

12th openmod workshop
26.-28.03.2024, Grenoble, France

Breakout Session

Model Linking



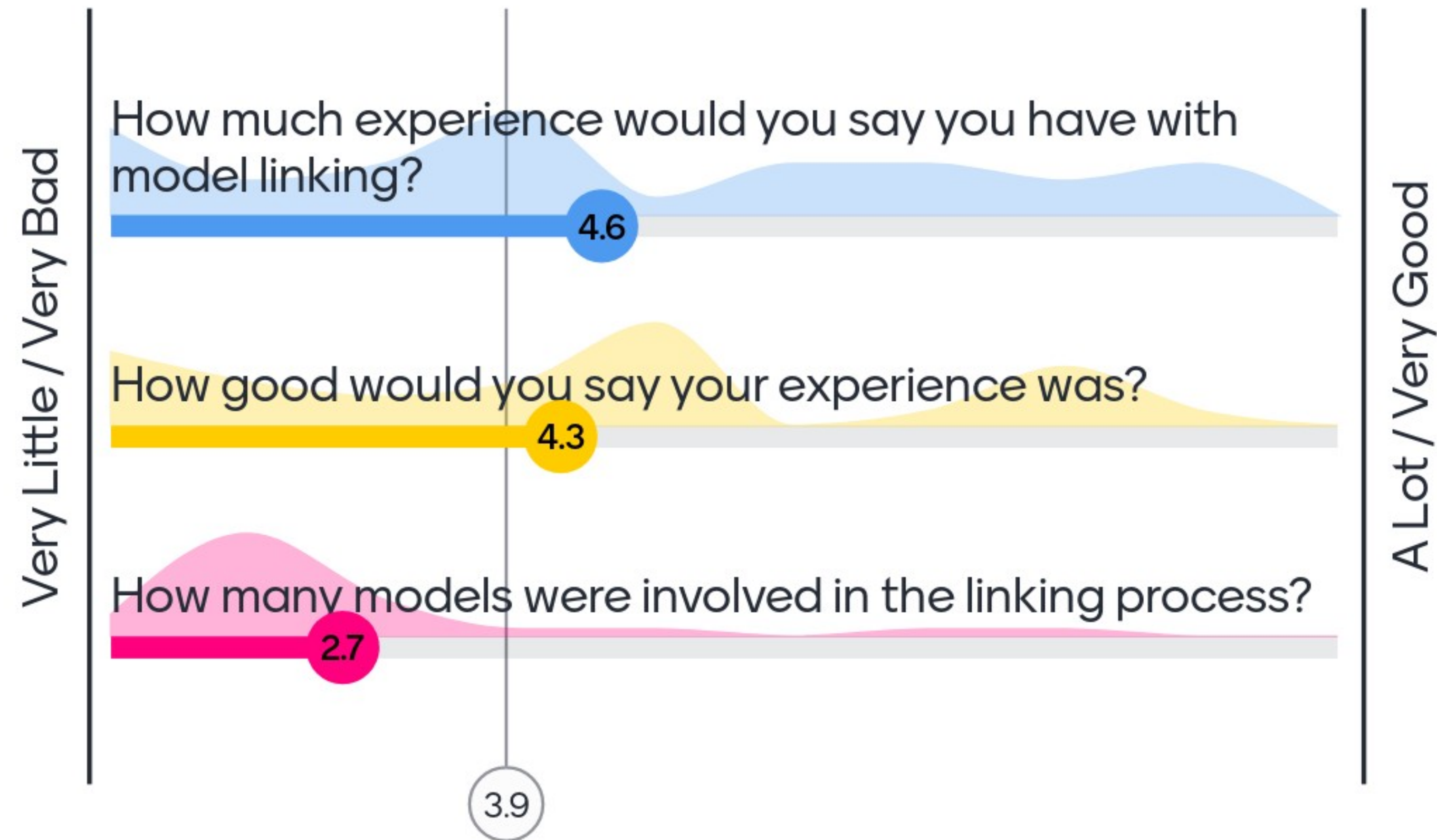
Einstein Stiftung Berlin
Einstein Foundation Berlin

