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Economic and Environmental Effects of Linking the European ETS in the Context of Global Reduction Targets

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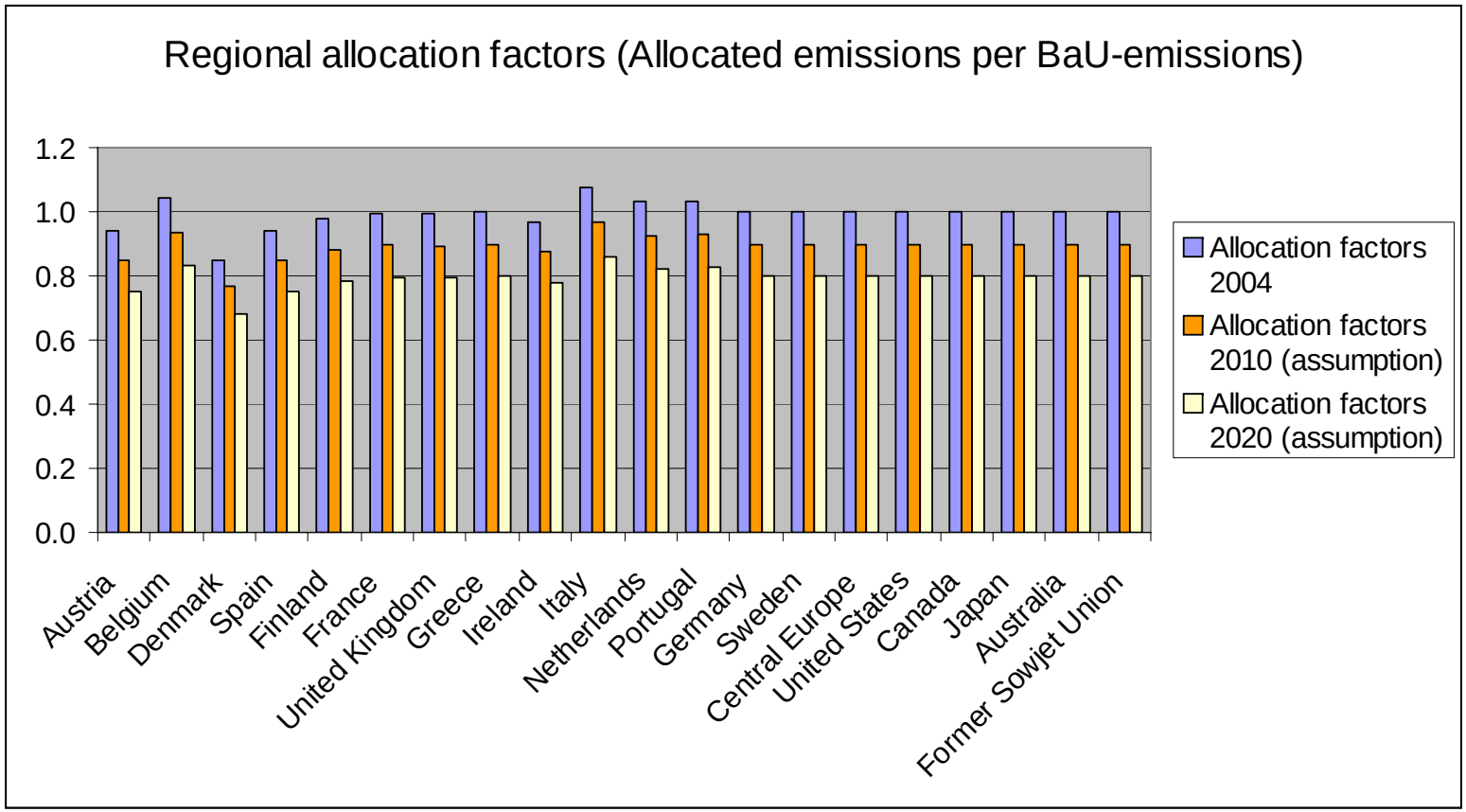
Agenda

1. EU Emissions trading scheme
2. Simulation model
3. Scenarios of linked ETS
4. Numerical results
5. Conclusions

EU emissions trading scheme

- EU Emissions Trading Directive: installation-based emissions trading ⇔ „warm-up“ phase since 2005
- Exclusive coverage of energy-intensive industries (electricity, iron and steel, paper and pulp, non-ferrous metals)
- Not covered: chemicals, transport, household, small emitters
- Allocation of emisssion allowances to covered installations (grandfathering) ⇔ National Allocation Plans (NAPs)
- Assumption: similar allocation modus in emerging ETS

EU ETS: current allocation

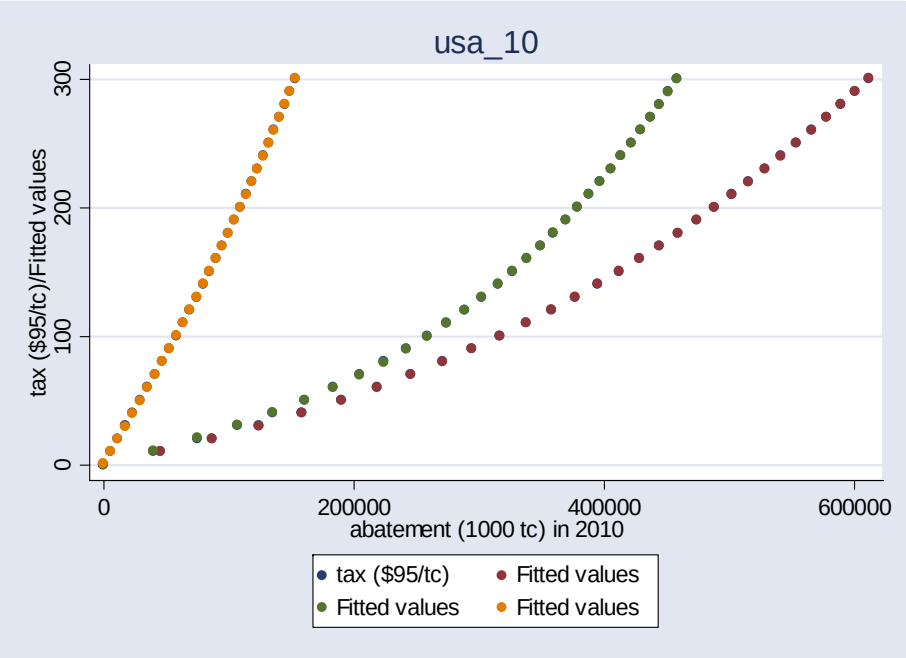


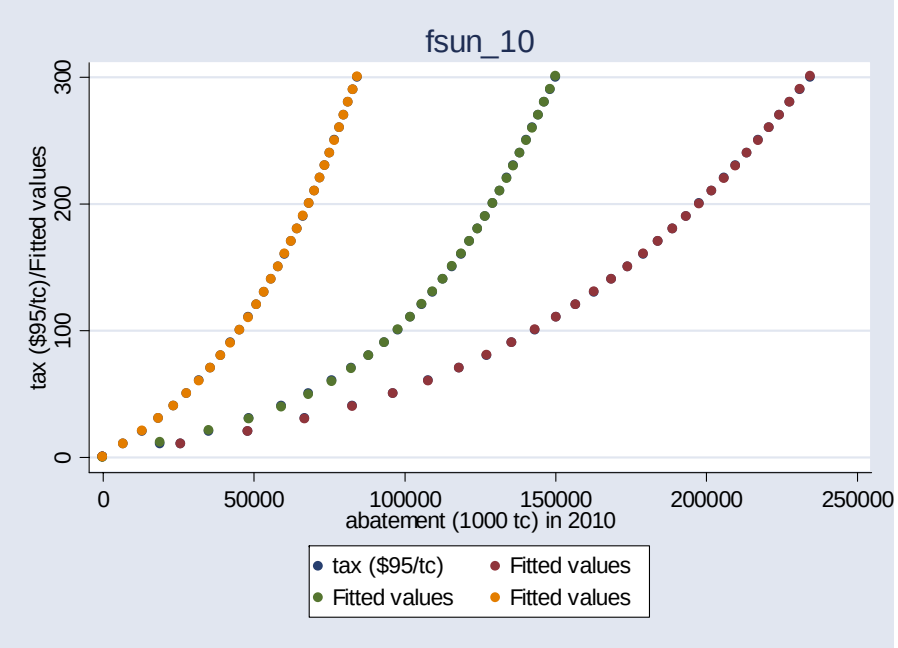
⇔ **Generous** current allocation (allocation factors close to 1)

