



Identifying systemic climate- and biodiversity-related vulnerabilities: an IO approach

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CLIMATE FINANCE, RISK AND UNCERTAINTY MODELLING

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SUSTAINABILITY

How sustainable are Net Zero development trajectories?

15th AFD International Research Conference on Development

CALL FOR PAPERS

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STRONG SUSTAINABILITY TRAJECTORIES: AFD LAUNCHES A CALL FOR RESEARCH PAPERS

0.1

Main source

Developing countries' macroeconomic exposure to the low-carbon transition

Espagne, É., Godin, A., Magacho, G., Mantes, A. & Yilmaz, D. (2021). Developing countries' macroeconomic exposure to the low-carbon transition. *AFD Research Papers*.

Cahen-Fourot, L., Campiglio, E., Godin, A., Kemp-Benedict, E., & Trsek, S. (2021). Capital stranding cascades: The impact of decarbonisation on productive asset utilisation. *Energy Economics*

Godin, A. & Hadji-Lazaro, P. (2022). Identification des vulnérabilités à la transition induites par la demande : application d'une approche systémique à l'Afrique du Sud. *Revue économique*

Svartzman, R., Espagne, E., Julien, G., Paul, H. L., Mathilde, S., Allen, T., ... & Vallier, A. (2021). A 'Silent Spring' for the Financial System? *Exploring Biodiversity-Related Financial Risks in France*

0.1 Hybrid IO tables

ENV-IO	Buying industries	Final demand	Sales
Selling industries	Intermediate consumption	Households Government Investment Exports	Total Output
Foreign mkts	Imports	Imports	↓ =
Income	Value added	Value added = Final demand	
Costs	Total input		

- Direct inputs, A , and indirect inputs, $L = (I - A)^{-1}$
- Direct and indirect emissions: $e^T = e(I - A)^{-1}$
- GLORIA MRIO database Release 055 (March 2022)