Agenda & Overview

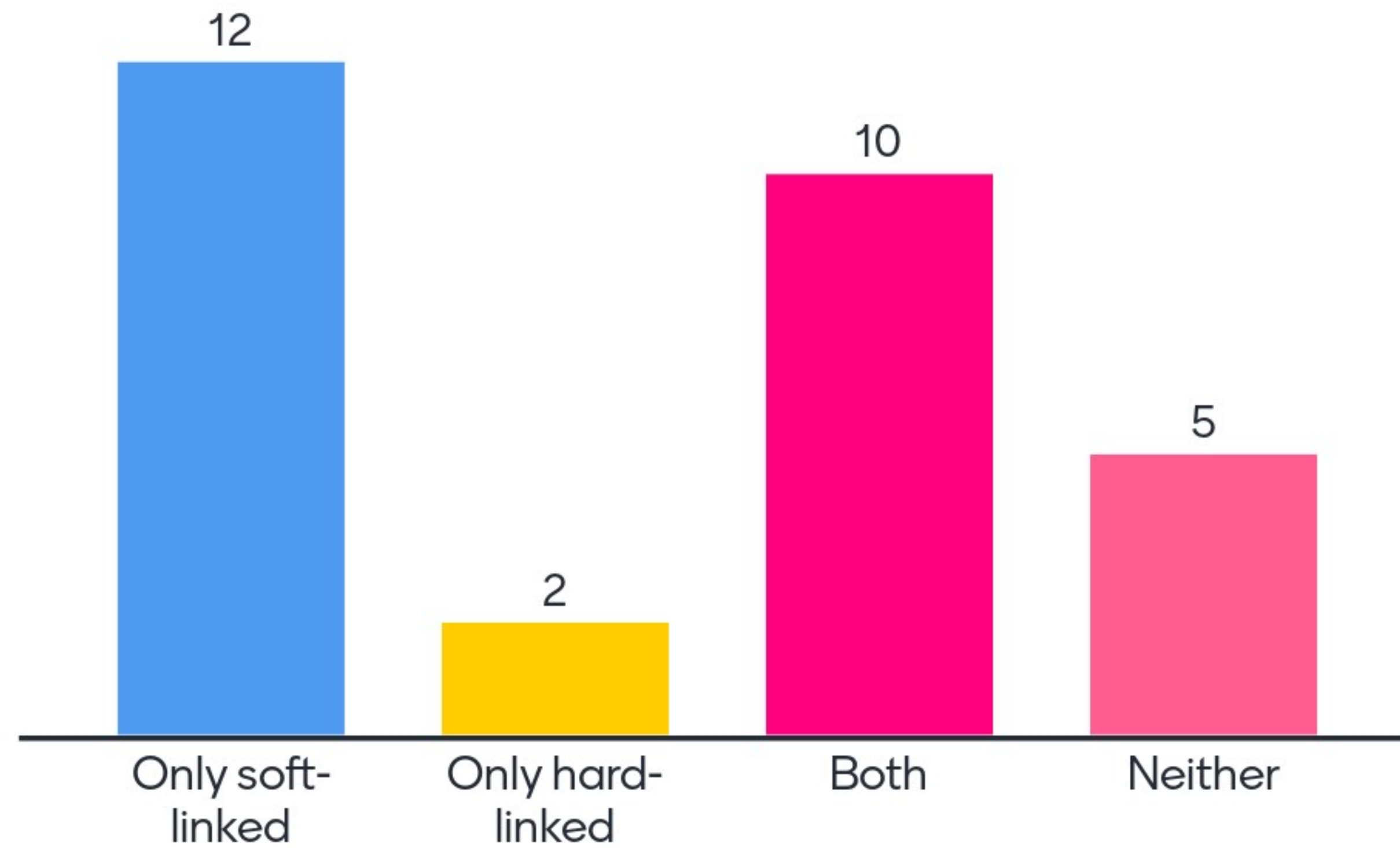
- 1.5-2 hour break-out session
- Mostly open discussion, with some input up front
- Goal: to find and discuss common challenges and issues when linking models
- Output (hopefully): a written conclusion about discussed findings and best practices regarding the linking of models