Simulation model

- ***SIMAC* : SI**mulation Model based on **M**arginal **A**batement **C**osts
  ⇔ Böhringer et al. (2005)
- Numerical multi-country partial equilibrium model of the world carbon market in 2010 and 2020
- Objective: Minimization of compliance (abatement) costs by emissions trading
- Model covers transaction costs and investment risk for CDM projects
- Based on (calibrated) marginal abatement cost functions for energy-intensive and non-energy-intensive sectors ⇔ EU-ETS
- MACs based on *POLES* energy system model (IEA data)

Marginal abatement cost functions





Scenarios: regional ETS emergence

Scenario \ Time	2010	2020
ETS EUROPE	EU-27	EU-27
ETS KYOTO	EU-27 Japan Canada	EU-27 Japan Canada Former Sowjet Union
ETS ANNEX B	EU-27 Japan Canada Former Sowjet Union	EU-27 Japan Canada Former Sowjet Union Australia + New Zealand USA
CDM host countries	Brazil Mexico India China South Korea	Brazil Mexico India China South Korea

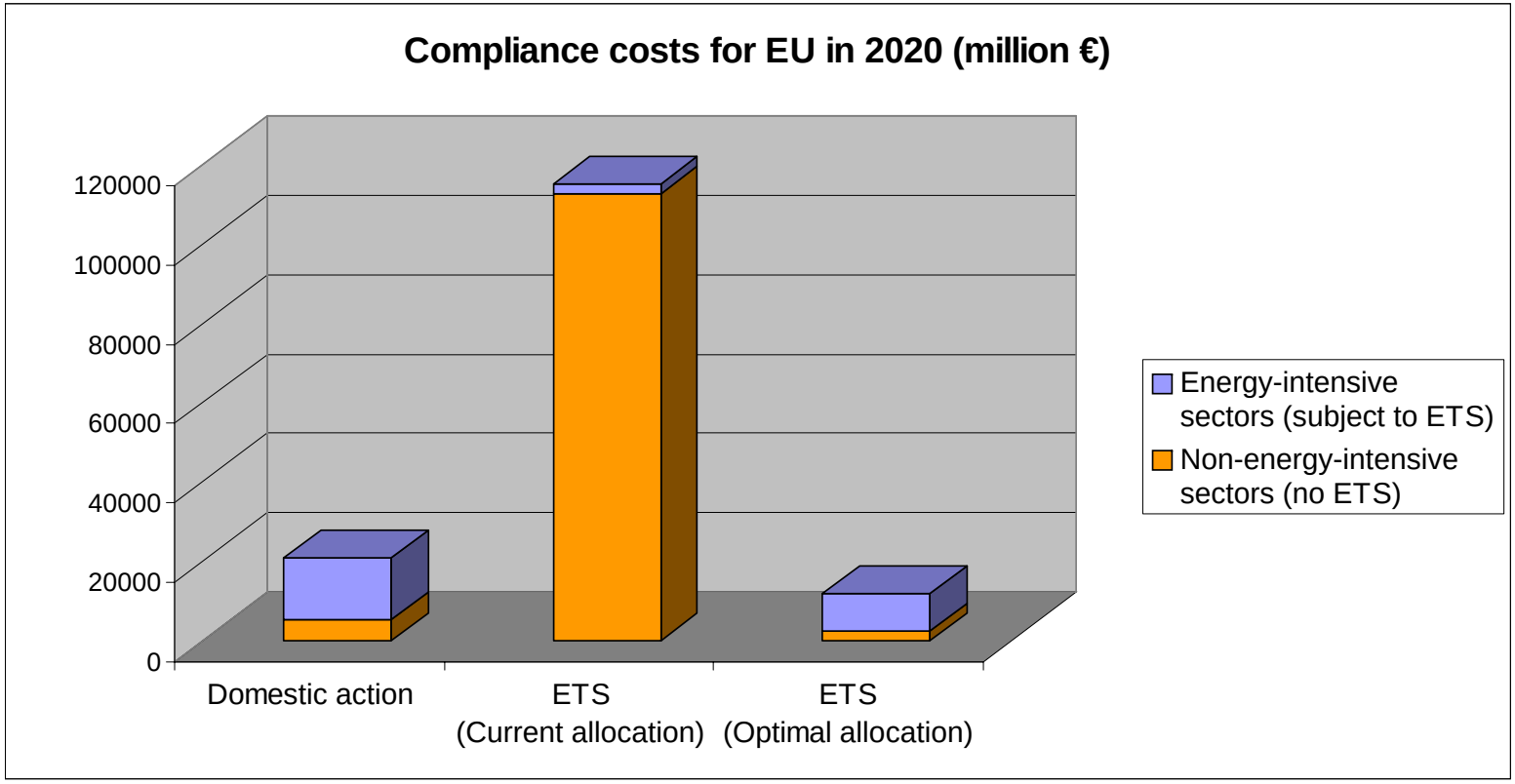
„Kyoto“ reduction targets

Regions	Reduction requirements in 2010 (in % vs. 1990)	Reduction requirements in 2020 (in % vs. 1990)
Austria	13.0	19.7
Belgium	7.5	14.7
Denmark	21.0	27.1
Spain	-15.0	-6.1
Finland	0.0	7.7
France	0.0	7.7
United Kingdom	12.5	19.3
Greece	-25.0	-5.3
Ireland	-13.0	-4.3
Italy	6.5	13.7
Netherlands	6.0	13.3
Portugal	-27.0	-17.2
Germany	21.0	27.1
Sweden	-4.0	4.0
Central Europe	-4.8	3.3
United States	-27.3	-23.8
Canada	6.0	8.6
Japan	6.0	8.6
Pacifc OECD	-7.0	-4.1
Former Sowjet Union	0.0	2.7

