HSE UNIVERSITY

Laboratory for Climate Change Economics

Transition risks: the review of Laboratory for Climate Change Economics Studies

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Transition risks

- TCFD transition risks involve financial and operational challenges stemming from new regulations, technological advancements, and changing market dynamics:
  - policy and legal
  - technology
  - market
  - reputational
- For Russia, transition risks mostly come from abroad (risks of inaction rather than risks of action). Major challenges:
  - reduction of the global demand for fossil fuels – risks for Russian exports of hydrocarbons
  - carbon-related trade barriers (CBAM or others)

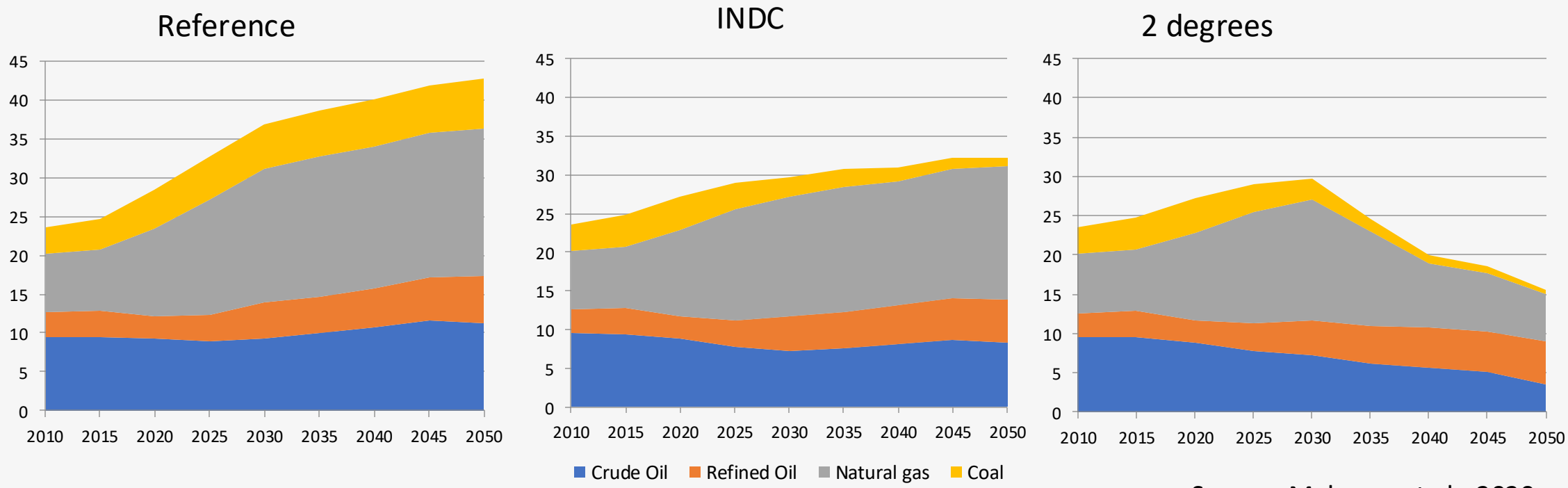
1. Risks of reduction of exports of fossil fuels

with Marina Starodubtseva

CGE-analysis 2019: Global green transition and Russian exports of fossil fuels

In any scenario taking into account Paris Agreement, Russian energy exports in 2030 are 20% lower (in energy terms) relative to the *Reference* scenario. By 2050 the corresponding reduction reaches 25% for *INDC* and 64% for *2 degrees*

Russia's exports of fossil fuels, EJ



Source: Makarov et al., 2020

After 2022

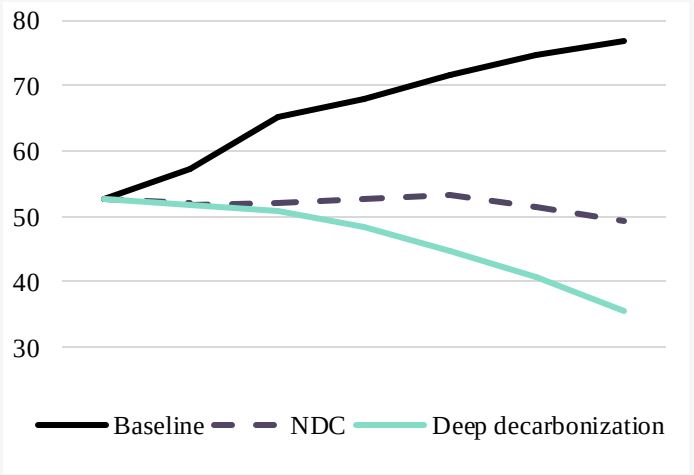
- Sanctions and bans of Russian FF exports by the EU (and US)
- CGE-models do not work well anymore:
  - Decisions on imports of Russian fossil fuels are not made based on economic criteria
  - Real prices of Russian fossil fuels are not clear
  - Structural transformation of the Russian economy makes irrelevant the current input-output tables (2016)
- Possible (albeit imperfect alternative) – simple extrapolation based on reasonable assumptions taking into account infrastructure constraints

Scenarios

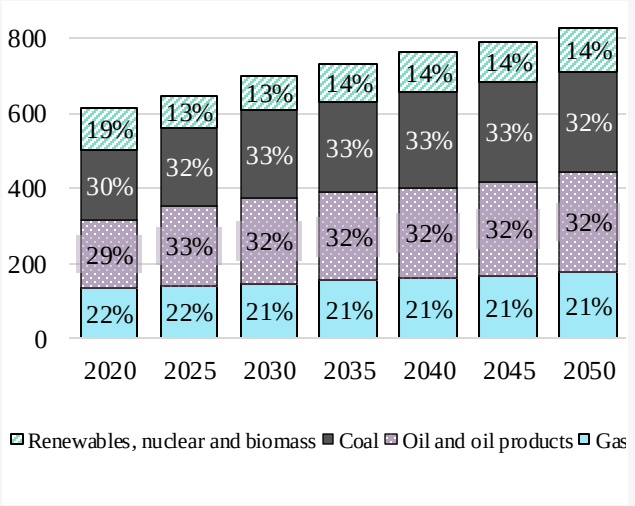
Scenarios of energy consumption – IMAGE3.2 (Integrated Model to Assess the Global Environment)