Welcome Round

Introduction

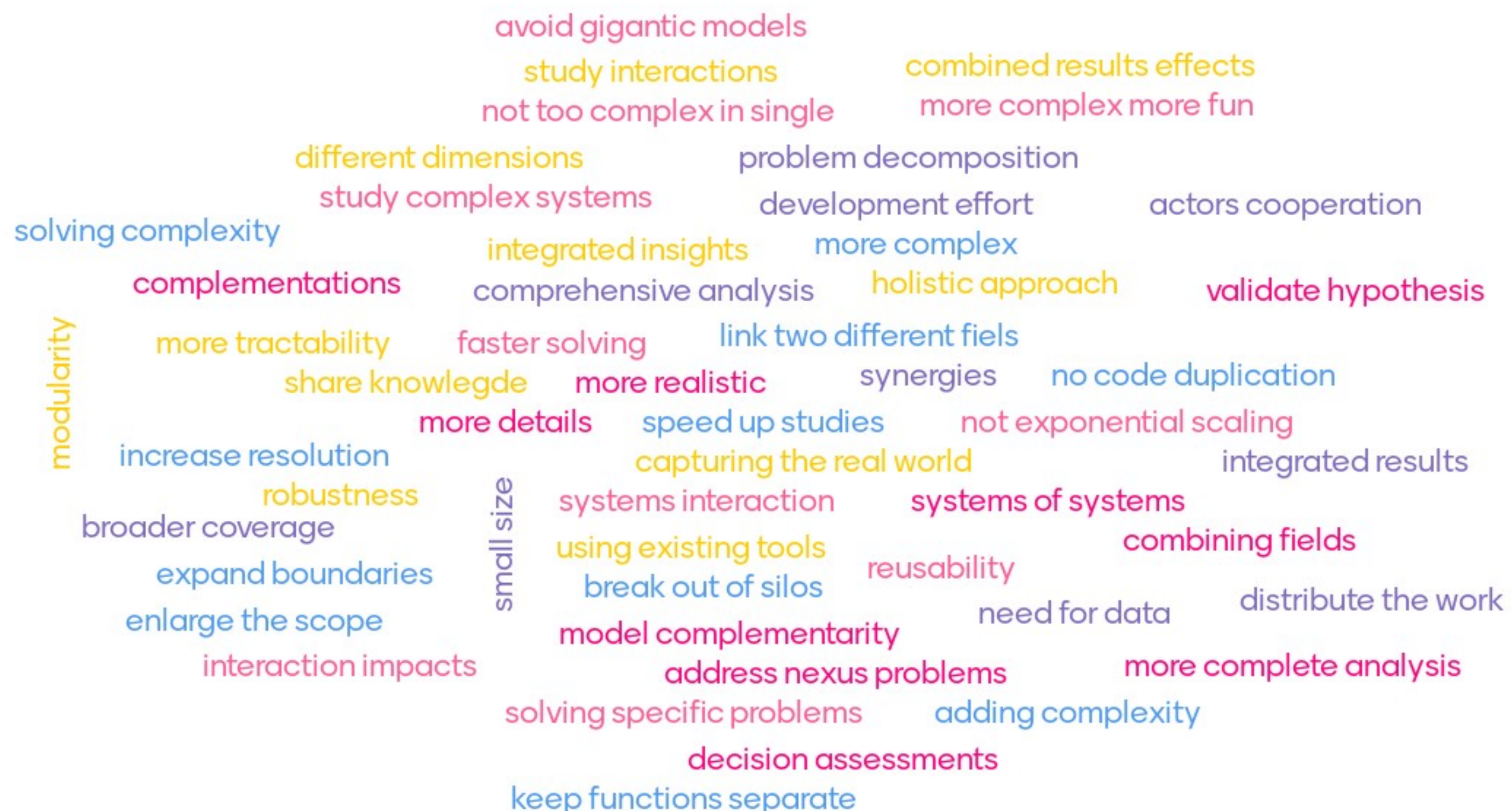


Have you soft- or hard-linked models?