EU burden sharing agreement

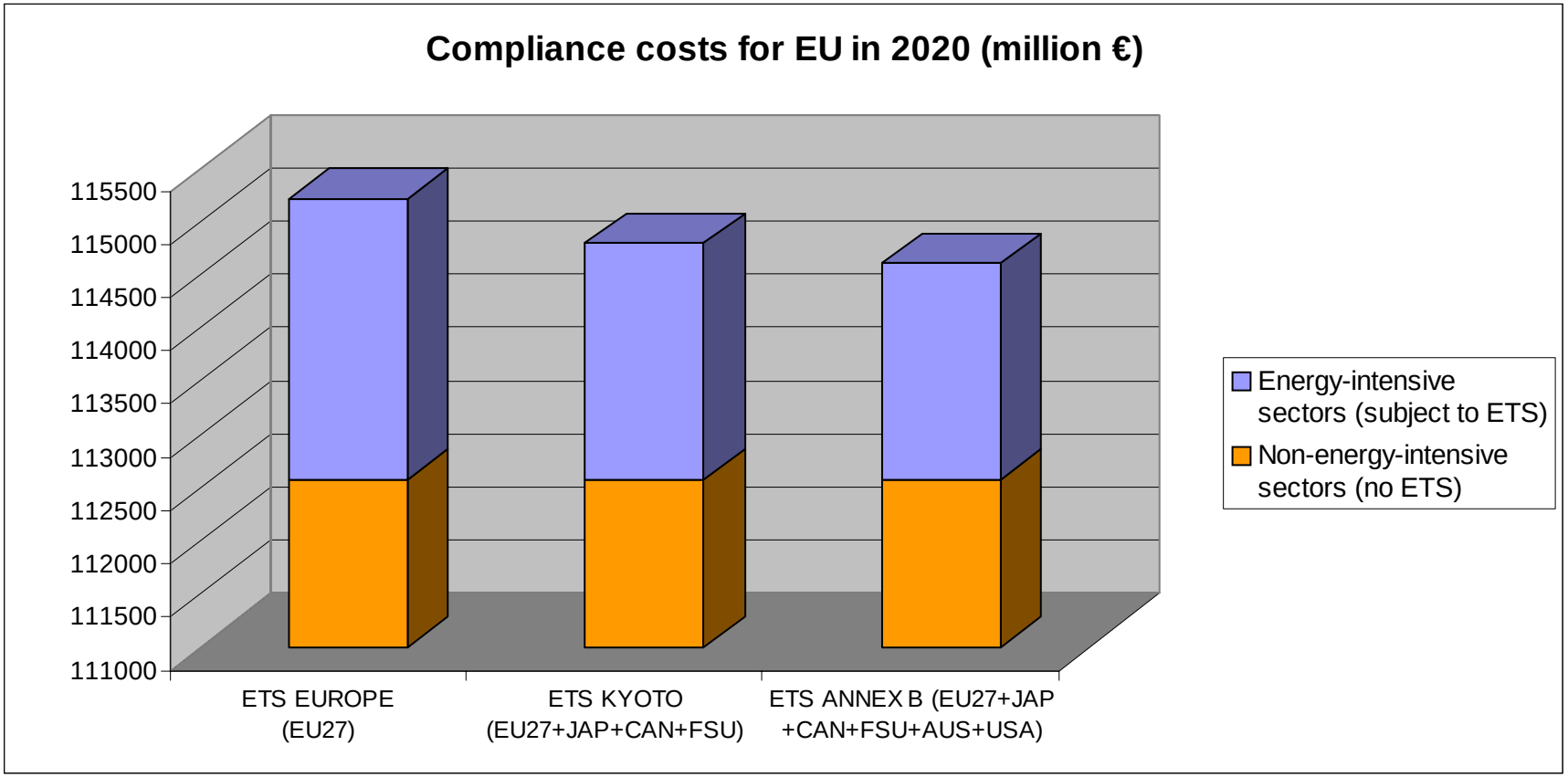
Simulation results

EU ETS: Inefficiencies due to burden shifting



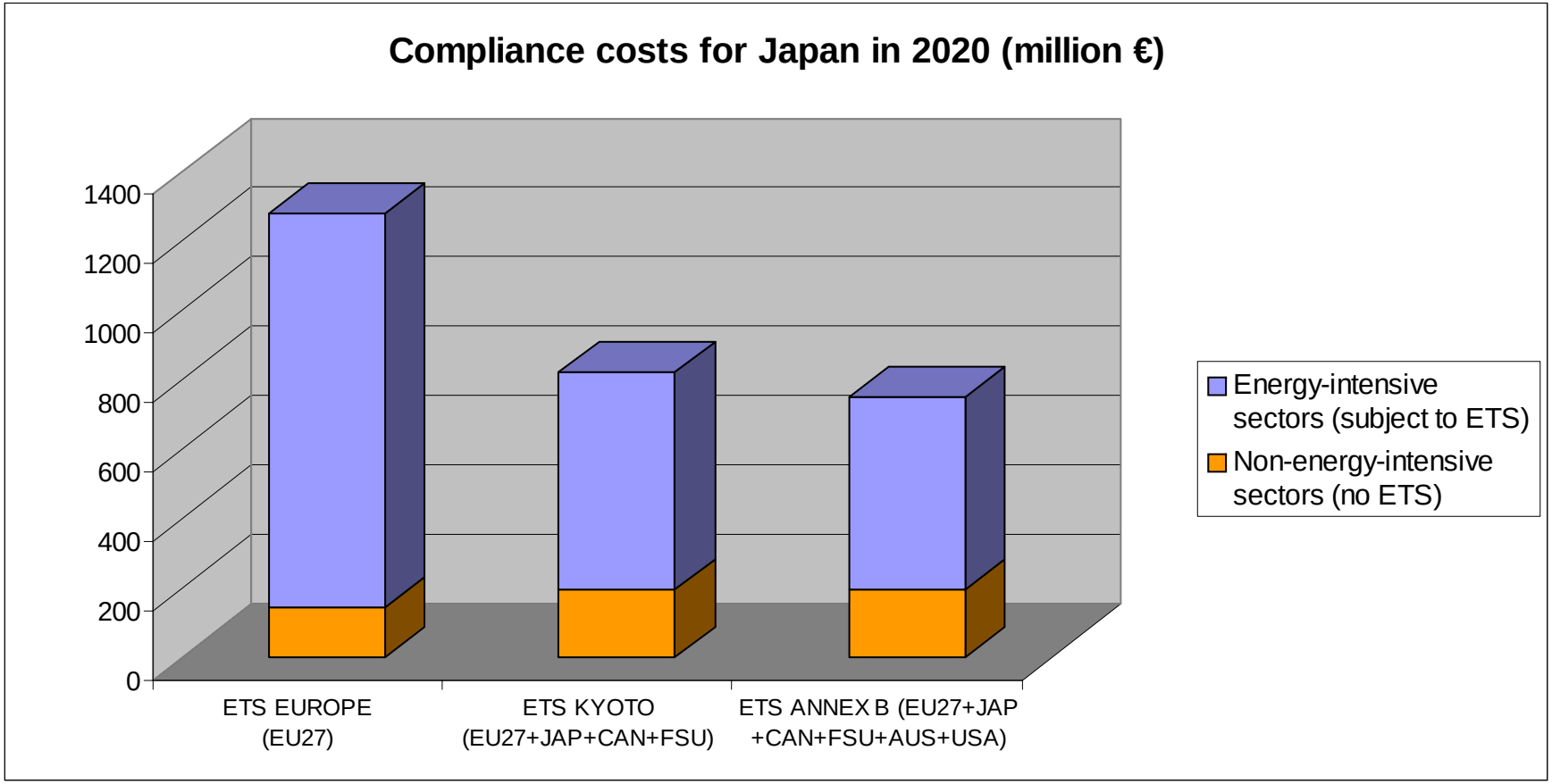
⇔ Current EU-ETS allocation induces higher costs than domestic action

Effects of linking ETS (current allocation)



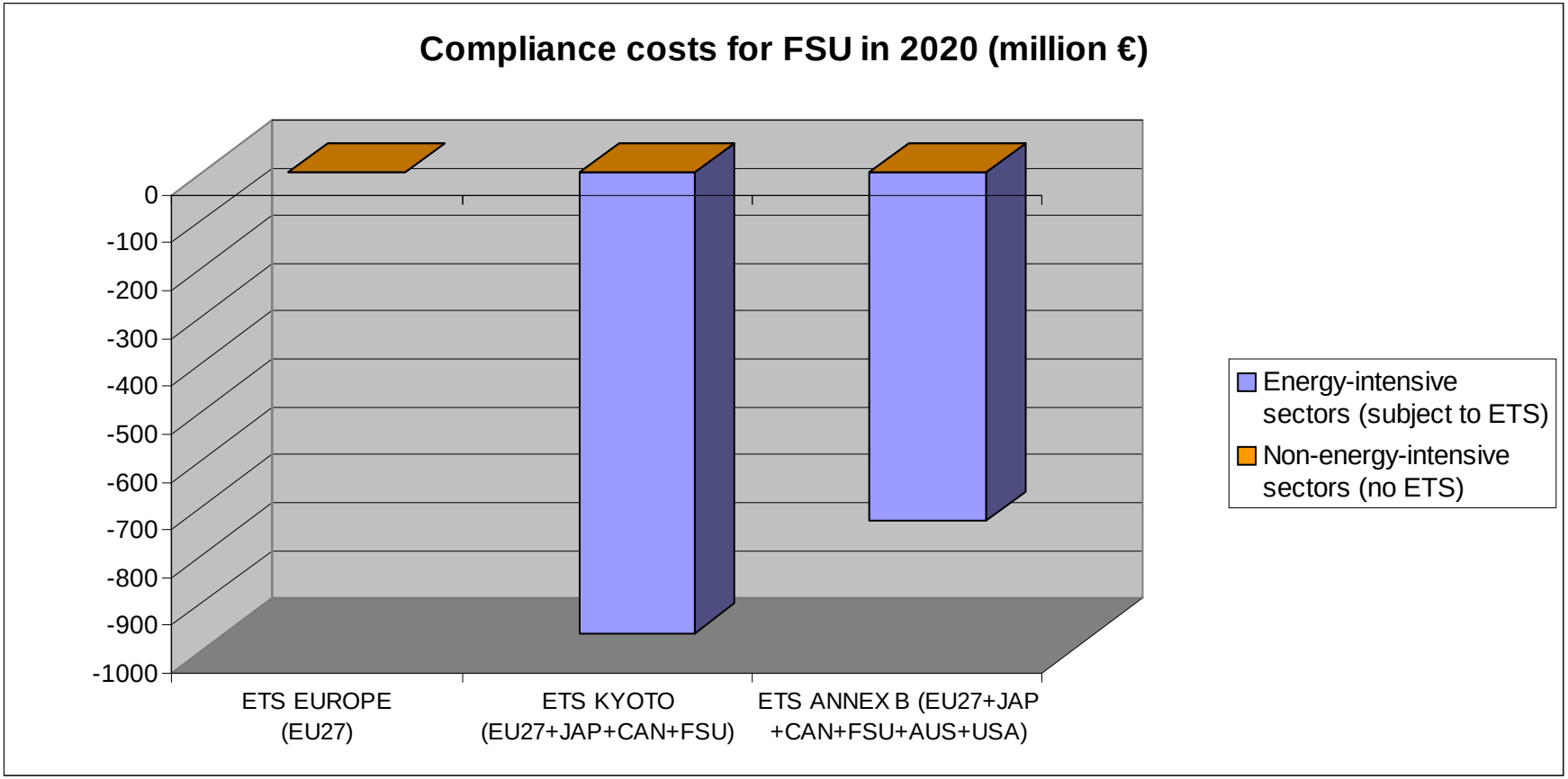
⇔ Cost reductions for EU through linking ETS