Scenarios	Description	Temperature rise by 2100
Baseline	Stated policies for the beginning of 2024, no new measures	3,7°C
NDC	NDCs submitted by 2024	2,7°C
Deep decarbonization	Stricter policies in order to achieve temperature goals of Paris Agreement	2,1°C

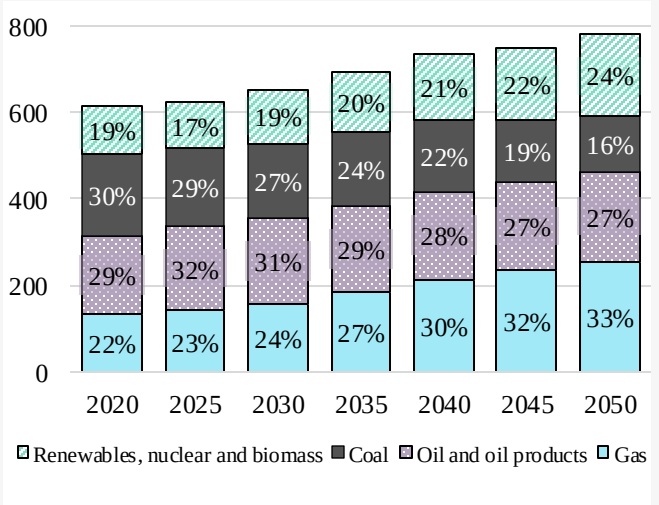
Emissions in different scenarios, GtCO2e



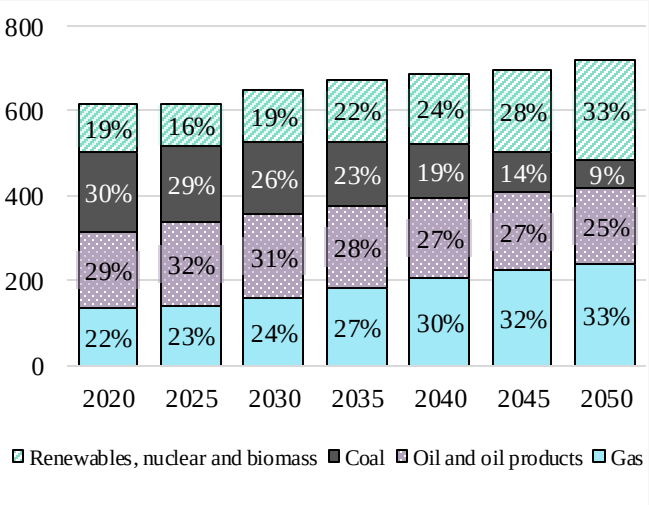
Energy consumption, EJ
Baseline scenario



Energy consumption, EJ
NDC scenario



Energy consumption, EJ
Deep decarbonization scenario



Geopolitical versions of scenarios

Region	Fuel	2025	2030	After 2030
«Reconciliation»				
Europe	Coal	0	0	= demand
	Oil and oil products	0	0	= demand at the level of reimports from India
	Gas	= demand (exports capacities > demand)	= demand (exports capacities > demand)	= demand
North America	Coal, oil and oil products, gas	0	0	= demand
India	Oil and oil products	= demand + reexports to Europe	= demand + reexports to Europe	= demand
«Confrontation»				
Europe	Coal	0	0	0
	Oil and oil products	0	0	0
	Gas	= demand (exports capacities > demand)	= demand (exports capacities < demand)	0
North America	Coal, oil and oil products, gas	0	0	0
India	Oil and oil products	= demand + reexports to Europe	= demand + reexports to Europe	= demand

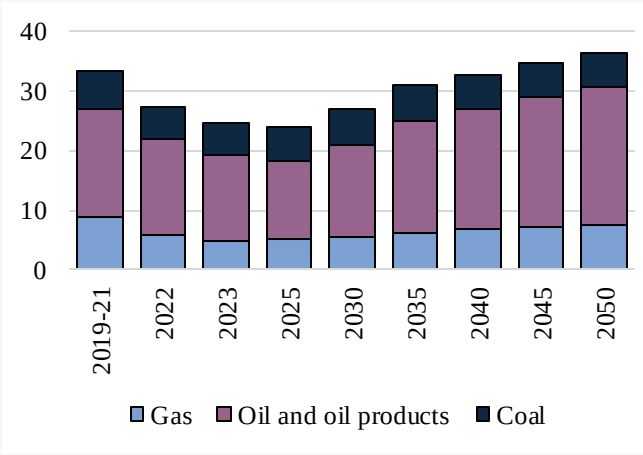
Assumptions

- Base year is 2023. Calculation is held for 6 points: 2025-2050 гг. with lag of 5 years
- 10 regions are considered as directions of Russian exports
- The share of imports from Russia for each of the fuels is considered to stay constant regardless of the volume of demand, consumption, structure if energy mix and total imports
- Infrastructure constraints limit Russian exports until 2030, after 2030 infrastructure is adjusted to the demand