Outline

1. The economic structure matters

1. Exposure, vulnerability and risk
2. Definition of potential sunset industries

2. Multidimensional analysis

1. Multidimensional footprints
2. Multidimensional exposure

3. From exposure to risk

1. Exposure in different dimensions
2. Risk in developing and emerging economies

1.1 Conceptual framework

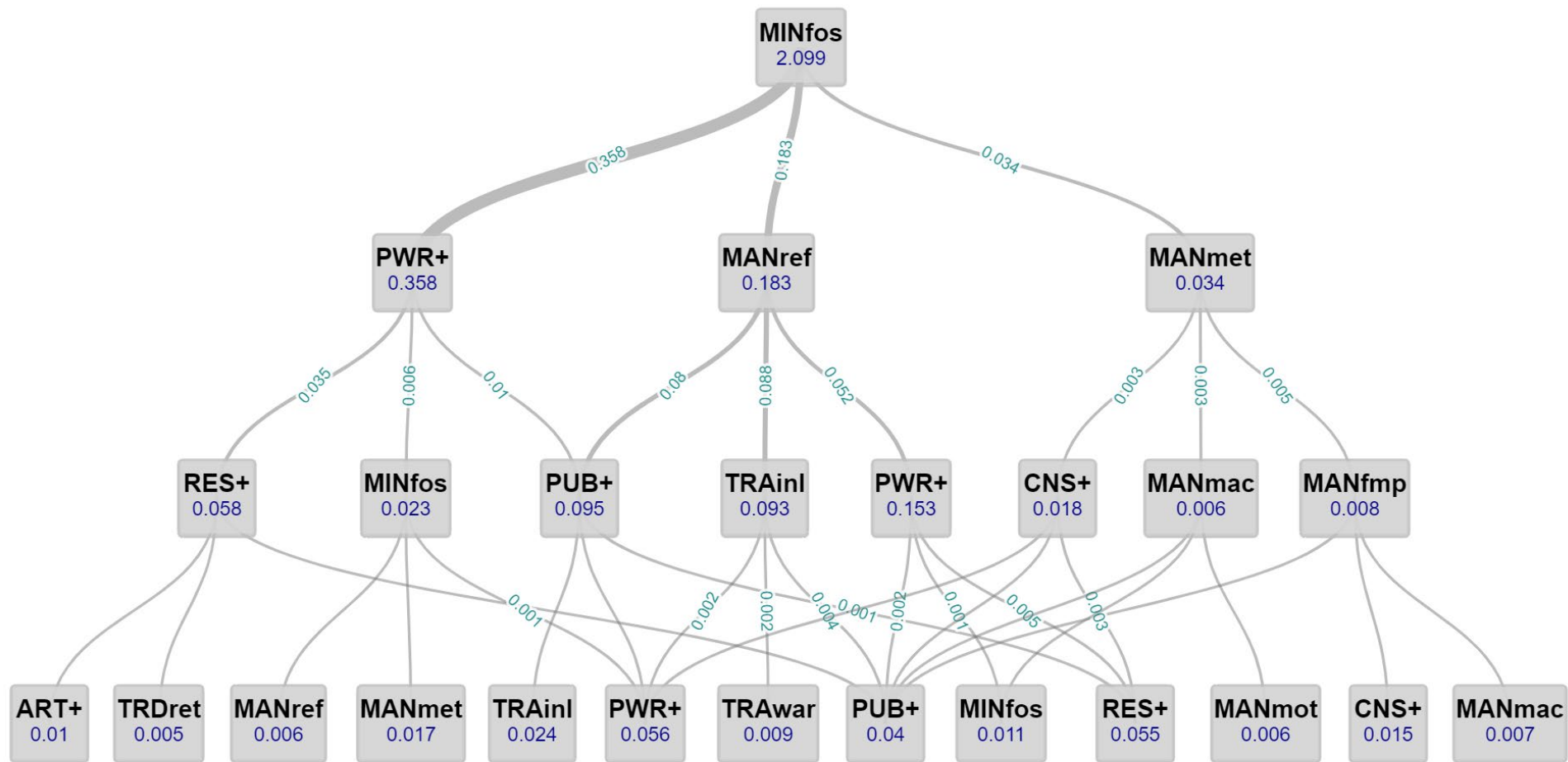
Exposure, vulnerability and risk

- Ecological transition and structural change
 - It is unique type of structural change, where low-footprint industries grow and high-footprint industries decline
 - The process is led by deliberate policies, changes in preferences and technological changes
 - Countries are impacted differently according to their structure of production, trade and finance
- Sunset industries are sunset...
 - ... because they are directly impacted by the transition...
 - ... or because they depend from industries impacted by the transition...
 - ... or because they rely on industries impacted by the transition