Effects of linking ETS (current allocation)



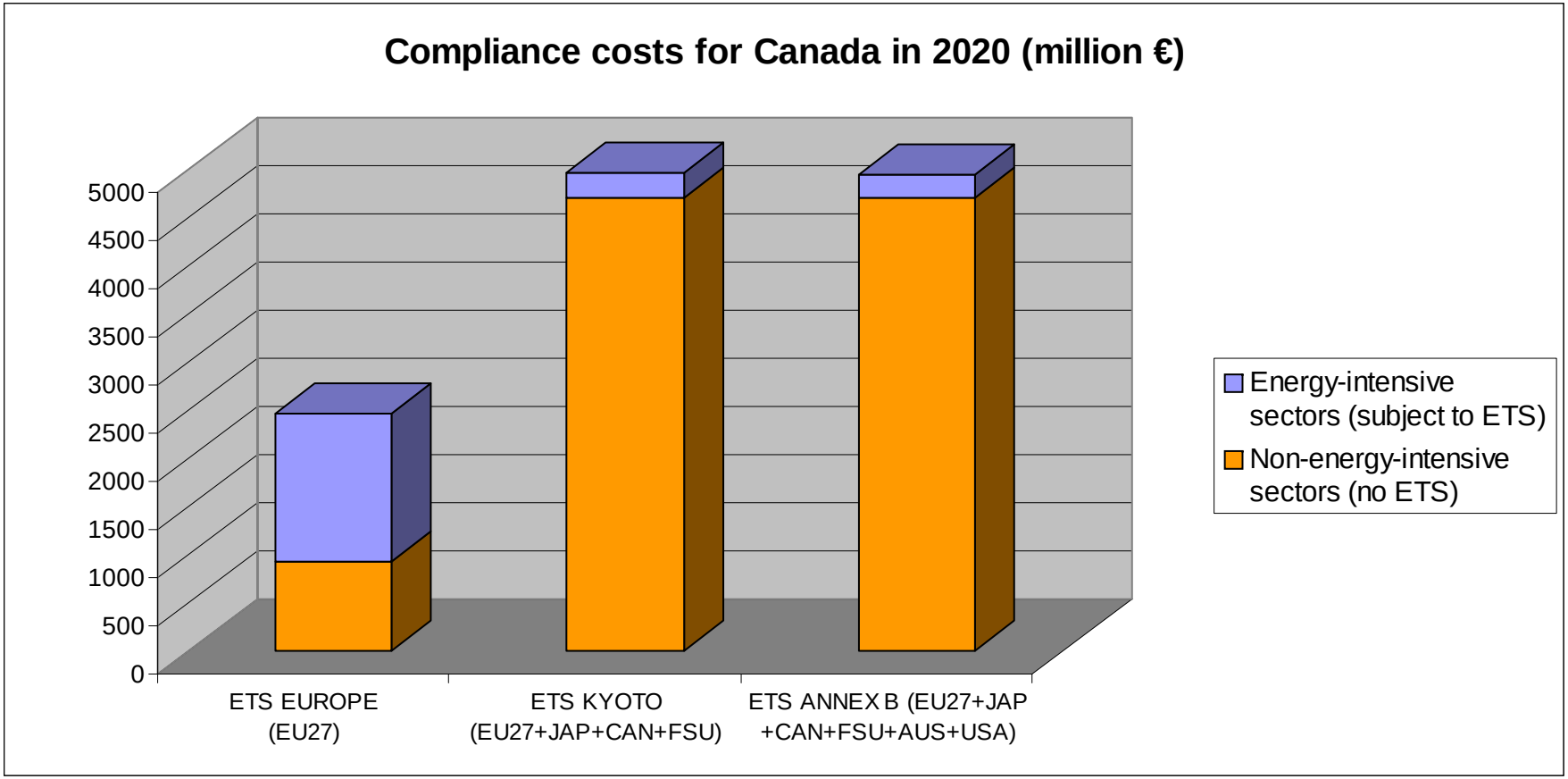
⇔ Incentives for Japan for linking up

Effects of linking ETS (current allocation)



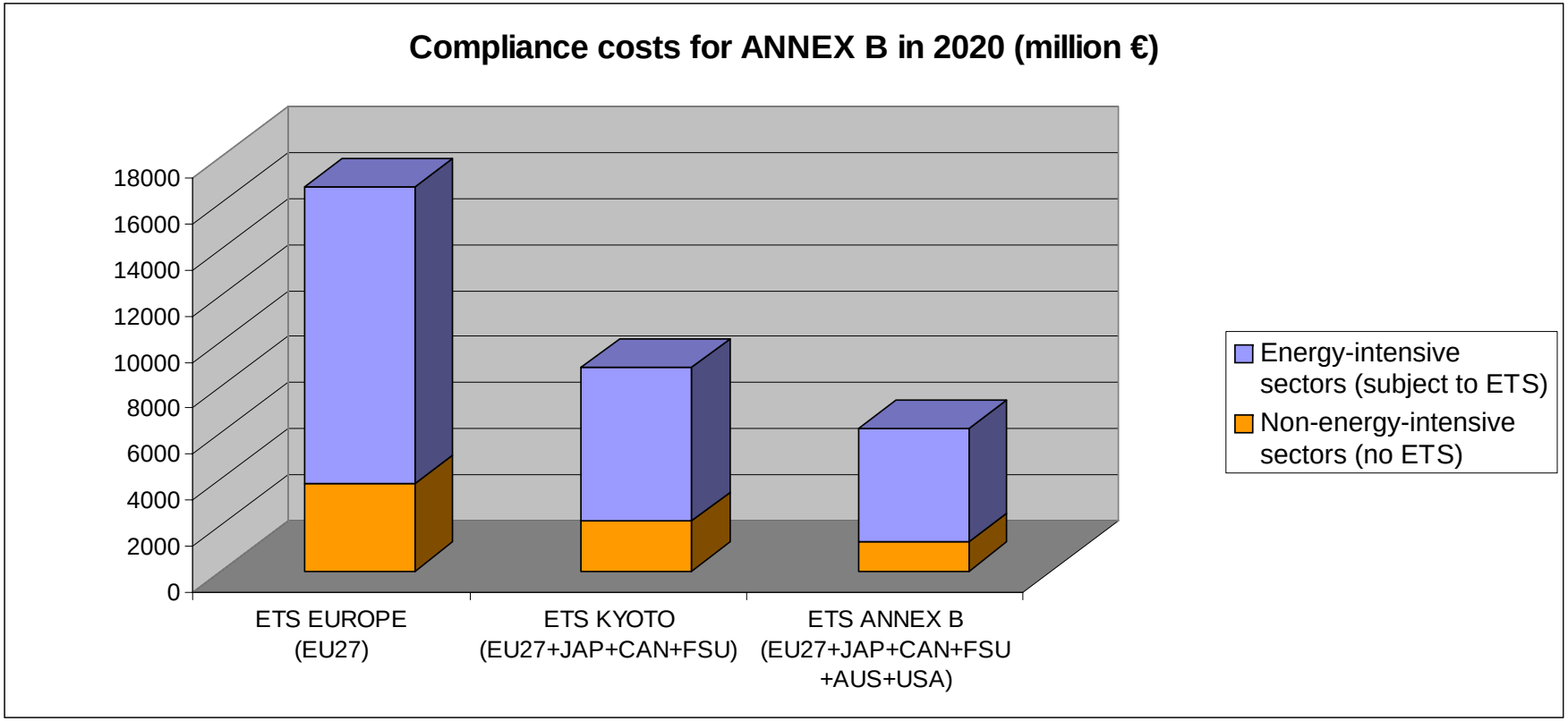
⇔ Benefits for Former Soviet Union (net of „Hot Air“)