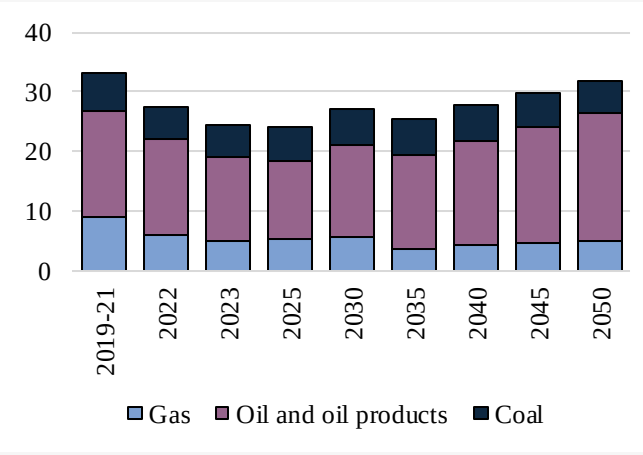
Baseline scenario

- 2030 г.: -19% from 2019-2021, +10% to 2023
- 2050:
  - Reconciliation: +9% from 2019-2021, +48% from 2023
  - Confrontation: -4% from 2019-2021, +30% from 2023

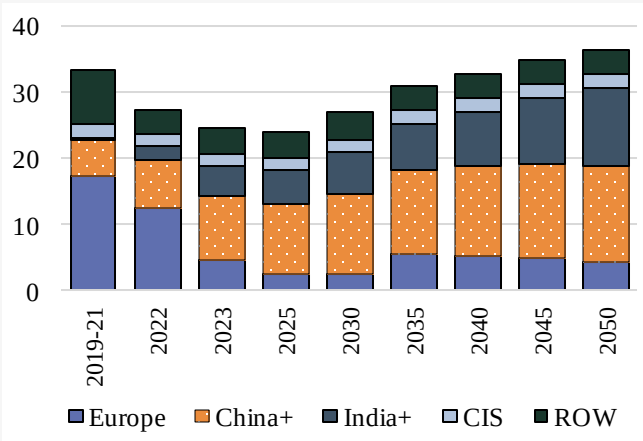
FF exports from Russia, EJ
Reconciliation



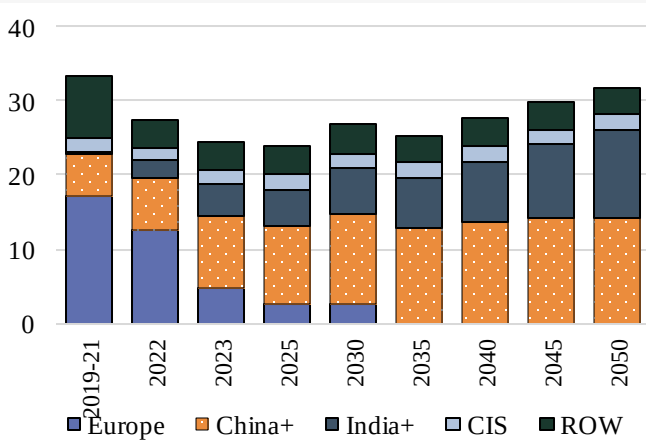
FF exports from Russia, EJ
Confrontation



FF exports from Russia, EJ
Reconciliation



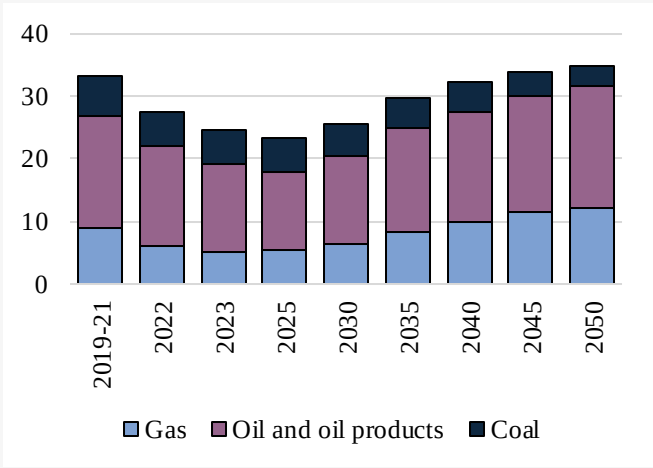
FF exports from Russia, EJ
Confrontation



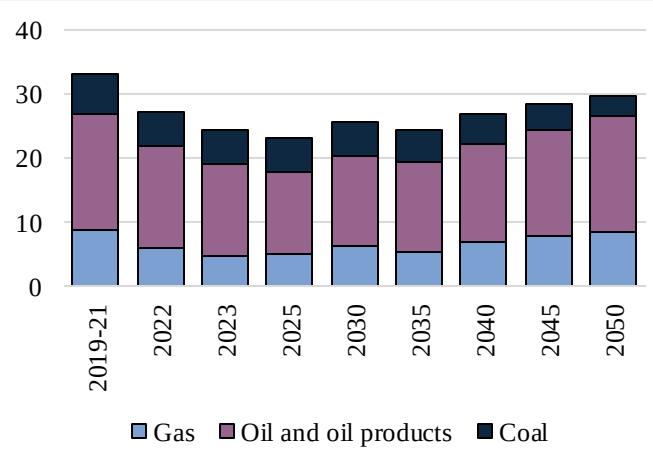
NDC scenario

- 2030: -23% from 2019-2021, +4% from 2023
- 2050:
  - Reconciliation: +5% from 2019-2021, +42% from 2023
  - Confrontation: -11% from 2019-2021, +21% from 2023

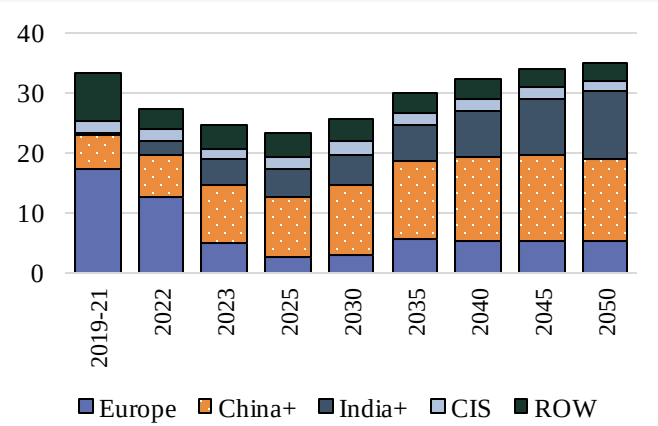
FF exports from Russia, EJ
Reconciliation



