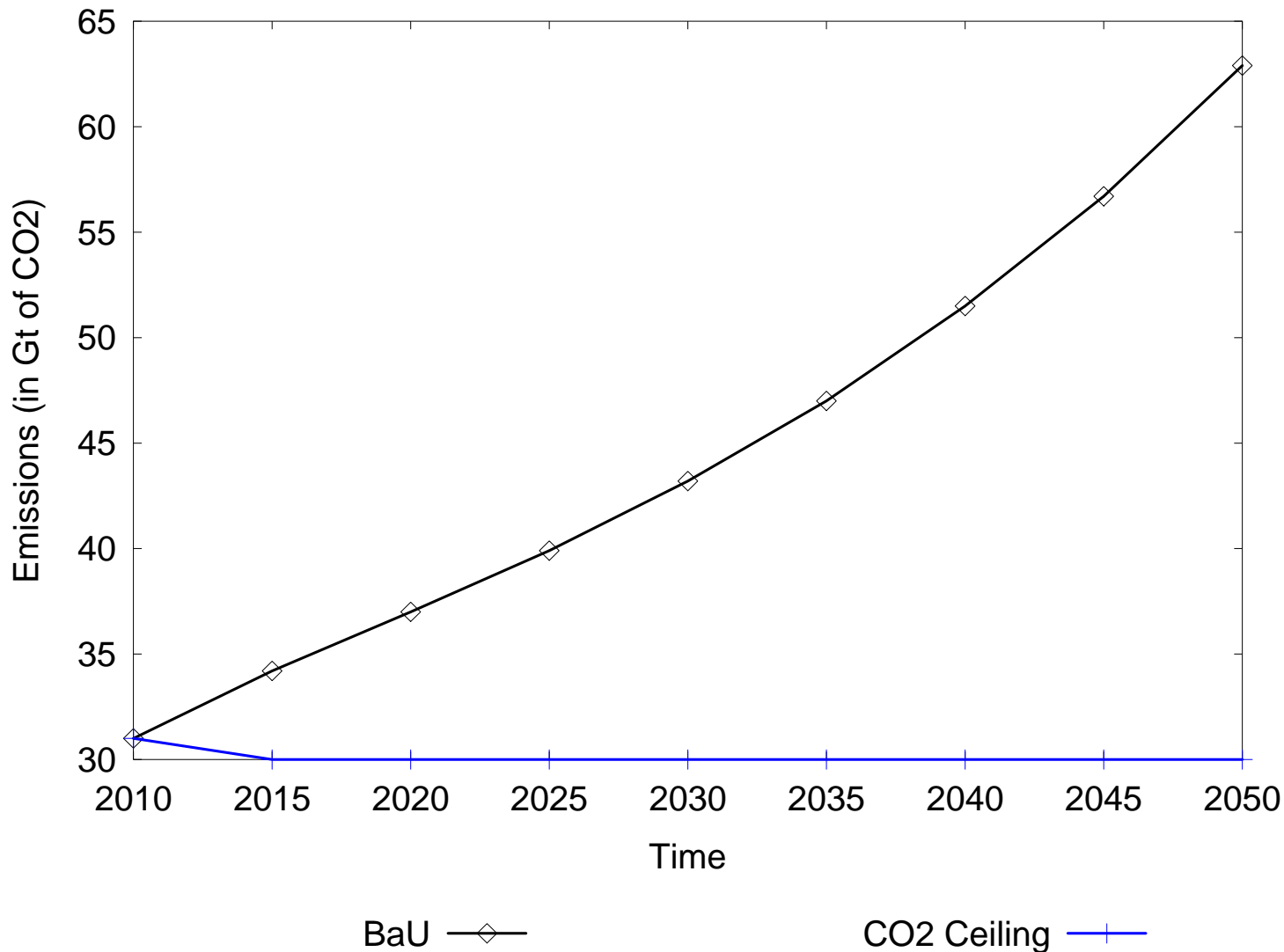
## Base year calibration: GTAP6

- Input-output tables and bilateral trade flows for 87 regions and 57 sectors
- Harmonized energy flows (IEA energy balances and statistics)