Effects of linking ETS (current allocation)



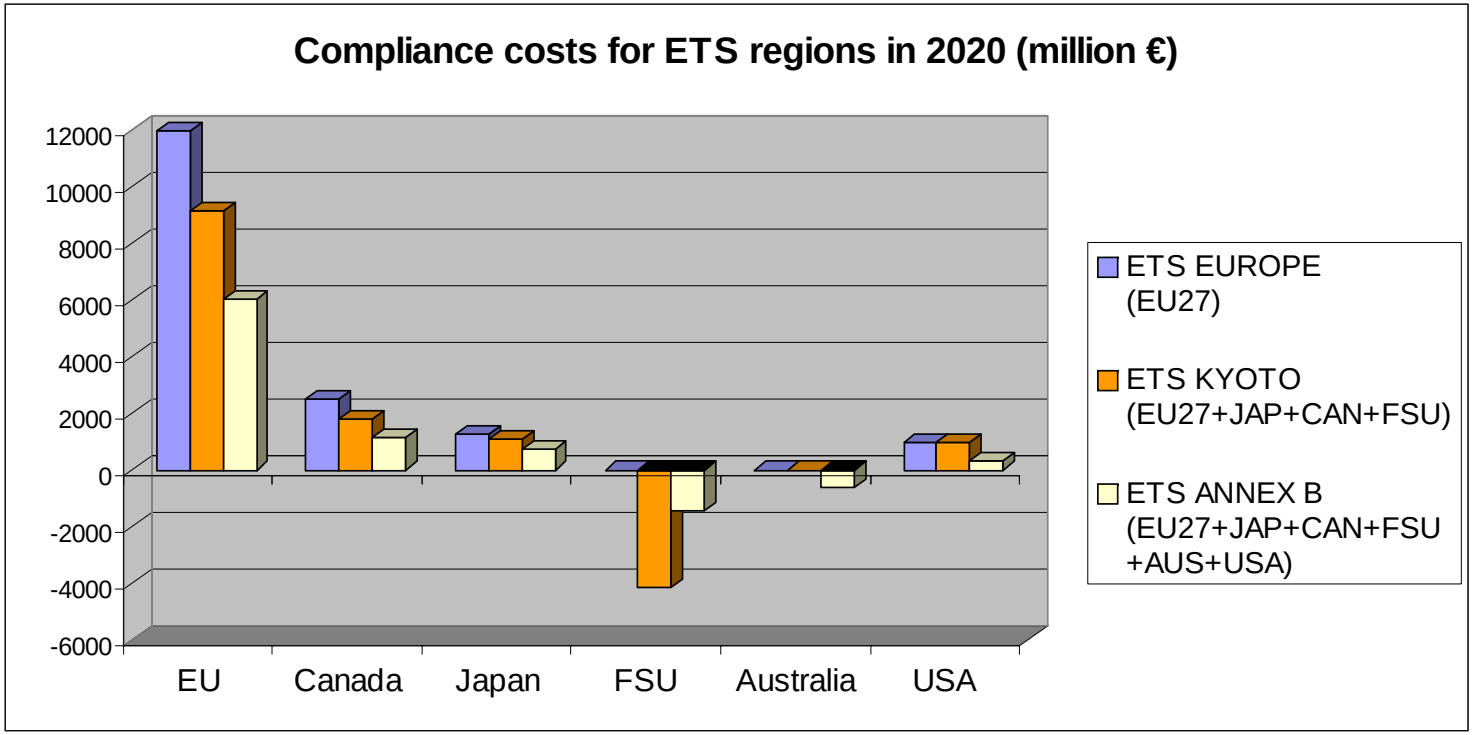
⇔ Higher costs for Canada (also due to national inefficiencies)

Effects of linking ETS (optimal allocation)



⇔ Large cost reductions with optimal allocation

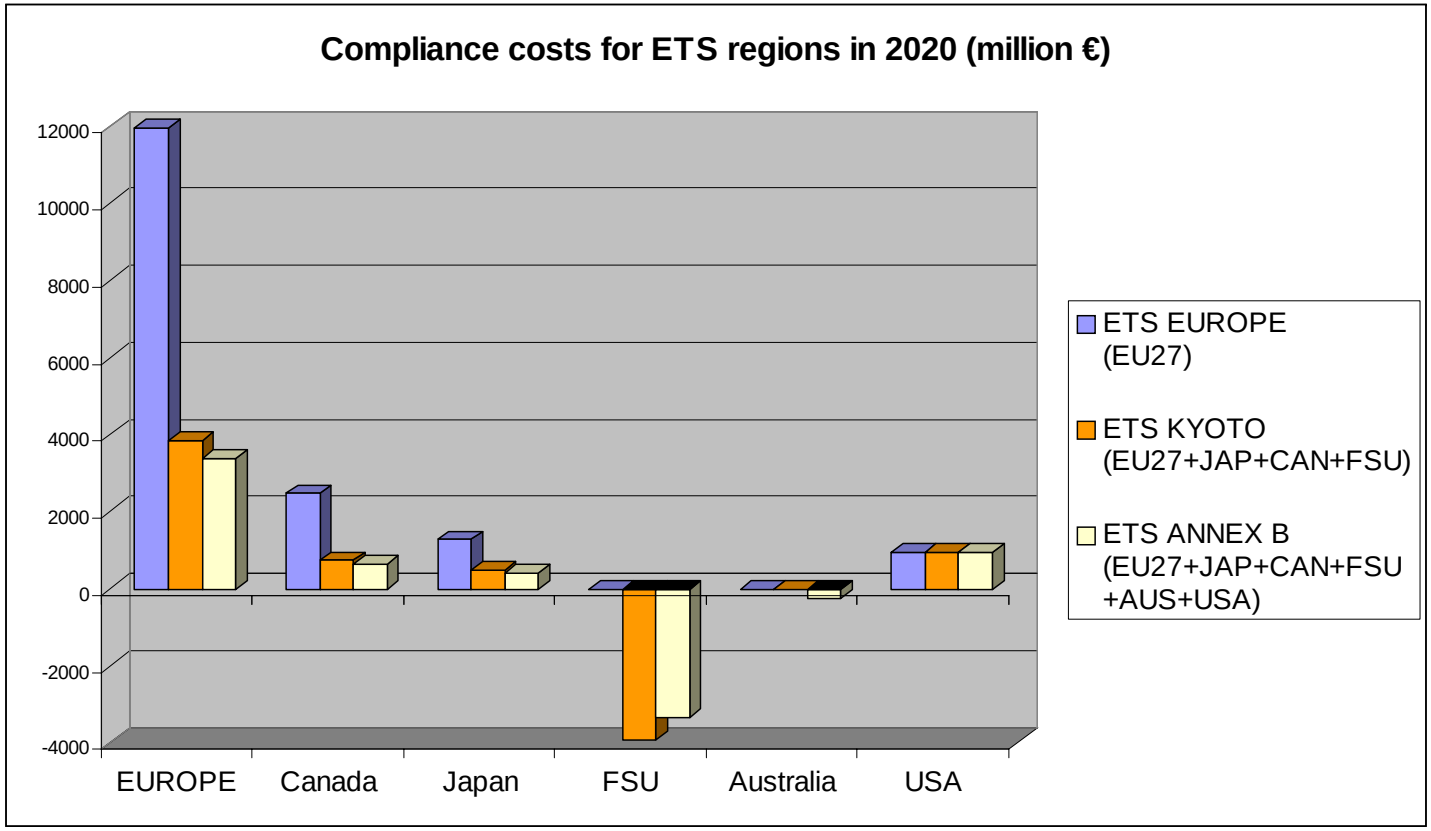
Effects of linking ETS (optimal allocation)