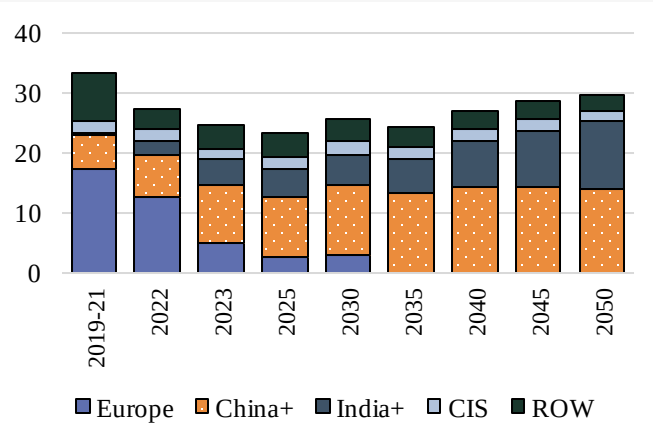
FF exports from Russia, EJ
Confrontation



FF exports from Russia, EJ
Reconciliation



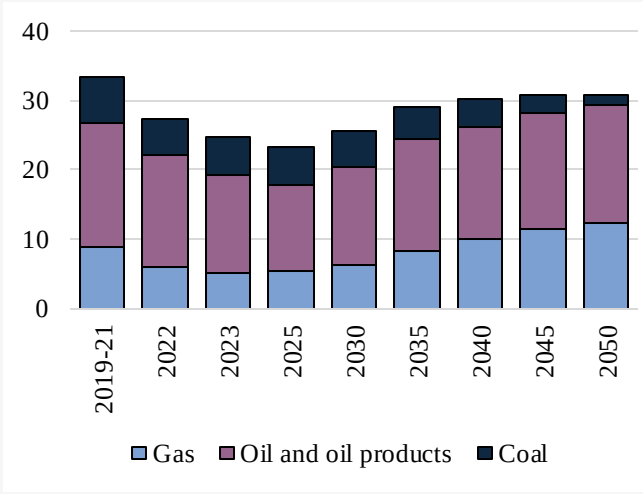
FF exports from Russia, EJ
Confrontation



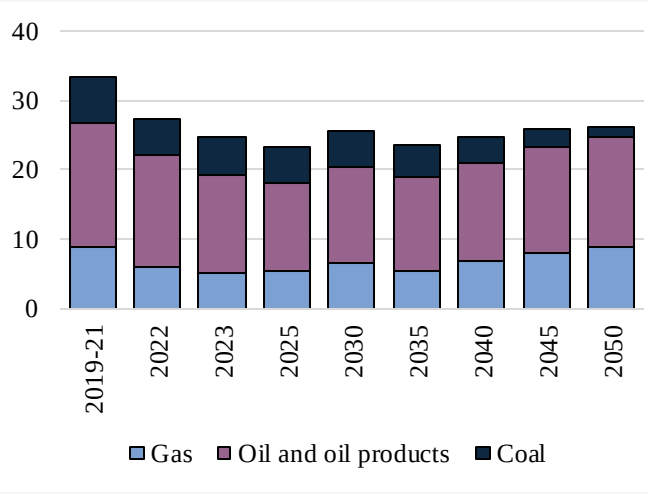
Deep decarbonization scenario

- 2030: -23% from 2019-2021, +4% from 2023
- 2050:
  - Reconciliation: +25% from 2023, -7% from 2019-2021
  - Confrontation: -21% from 2019-2021, +6% from 2023

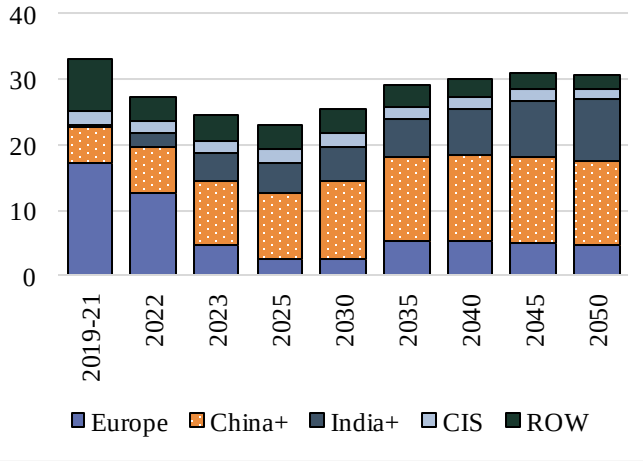
FF exports from Russia, EJ
Reconciliation



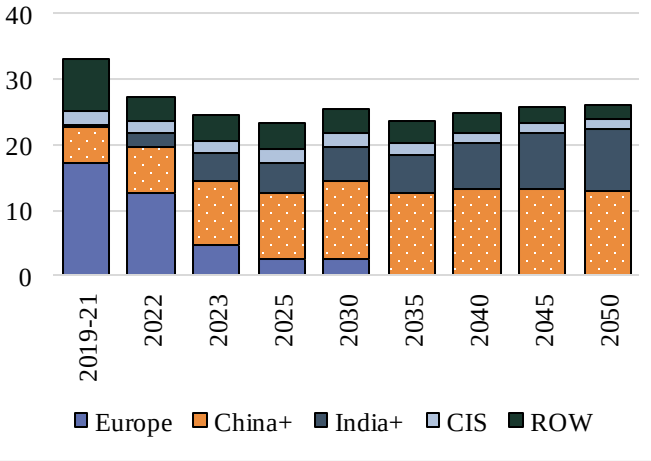
FF exports from Russia, EJ
Confrontation