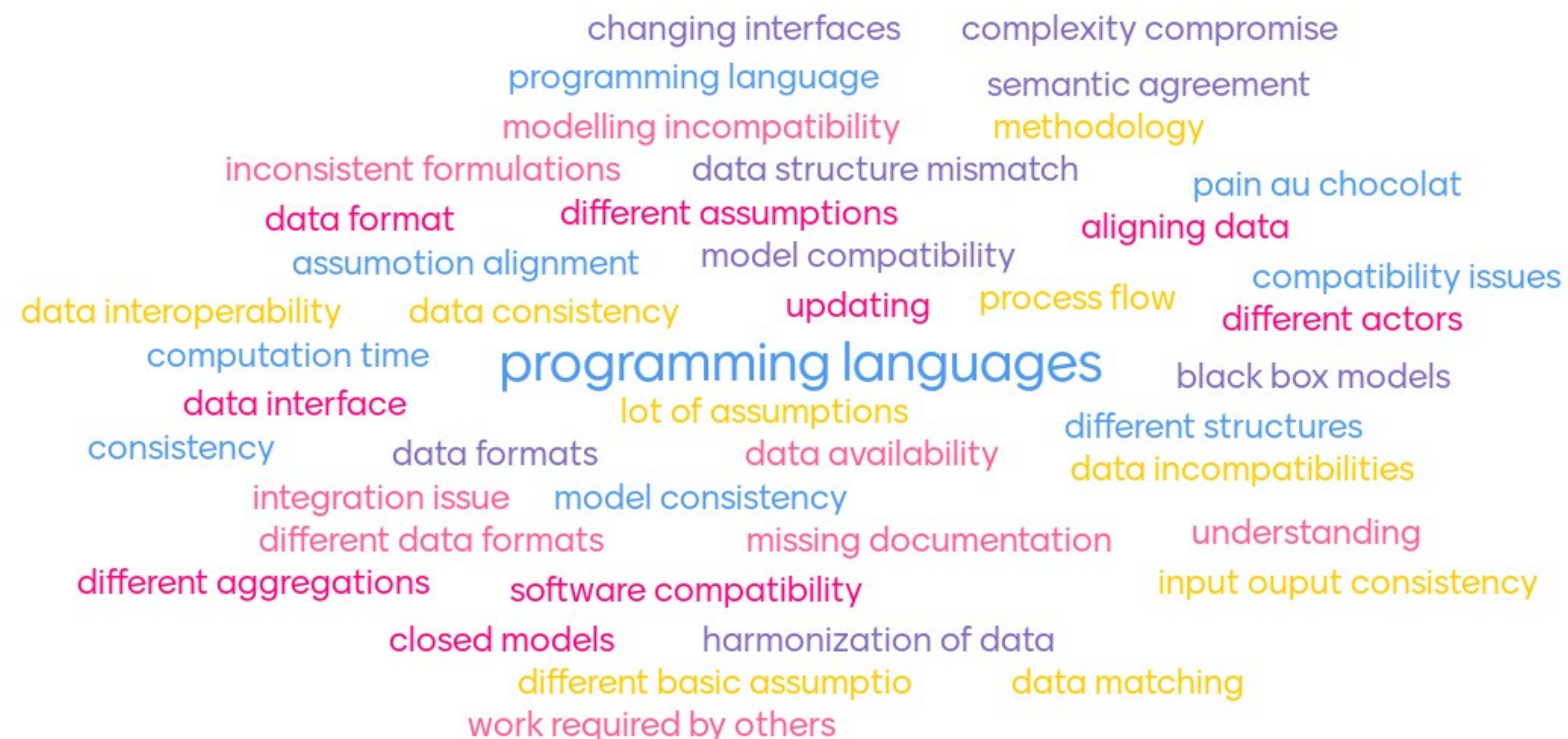
What, in your opinion, are the benefits of linking multiple models?

52 responses



What barriers have you faced when performing model coupling?