⇔ Large cost reductions <u>for all participants</u> with optimal allocation

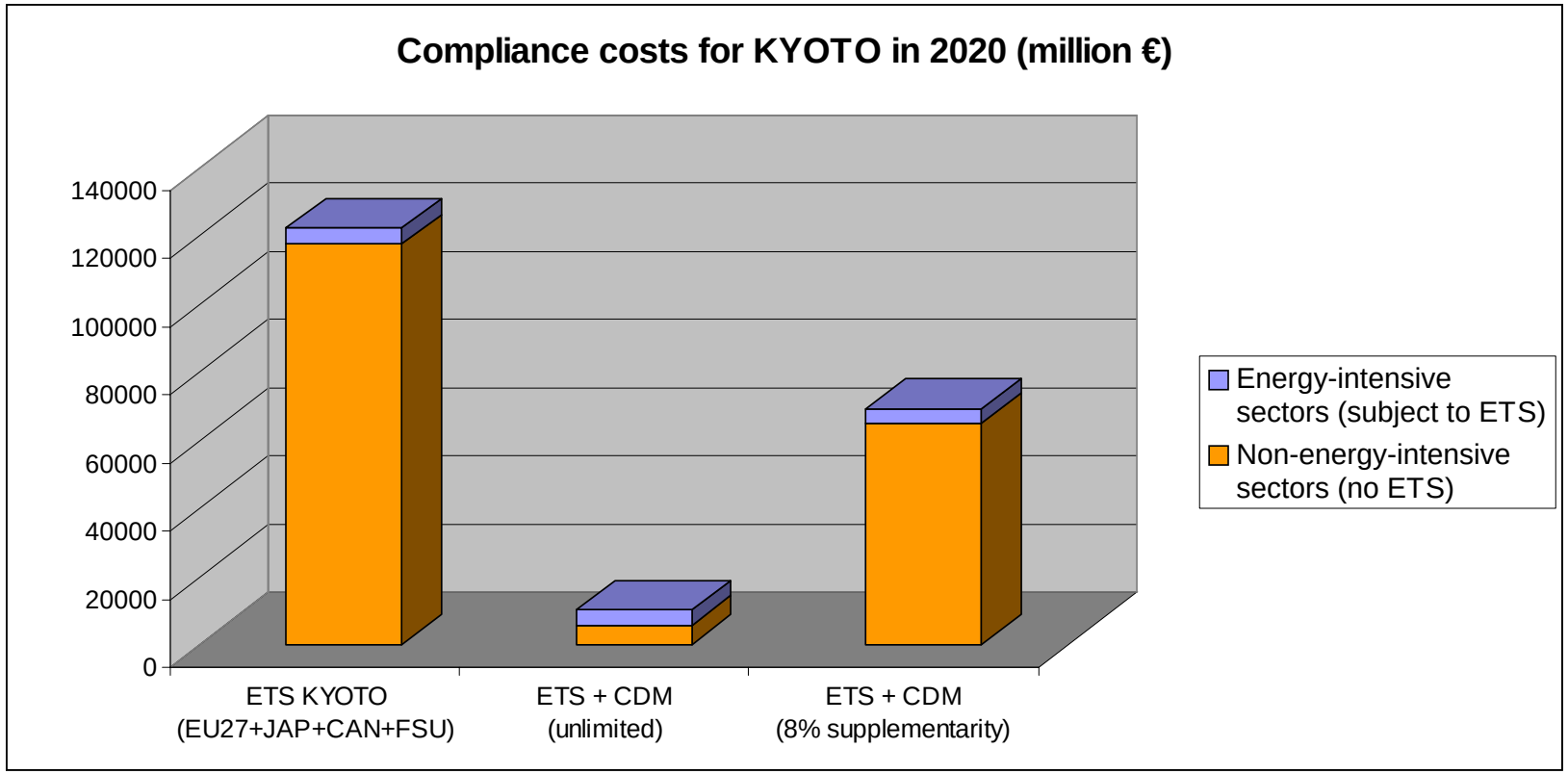
Effects of linking ETS (optimal allocation)

➢ **including „Hot Air“**



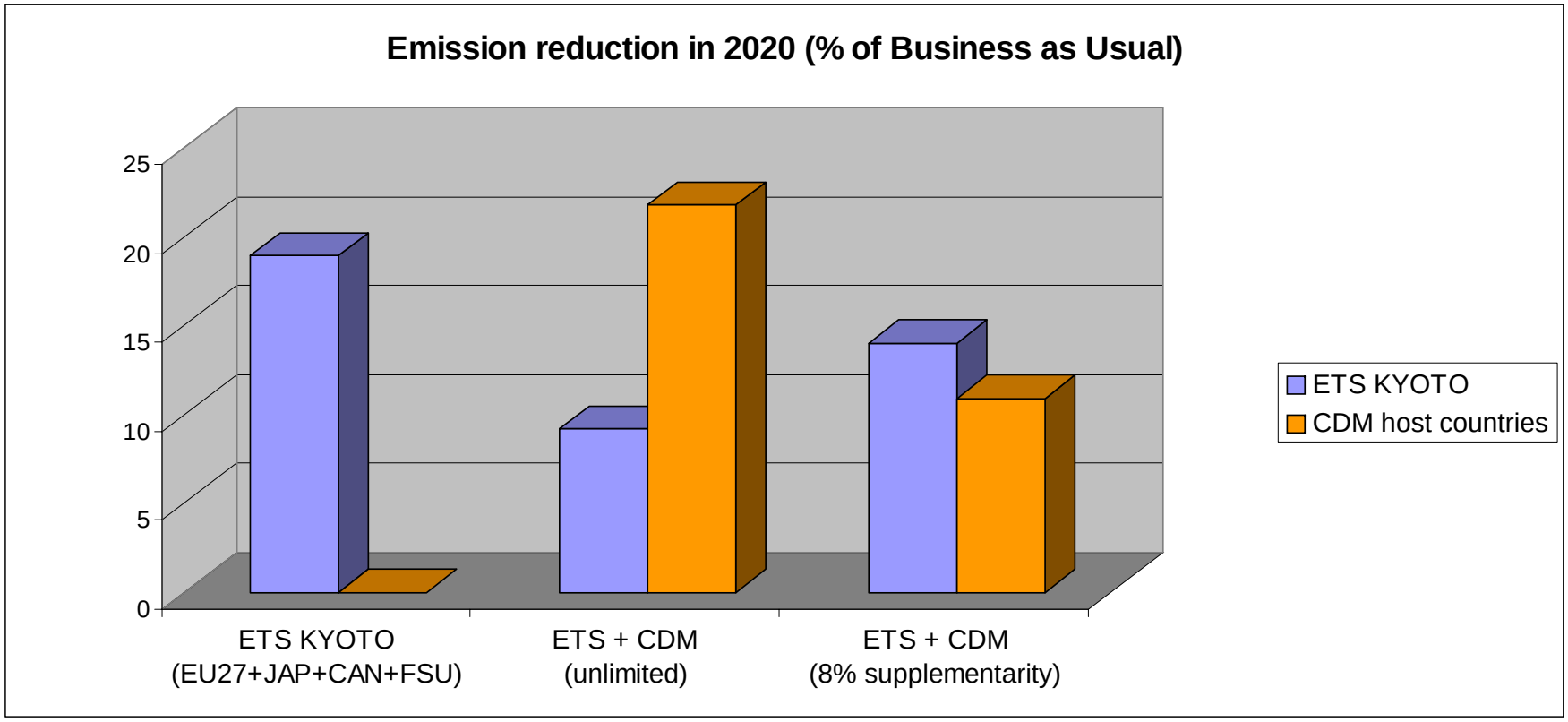
⇔ „Hot Air“ induces larger cost reductions (but less abatement)