FF exports from Russia, EJ
Reconciliation



FF exports from Russia, EJ
Confrontation



Conclusions

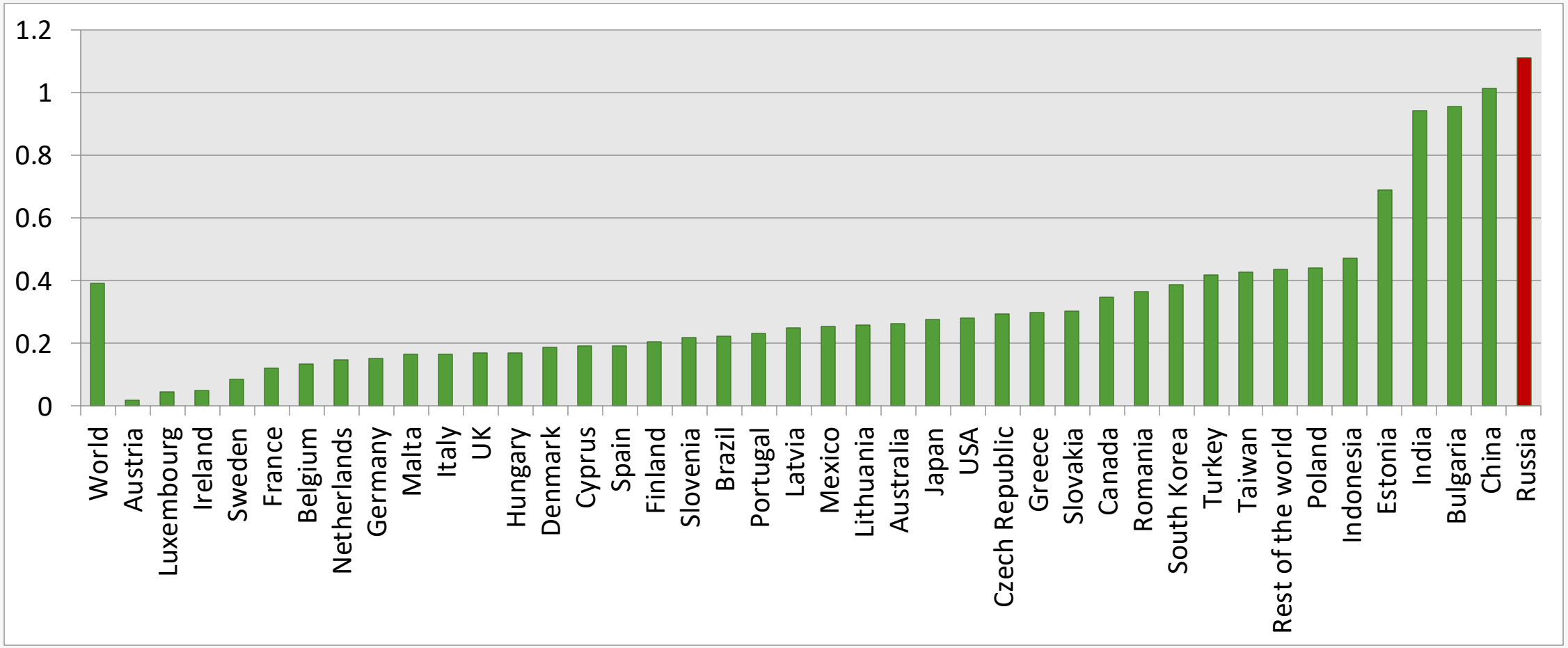
- Long-term transitions risks to Russia compressed to 2 years (2022-2023). This became a significant shock for the Russian economy
- As a response, Russia reoriented its FF exports from the shrinking markets to growing markets. The scenarios of Russian exports of fossil fuels by 2040-2050 are much better than before 2022
- The impact on fossil fuels is uneven. Coal is hit severely, gas will attain the strongest impetus
- However, even gas exports can’t grow faster than the desirable rates of economic growth. It means that even gas (let alone other fuels) can’t be the driver of the Russian economy

2. Risks of carbon-related trade barriers

with Altana Davydova

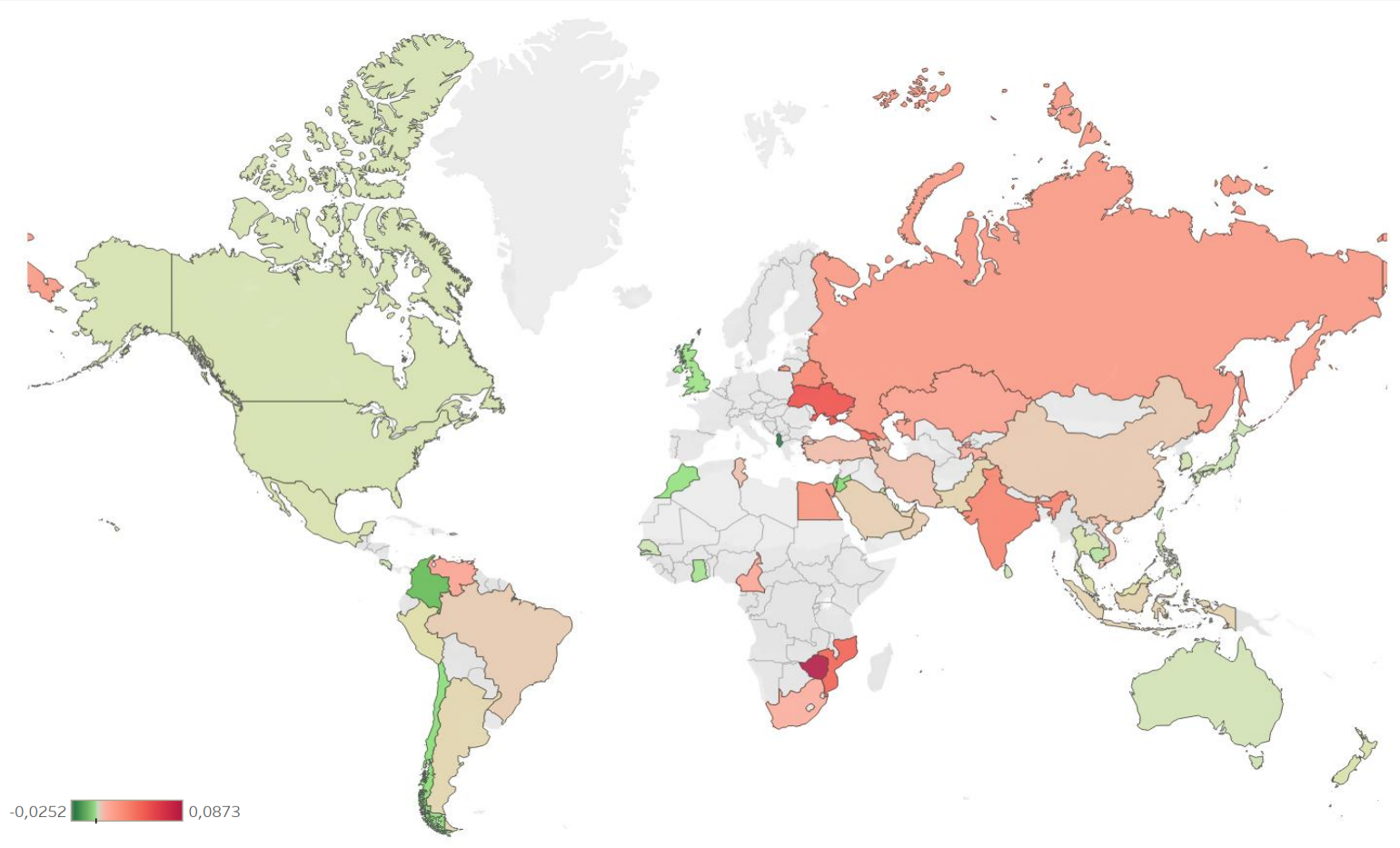
Risks for Russian carbon-intensive products exports