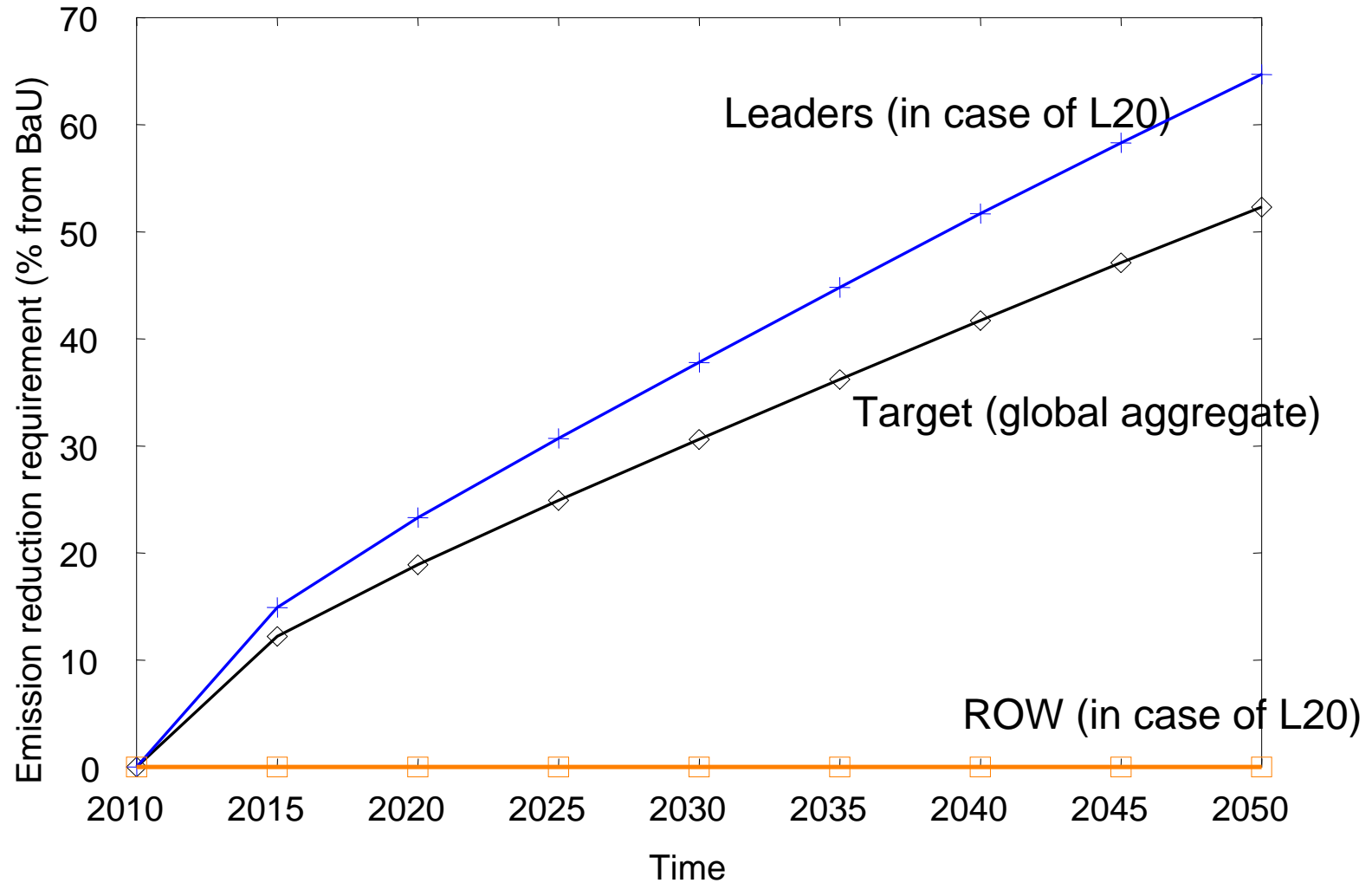
## Baseline projections: IEO/DOE

- Region-specific projections for GDP, energy use and crude oil production
- Sensitivity analysis: alternative baselines (low – ref – high)