1.1

Conceptual framework

Cascades of assets stranding - supply

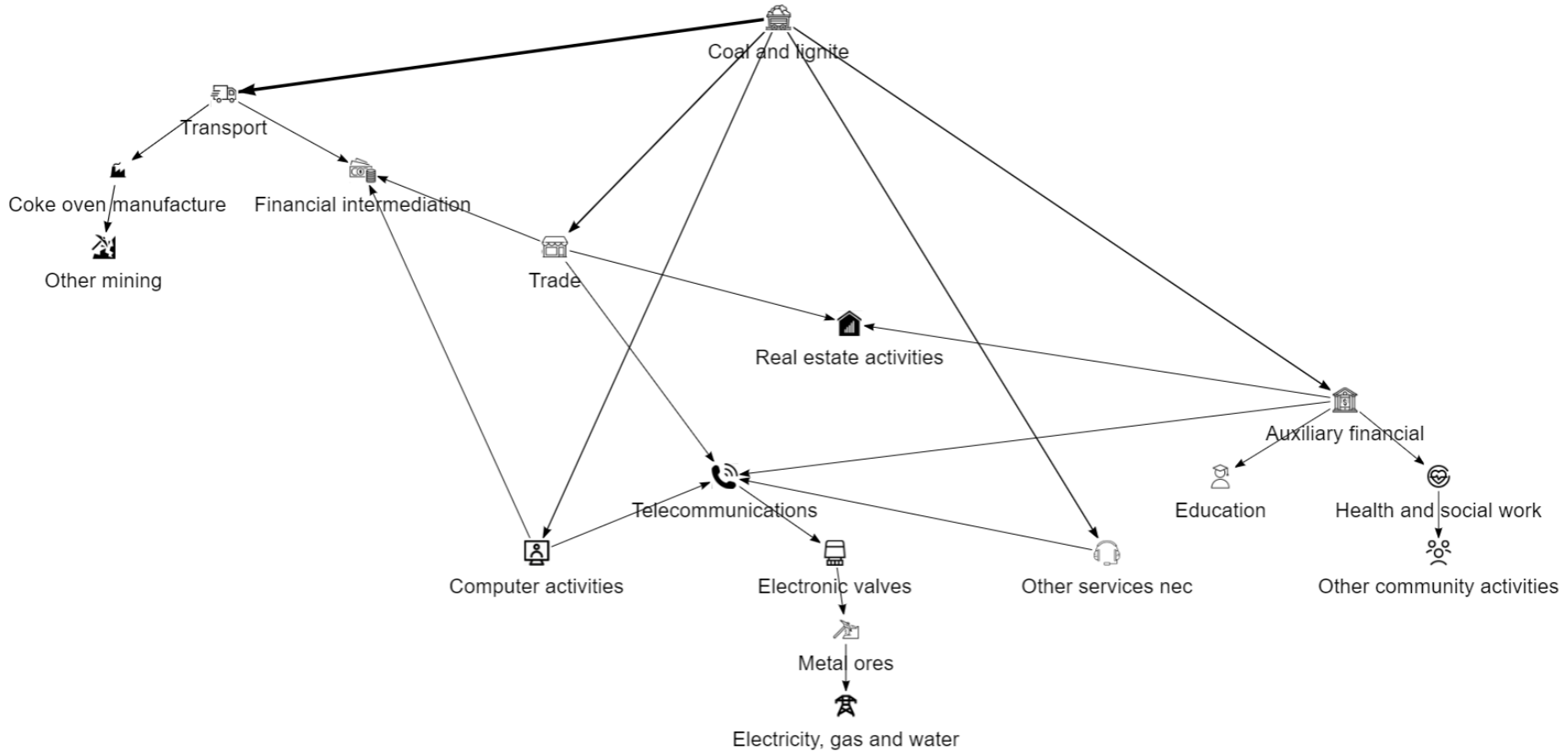


Source: Cahen-Fourot, L., Campiglio, E., Godin, A., Kemp-Benedict, E., & Trsek, S. (2021). Capital stranding cascades: The impact of decarbonisation on productive asset utilisation. *Energy Economics*,