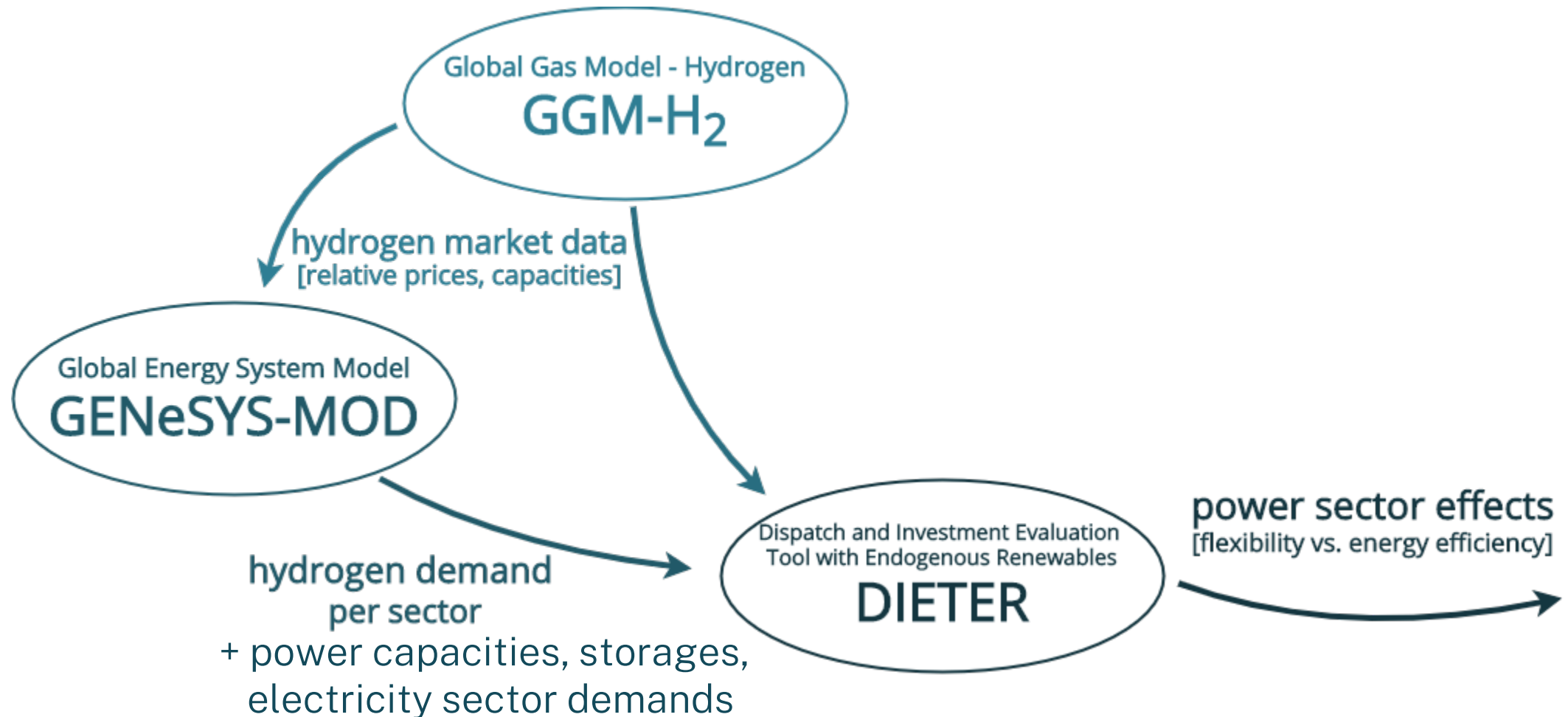
44 responses



Background Information: Our Project

- Title: Open-source modeling of the future role of renewable hydrogen in Germany and Europe
- Acronym: _(ツ)_/
- Funded by the Einstein Foundation Berlin
- Duration: 11/2021 – 11/2024
- TU Berlin & DIW Berlin
- Idea: extend and link three open-source models from TUB and DIW Berlin to answer questions about future demands and use cases of renewable hydrogen in the energy system

Open-Source Modeling of the Role of Renewable Hydrogen



Our Experiences in Model Linking

- Current status:
 - Instead of extending the existing Global Gas Model (GGM), a new model called HYDROGEN-Mod has been developed
 - GENeSYS-MOD and DIETER were extended to better represent hydrogen and different aspects, such as gas infrastructure, in the models
- The HYDROGEN-Mod prices are used for the other models (✓)
- GENeSYS-MOD and DIETER is actively underway, with multiple iterations already conducted