# Emissions – BaU and Ceiling

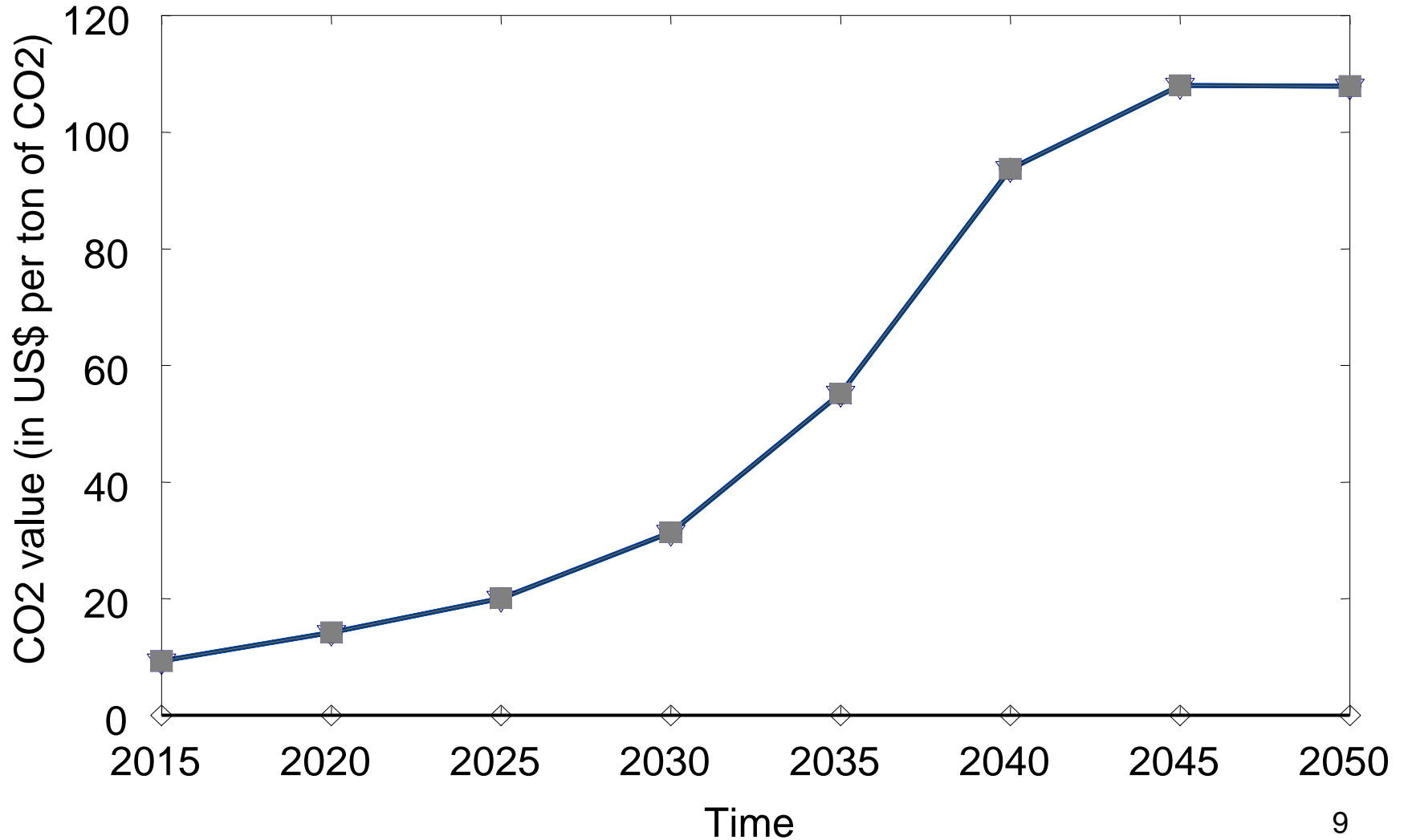


# Emission Reduction versus BaU

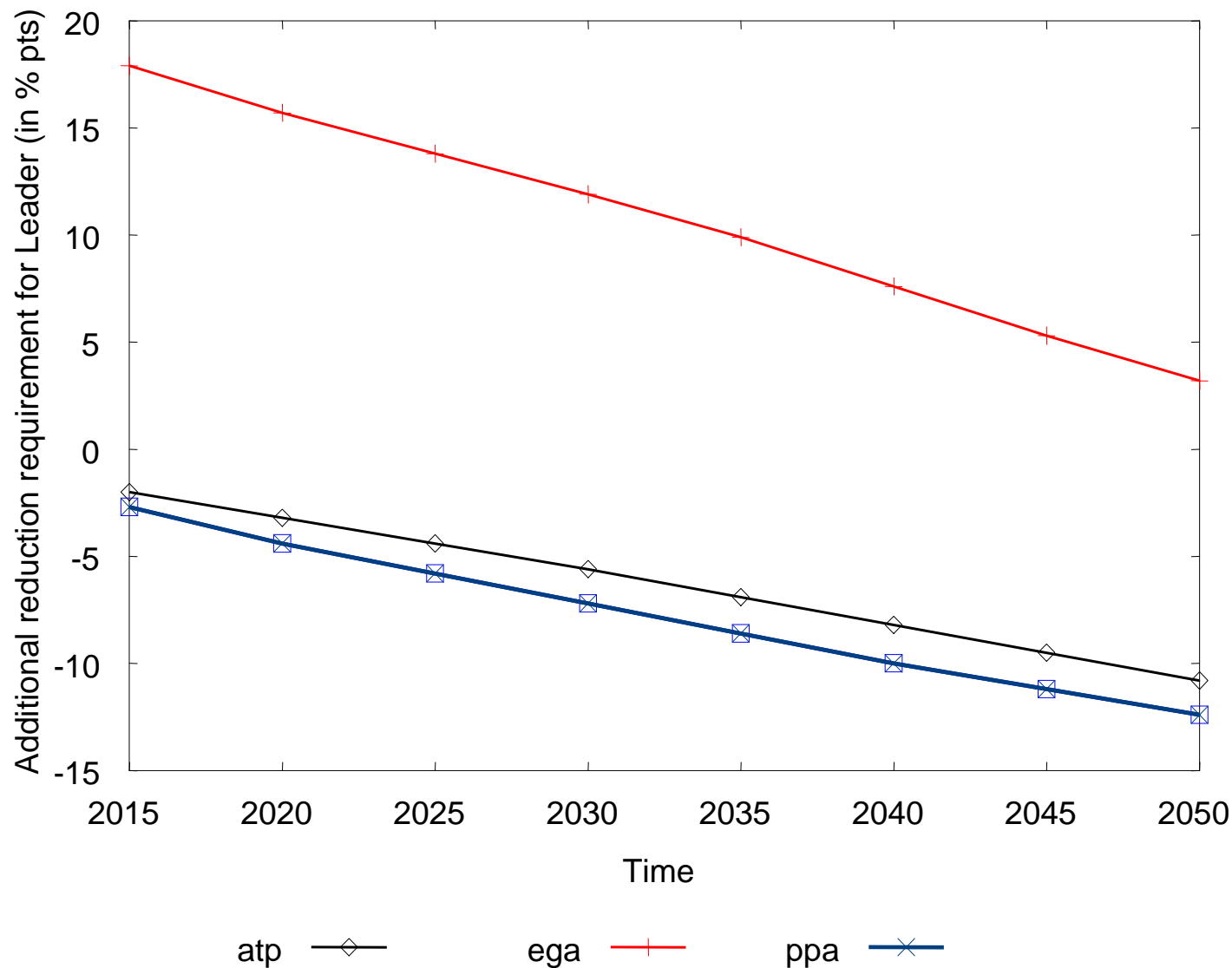




# Carbon Value (Marginal Abatement Cost)

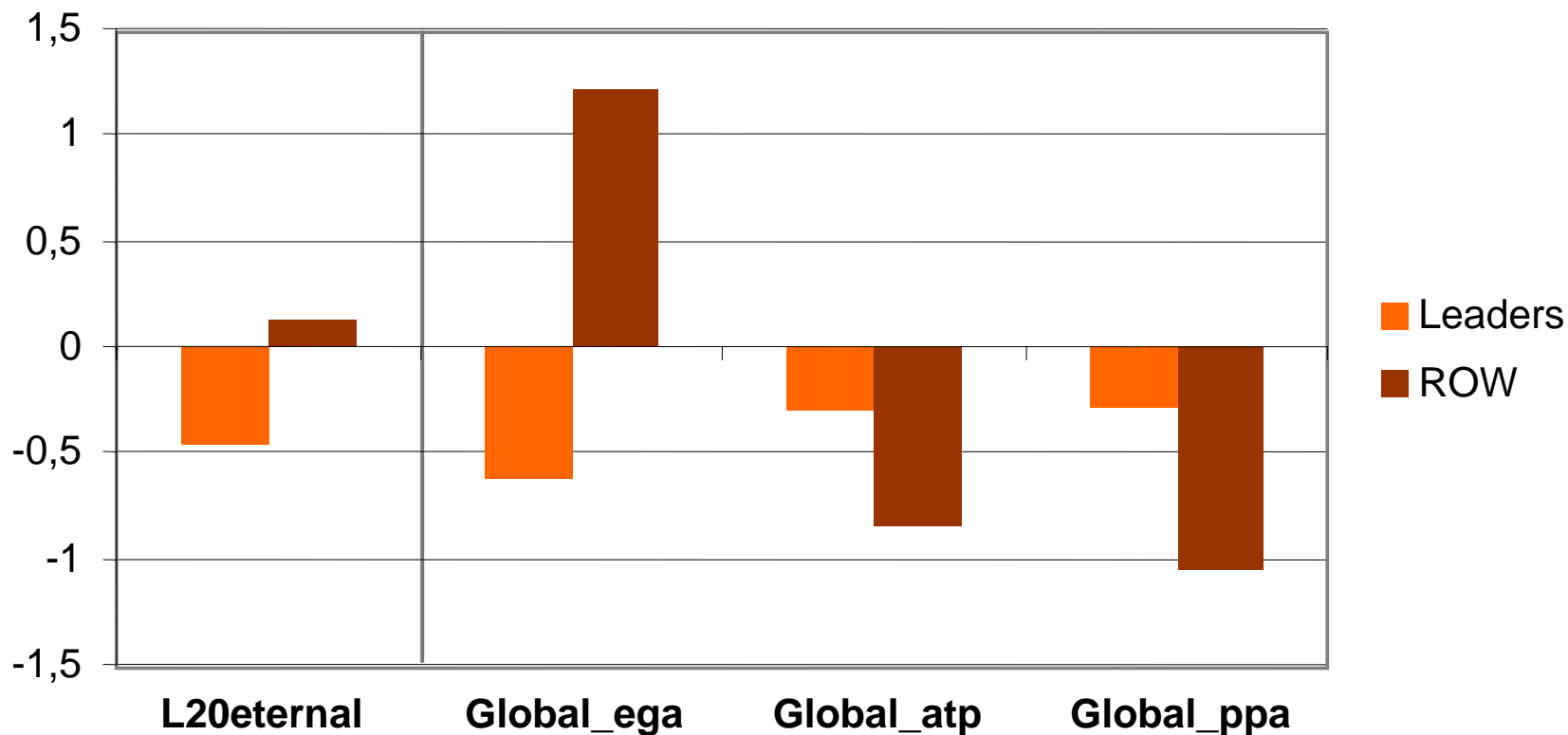


# Implications of L20 versus Global



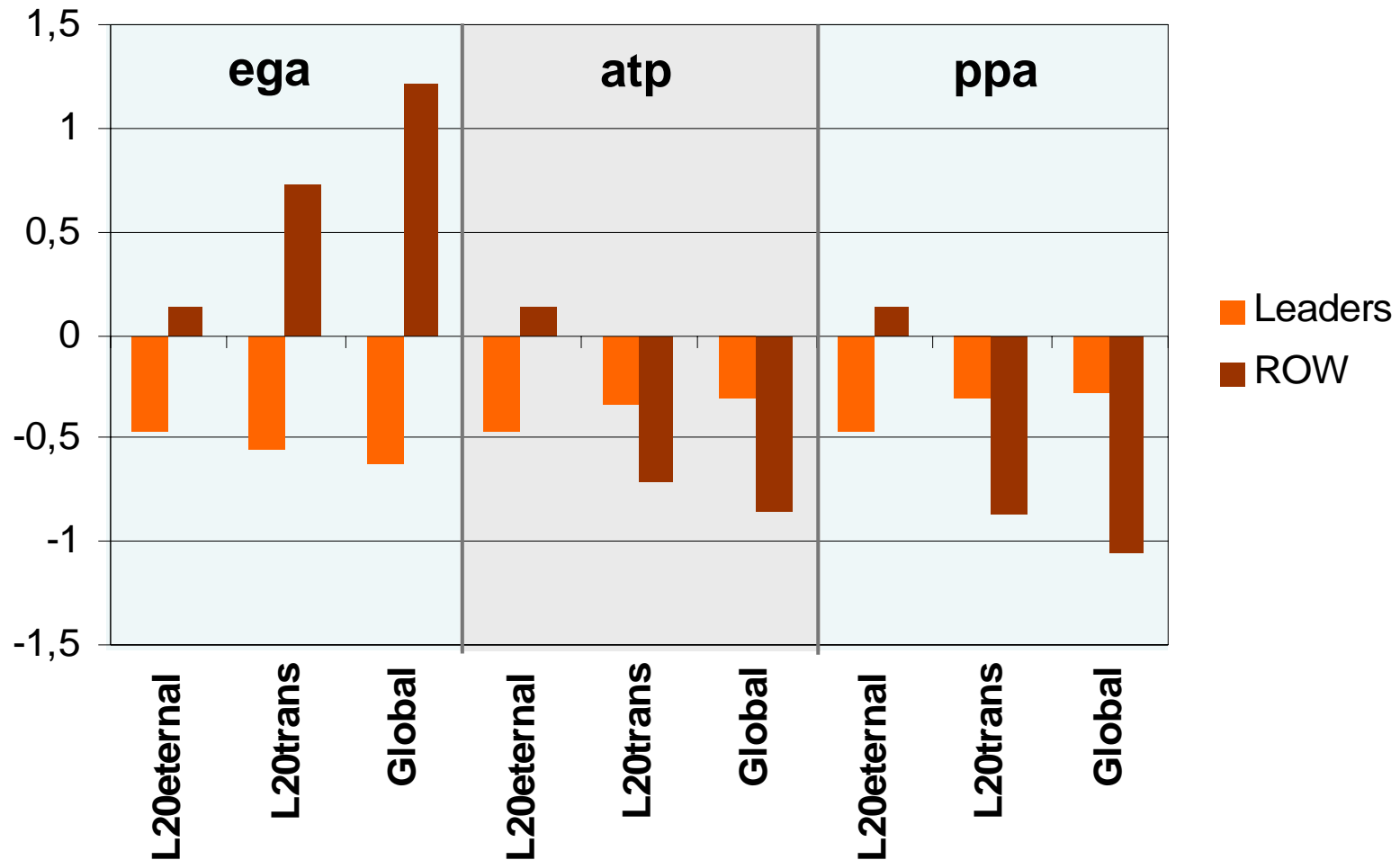
# Aggregate Welfare – *L20eternal* versus *Global*

## Welfare Implications (% HEV from *BaU*)