Carbon intensity of exports of various countries, kg of CO_2 per USD



Source: Makarov and Sokolova, 2017

CBAM exposure index



Index is calculated based on 1) the weighted carbon intensity of countries' exports related to the weighted carbon-intensity of these sectors in the EU and 2) share of the EU in exports of CBAM-goods

Source: World Bank

CBAM exposure index

Country	Carbon intensity of CBAM products, kg CO_2e/dollar					Share of EU in total exports of CBAM products	Share of GDP covered by CBAM	Most affected product
	Iron and steel	Fertilizers	Electricity	Cement	Aluminum			
Russia	0.61	1.8	4.56	8.81	0.13	31%	0.66%	Iron and steel
Brazil	0.37	0.25	1.11	4.92	0.67	11%	0.05%	Iron and steel
Egypt	0.8	1.37	5.94	4.6	0.25	38%	0.35%	Fertilizers
India	2.01	1.39	4.74	7.09	0.33	19%	0.1%	Iron and steel
Iran	0.81	3.4	6.13	8.41	1.06	5%	0.03%	Fertilizers
China	0.52	1.18	8.27	8.15	0.28	9%	0.05%	Cement
UAE	0.46	0.98	3.58	9.32	0.17	14%	0.35%	Aluminum
Ethiopia	0.09	0.45	0.01	4.11	0.01	N/D	N/D	N/D
South Africa	0.91	1.46	15.68	8.61	0.32	17%	0.2%	Iron and steel
Average carbon-intensity in the EU	0.16	0.46	1.47	4.97	0.07			

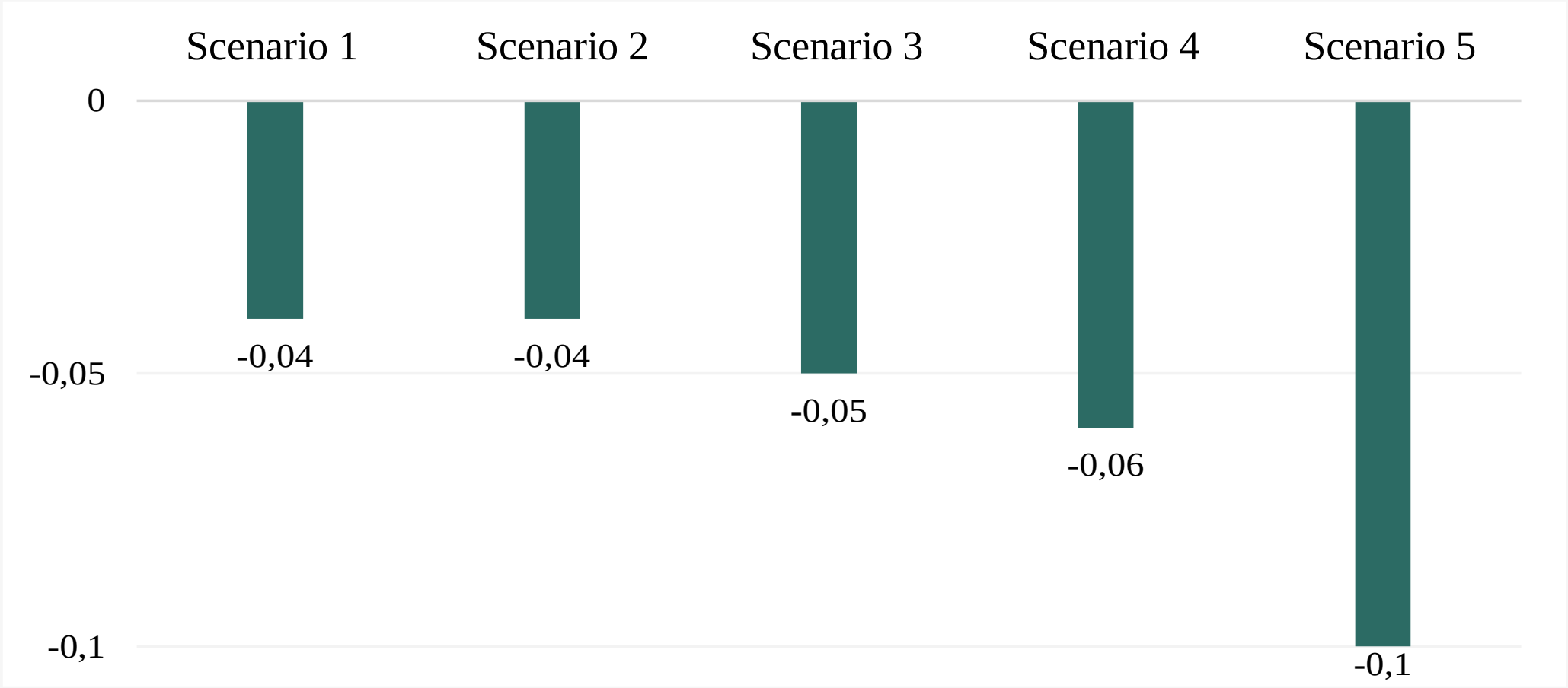
European CBAM is not very relevant for Russia anymore. But what if China introduces CBAM? Experience of GTAP-based analysis