Effects of CDM-Linkage (current allocation)



⇔ Unlimited (restricted) CDM usage induces large (less) cost reductions

Effects of CDM-Linkage (current allocation)



⇔ Unlimited (restricted) CDM shifts abatement (less) to developing countries

Conclusions

- Linking the EU ETS to other domestic ETS substantially lowers Kyoto compliance costs for EU and most other regions
- Optimal emissions allocation within ETS causes a stronger fall in compliance costs ⇔ higher benefits of linking ETS
- Unlimited CDM usage substantially lowers compliance costs (low-cost abatement options of DC) but shifts abatement
- Supplementarity rule of 8% induces substantially higher compliance costs than unlimited CDM but ensures higher abatement within ETS regions

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Marginal abatement cost functions

- Calibrations based on *POLES* model data
  (Prospective Outlook on Long-term Energy Systems)

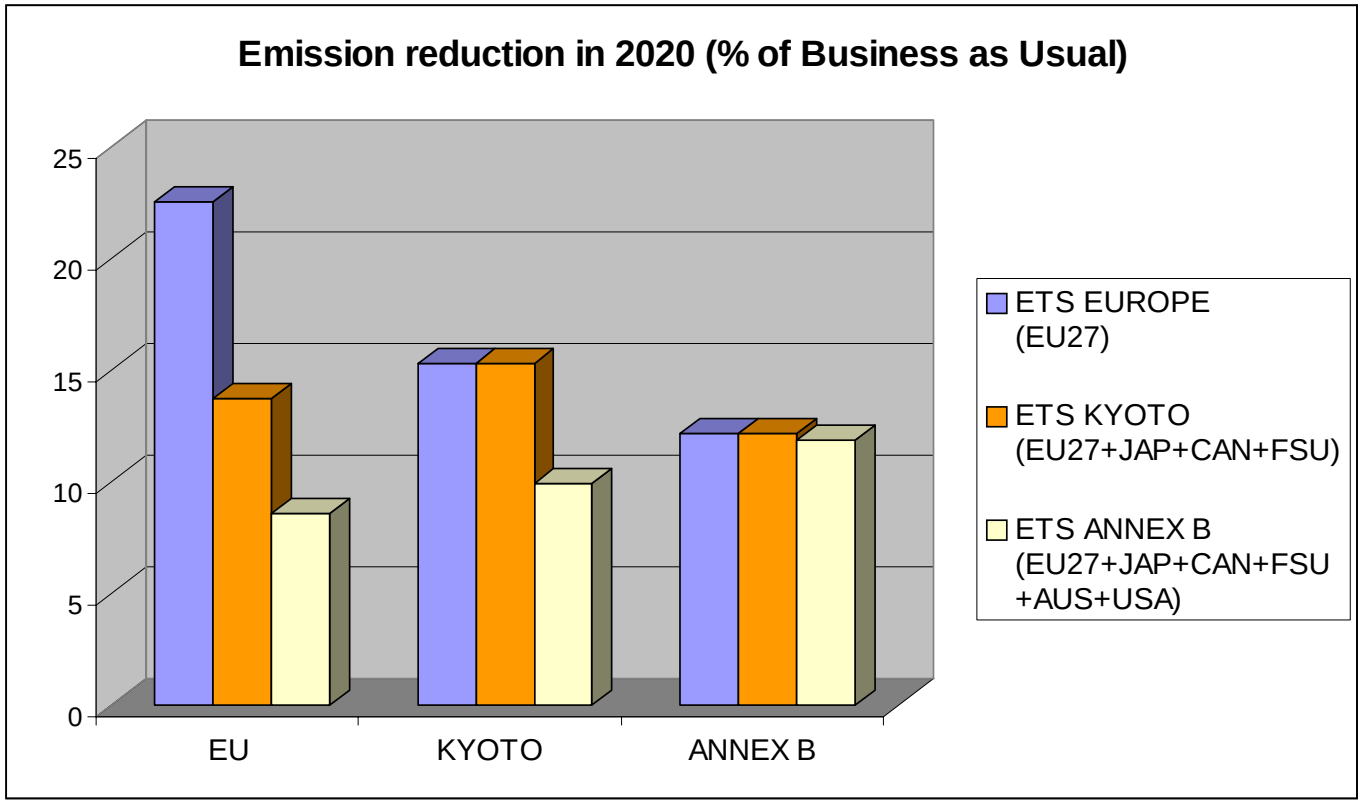
⇔ *POLES*: Simulation of carbon taxes (marginal abatement costs) and associated emission abatement in 2010 and 2020

- OLS regression of marginal abatement costs on respective emissions abatement

⇔ Fitting MAC functions to *POLES* data

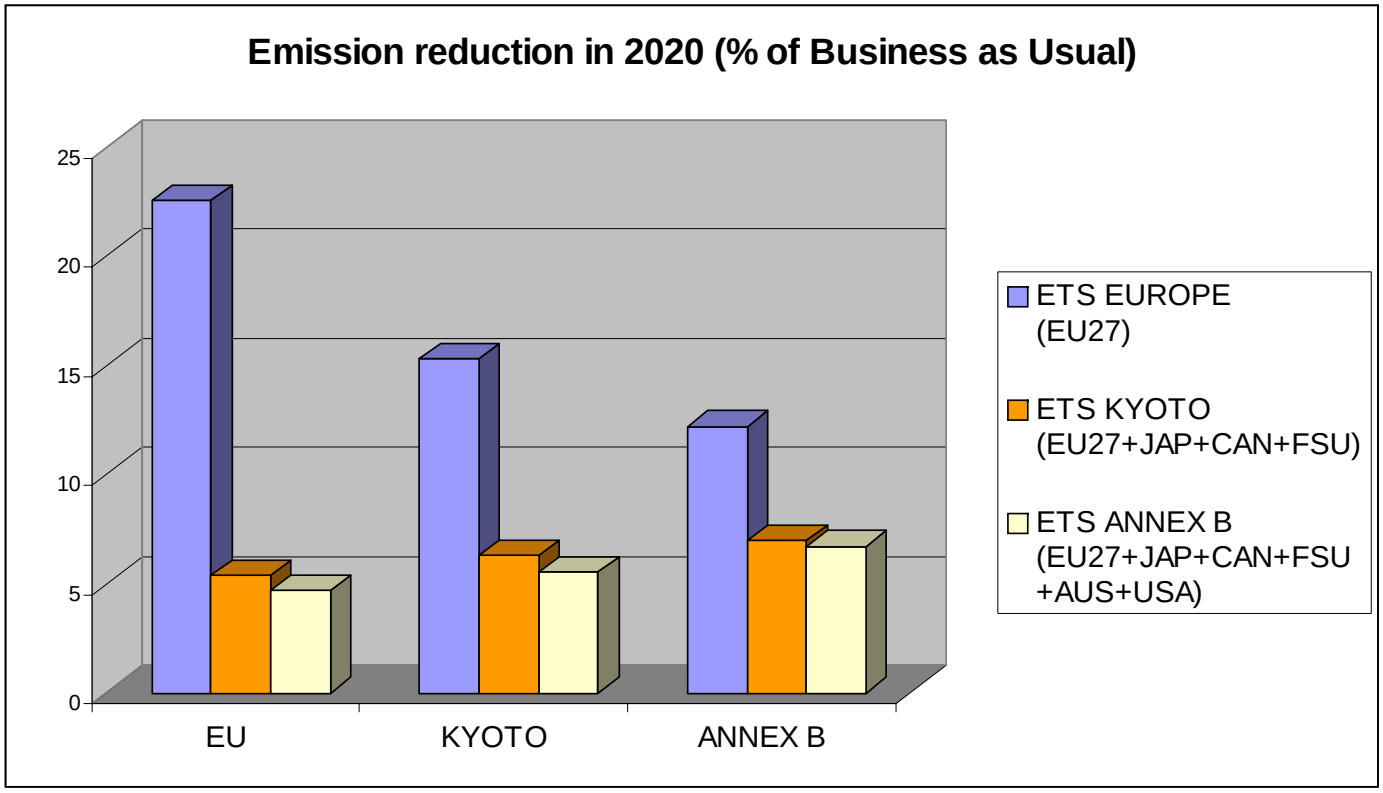
- Distinction of aggregate energy-intensive industries and remaining (non-energy-intensive) industries