# L20 as Transitional Approach

## Welfare Implications (% HEV from *BaU*)



# From G8 to L20

## Conclusions

- Scenarios: Income transfers via carbon endowments (overall efficiency is warranted through comprehensive “where-flexibility”)
- *Egalitarian* allocation rule: Leaders (“L20” countries) prefer leadership to global coverage due to population dynamics
- *Ability-to-pay* and *polluter-pays* (*sovereignty*): global application of allocation rule makes “Leaders” group better off than leadership
- Leadership is much *less costly* (to the Leaders) *if restricted* to transitional phase

## Caveats

- Economic impacts within L20 can be quite different (and not resolved in this analysis...)
- Comprehensive sensitivity analysis with respect to
  - key elasticities
  - global target trajectories for emissions
  - BaU projections
  - Limited “where-flexibility” (leakage)

# Backup

## Aggregate Welfare Implications (% HEV from *BaU*)

L20eternal:

Scenario	L20	ROW	Total
<i>L20_ega</i>	-0.47	0.13	-0.38
<i>Global_ega</i>	-0.63	1.21	-0.37
<i>L20_atp</i>	-0.47	0.13	-0.38
<i>Global_atp</i>	-0.31	-0.85	-0.39
<i>L20_ppa</i>	-0.47	0.13	-0.38
<i>Global_ppa</i>	-0.28	-1.05	-0.39
<i>L20_sov</i>	-0.47	0.13	-0.38
<i>Global_sov</i>	-0.28	-1.05	-0.39