	Scenario 0 (baseline)	Scenario 1 (stated policies)	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Carbon regulation in the EU	ETS: carbon price – \$78/tCO_2	ETS and CBAM: carbon price – \$108/tCO_2	ETS and CBAM: carbon price – \$108/tCO_2	ETS and CBAM: carbon price – \$108/tCO_2	ETS and CBAM: carbon price – \$108/tCO_2	ETS and CBAM: carbon price – \$108/tCO_2
Carbon regulation in China	ETS: carbon price – \$8/tCO_2 for electricity	ETS: carbon price – \$8/tCO_2 for electricity	ETS and CBAM: carbon price – \$13/tCO_2	ETS and CBAM: carbon price – \$13/tCO_2	ETS and CBAM: carbon price – \$13/tCO_2	ETS and CBAM: carbon price – \$13/tCO_2
Carbon regulation in Russia	-	-	-	Domestic carbon price – \$5/tCO_2	Domestic carbon price – \$10/tCO_2	Domestic carbon price – \$20/tCO_2

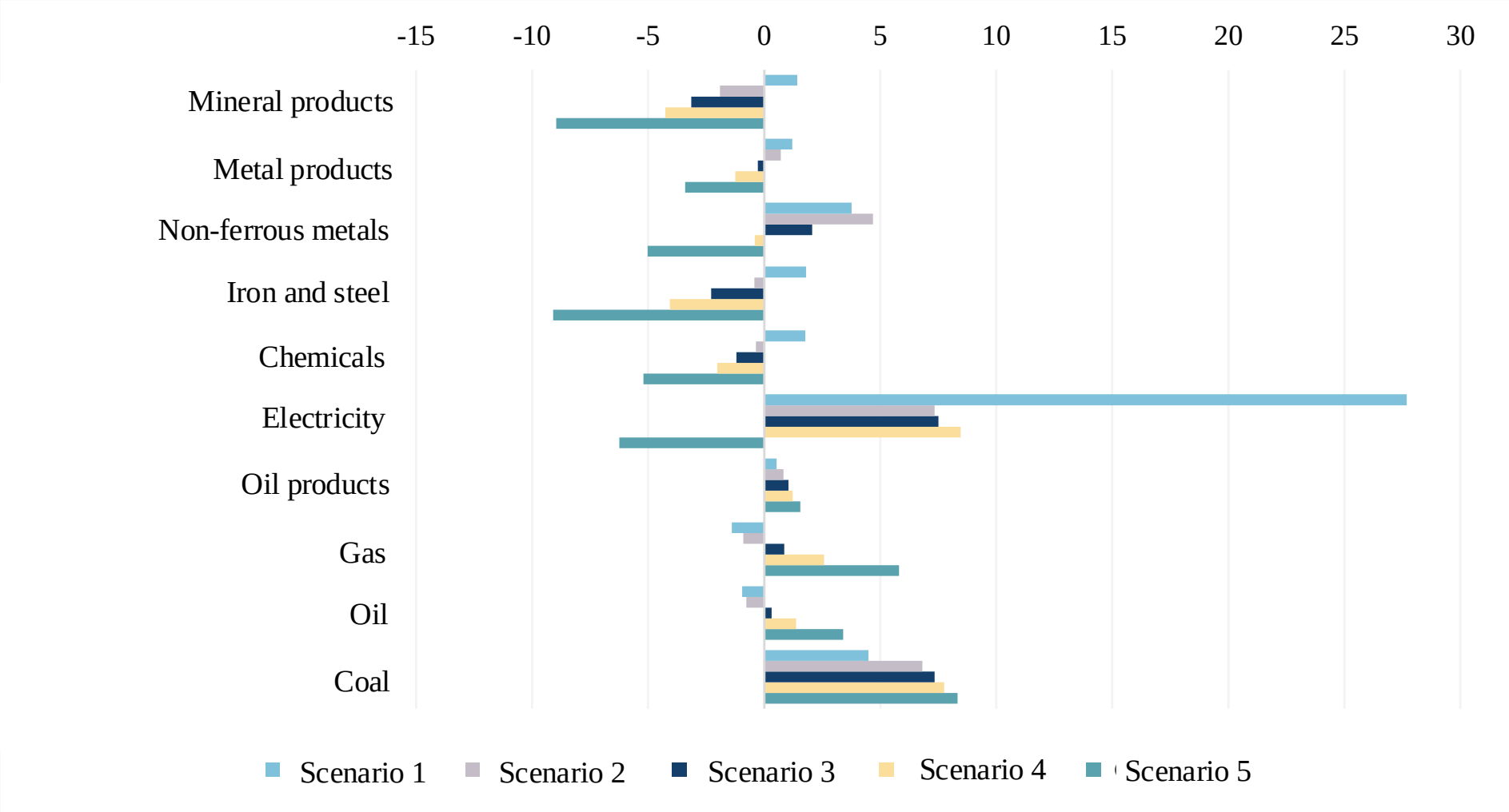
Ad valorum equivalents of China's CBAM

Sector	Scenario 2	Scenario 3	Scenario 4
Electricity	6.26	3.85	1.44
Chemicals	0.48	0.29	0.11
Iron and steel	0.61	0.37	0.14
Non-ferrous metals	0.003	0.002	0.001
Metal products	0.08	0.05	0.02
Mineral products	0.93	0.57	0.21