Effects of linking ETS (optimal allocation)

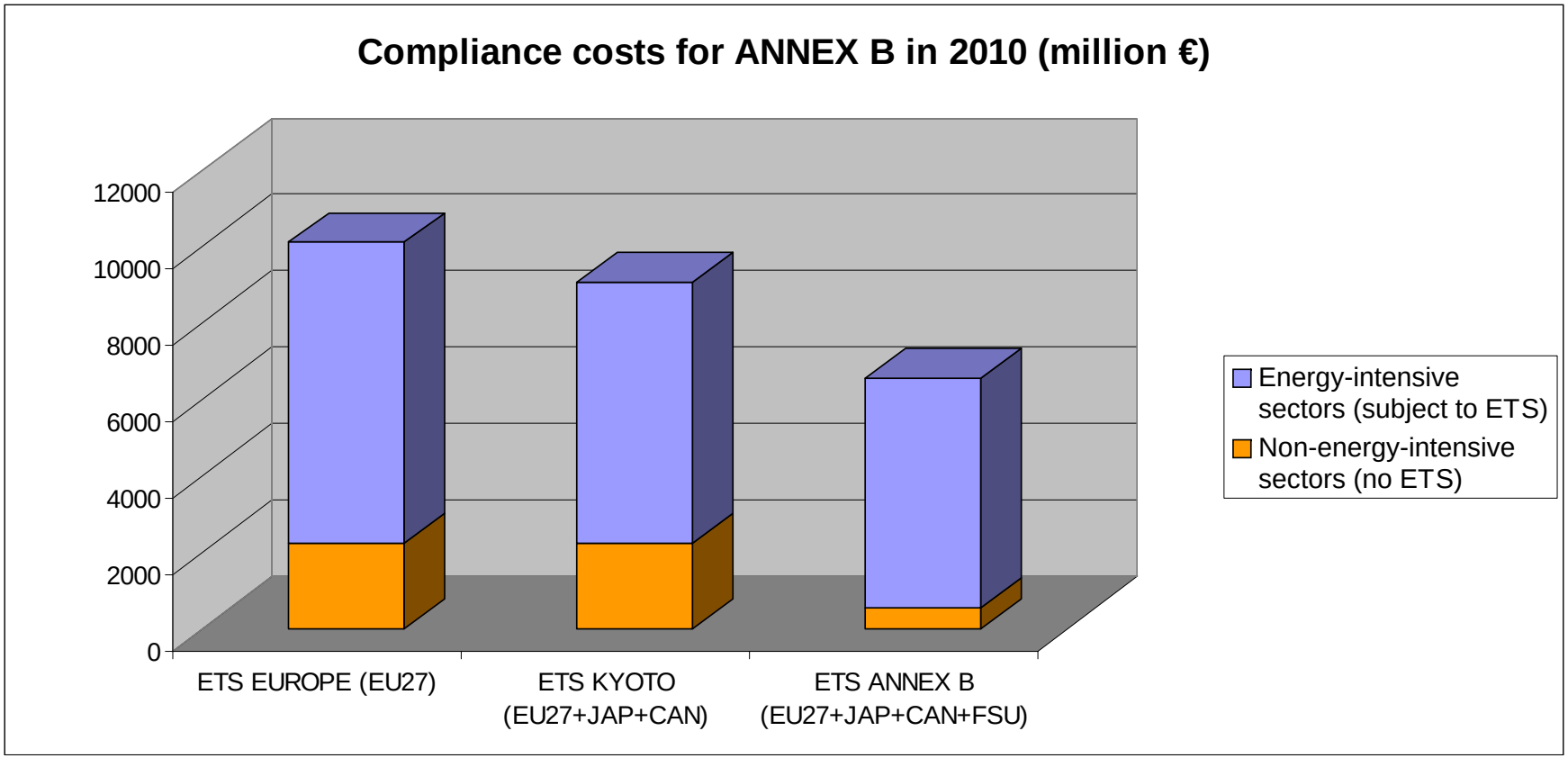


Effects of linking ETS (optimal allocation)

➢ **including „Hot Air“**

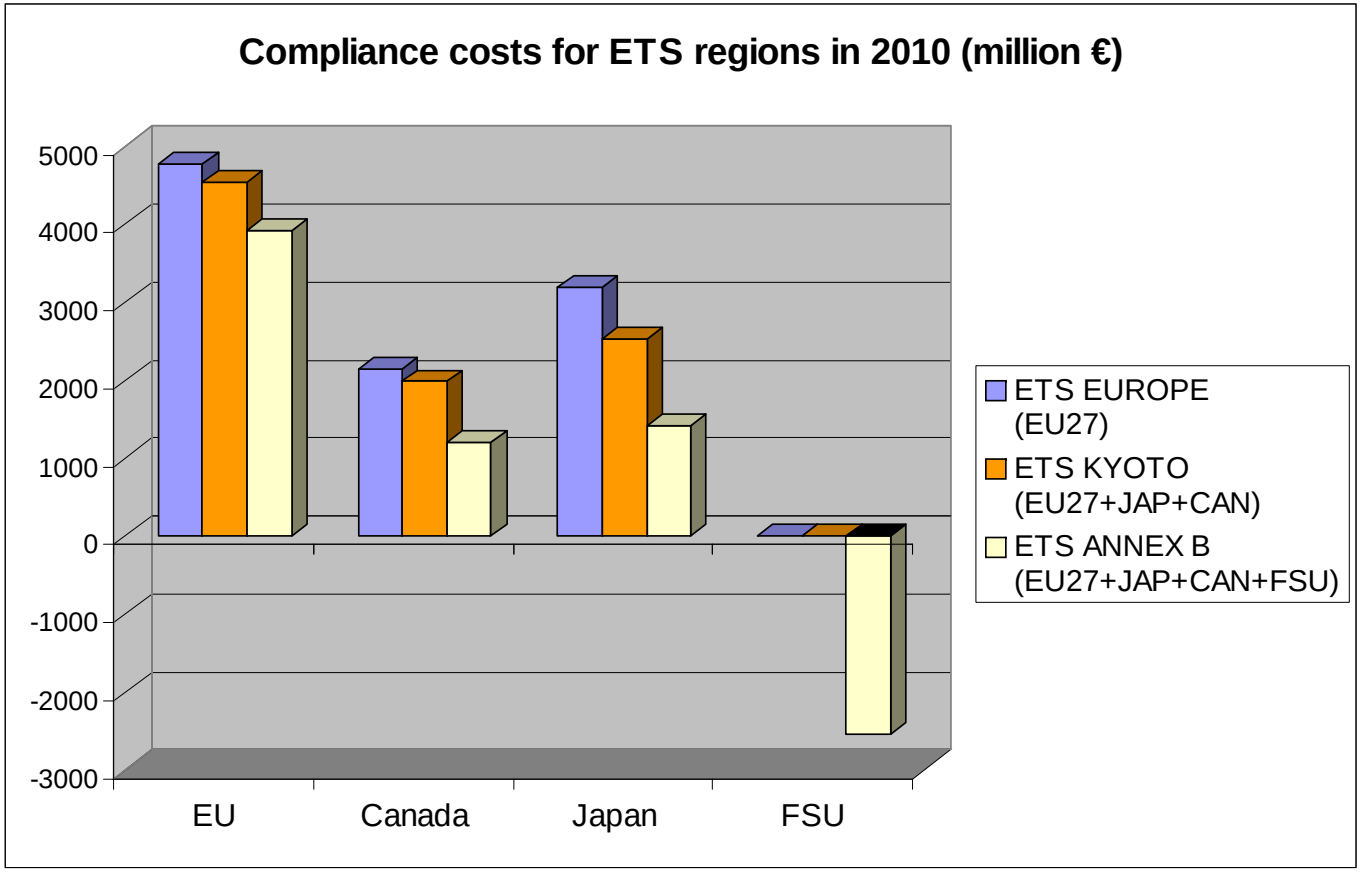


Effects of linking ETS (optimal allocation)



⇔ Large cost reductions with optimal allocation

Effects of linking ETS (optimal allocation)



⇔ Large cost reductions <u>for all participants</u> with optimal allocation