## Aggregate Welfare Implications (% HEV from *BaU*)

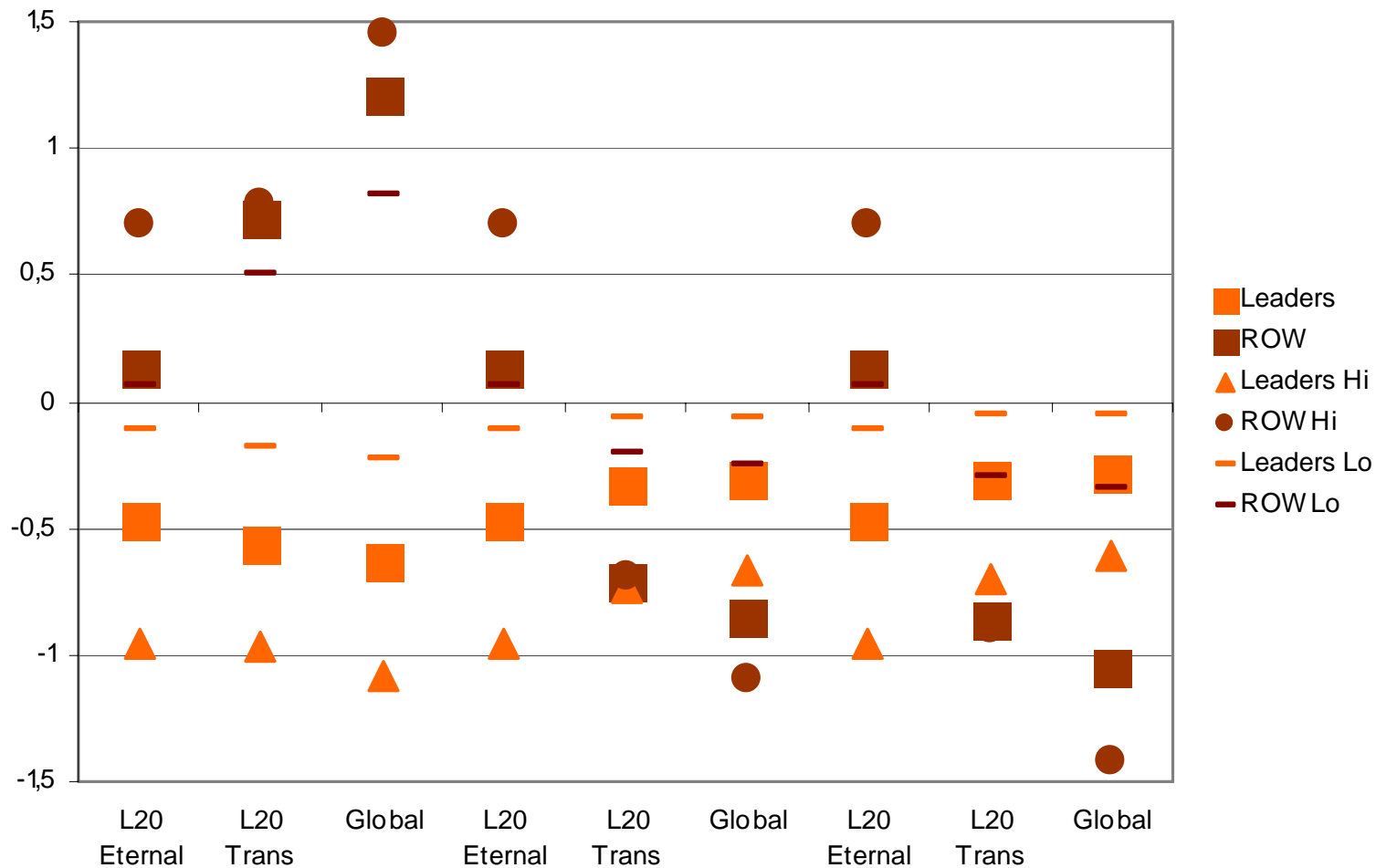
L20trans:

Scenario	Leaders	ROW	world
L20_ega	-0.56	0.72	-0.38
Global_ega	-0.63	1.21	-0.37
L20_atp	-0.33	-0.71	-0.39
Global_atp	-0.31	-0.85	-0.39
L20_ppa	-0.31	-0.87	-0.39
Global_ppa	-0.28	-1.05	-0.39
L20_sov	-0.31	-0.87	-0.39
Global_sov	-0.28	-1.05	-0.39

➔ Costs for Leaders substantially reduced!



# Baseline-Sensitivity - Welfare (% HEV from *BaU*)



## Baseline-Sensitivity - Welfare (% HEV from *BaU*)