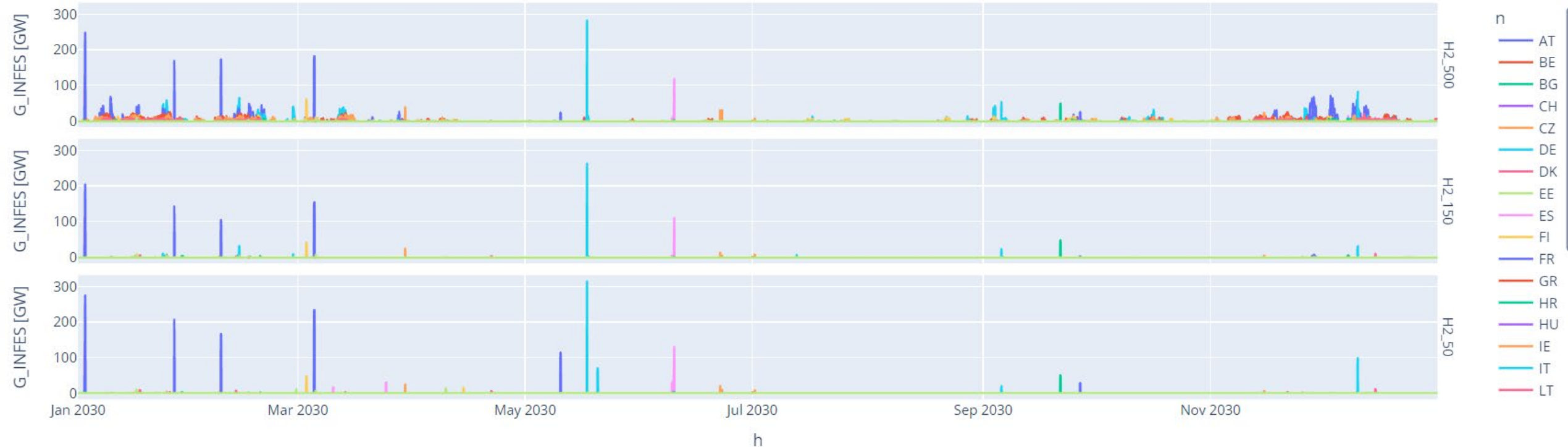
Model backgrounds

	GENeSYS-MOD	DIETER
Sectors covered	4 (Electricity, Buildings, Industry, Transport)	1 (Electricity)
Years covered	7 (2018, 2025, 2030, 2035, 2040, 2045, 2050)	1 (2030 or 2050)
Hours per year	~120	8760
Regional scope	Europe, 30 regions	Europe, 30 regions
Focus	Long-term pathways	Power sector analysis, flexibility

The Good

- The model coupling revealed really interesting shortcomings in the large-scale energy system model regarding power system instability, which is now used to improve the model:

Generation infeasibility



The Bad

- Since GENeSYS-MOD and DIETER have a fundamentally different operating range (long-term pathway vs. single year), it is sometimes difficult to directly compare results
- Model complexity quickly shoots up
- Fixing DIETER to GENeSYS-MOD results usually leads to infeasibility, so a boundary range needed to be defined
- Convergence criteria still a bit unclear (e.g. when do we stop iterating)

The Ugly

- “Timeseries uncrunching”:
 - Since GENeSYS-MOD uses a reduced hourly timeseries (usually down to ~120 time steps per year), but DIETER uses a full hourly calculation, load and generation profiles cannot easily be passed on
 - GENeSYS-MOD does endogenously calculate EV power consumption per time step, but how do we disaggregate / “uncrunch” the time series again?
 - For now, we are just exchanging annual values

Let's collect our thoughts together

- Etherpad for joint note-taking and discussion:

<https://etherpad.opendev.org/p/r.6bcf29e06ef9a5d4ce3d99ea6e4c8f96>

(replaced with read-only link to preserve comments)

Your (success?) Stories

- What experiences have you had doing model coupling?
- What were successes, where did you struggle?

Wrap-Up and Conclusion

- We will structure our findings and discussions collected in the Etherpad and create a written summary and post it on the openmod forum