Effect on Russian GDP



Changes in real exports from Russia to China



Conclusions

- CBAM in China is very unlikely though some carbon-related trade barriers may appear (for instance technical standards)
- If it happens, it won’t be critical for the Russian economy though for some companies and sectors it may be sensitive in terms of the decrease in exports to China (electricity, mineral products)
- Some goods may even expand their exports (non-ferrous metals, coal) to China

3. Transition risks globally: transfer of burden from developed to developing countries

with Elizaveta Smolovik

Index of countries' vulnerability

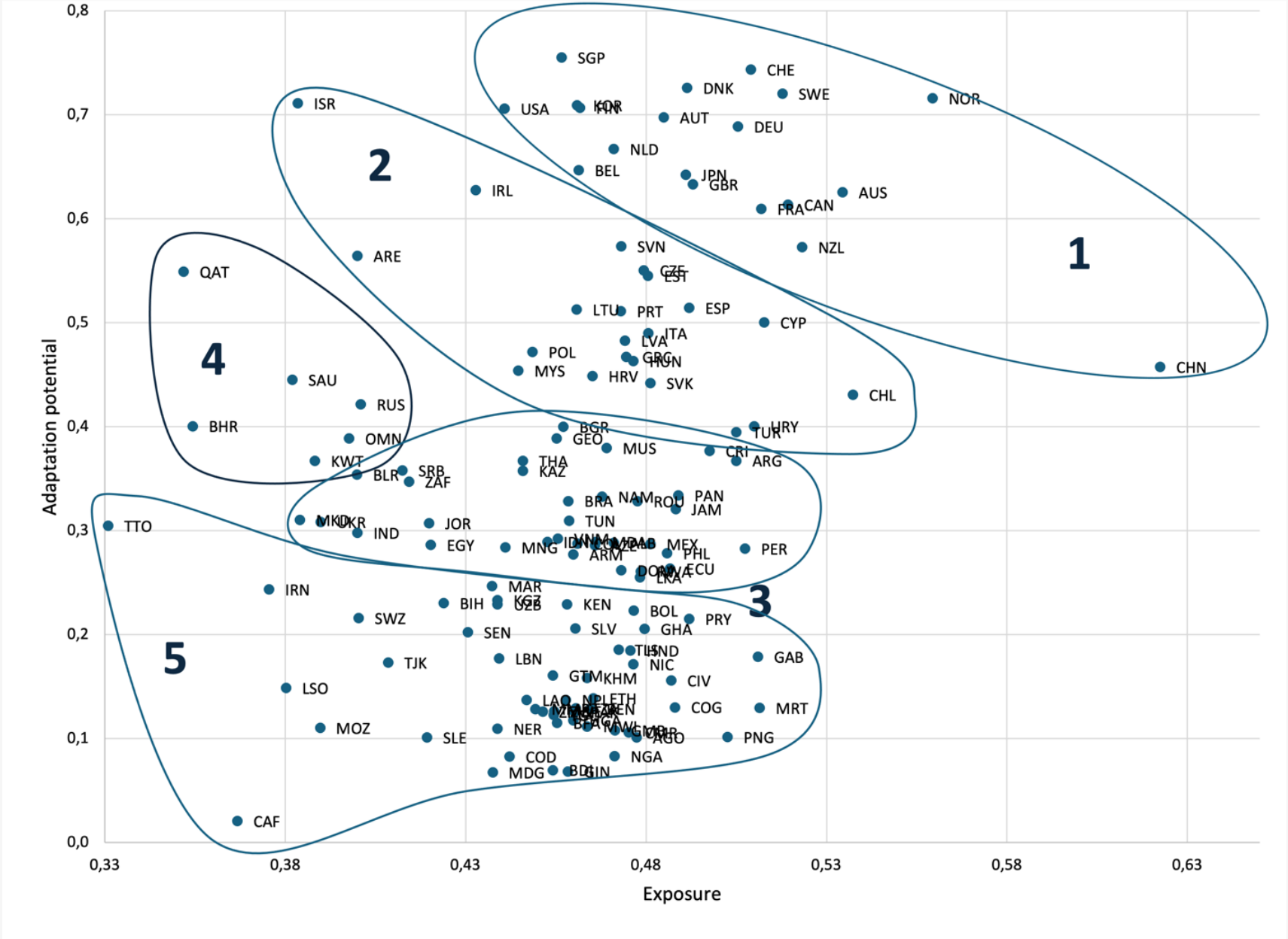
$$V = \sqrt[2]{(FF + CIP + CES + CM)/4 * (RD + GDPpC + Ed + GE)/4}$$

Exposure:
FF – fossil fuels (production, exports, reserves by type)
CIP – carbon-intensive production (exports, carbon intensity of the economy)
CES – clean energy sources (production, potential)
CM – critical metals and minerals (reserves, processing)

Adaptation potential:
RD – R&D expenses
GDPpC– GDP per capita
Ed – education expenses
GE – government effectiveness

All indicators are scale-adjusted

Distribution of countries



Conclusions

- The burden of transition risks is spread unevenly: the major beneficiaries are European countries and China, the most affected are small and relatively poor FF-dependent economies
- Factor of China may be crucial. Low-carbon transition quickly becomes super-beneficial for it that may accelerate the process
- Dialogue is needed between those who win and those who loose, including within the framework of just energy transition

Laboratory for Climate Change Economics

Thank you for your attention!

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