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Conceptual framework

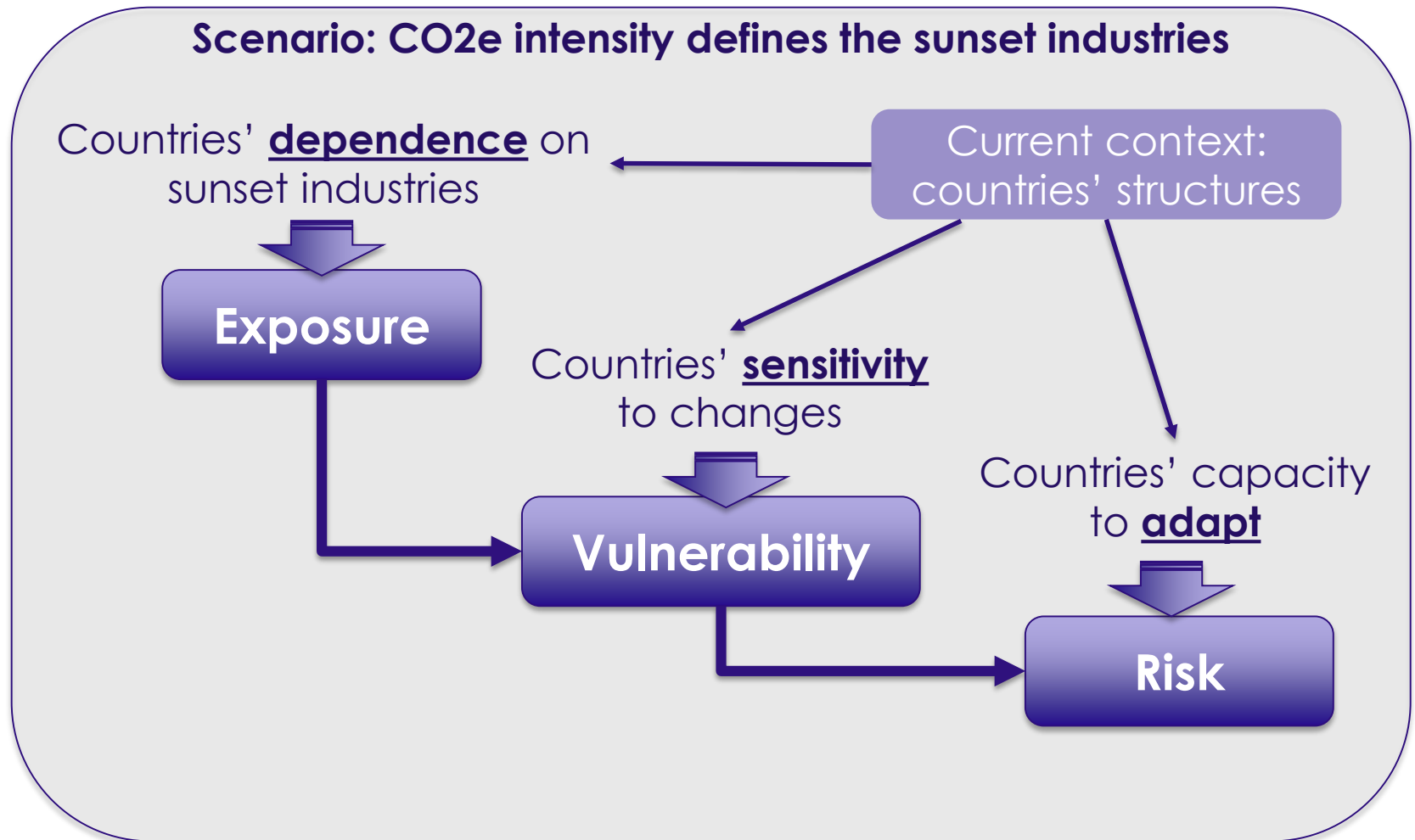
Cascades of assets stranding - demand



Source: Godin, A. & Hadji-Lazaro, P. (2022). Identification des vulnérabilités à la transition induites par la demande : application d'une approche systémique à l'Afrique du Sud. *Revue économique*

1.1 Conceptual framework

Exposure, vulnerability and risk



1.2

Conceptual framework

Defining potential sunset industries globally

	Low upstream	Medium upstream	High upstream
Low downstream	All other sectors	Electrical and mach. Other manufacturing Textiles Transport equipment	Recycling
Medium downstream			Chemicals* Metal Products Electricity**
High downstream		Mining and Quarrying	

(*) Petroleum, chemicals and non-metal minerals; (**) Electricity, Gas and Water

- **What are the potential sunset industries?**

- Mining and Quarrying;
- Petroleum, Chemical and Non-Metallic Mineral Products
- Metal Products
- Electricity, Gas and water

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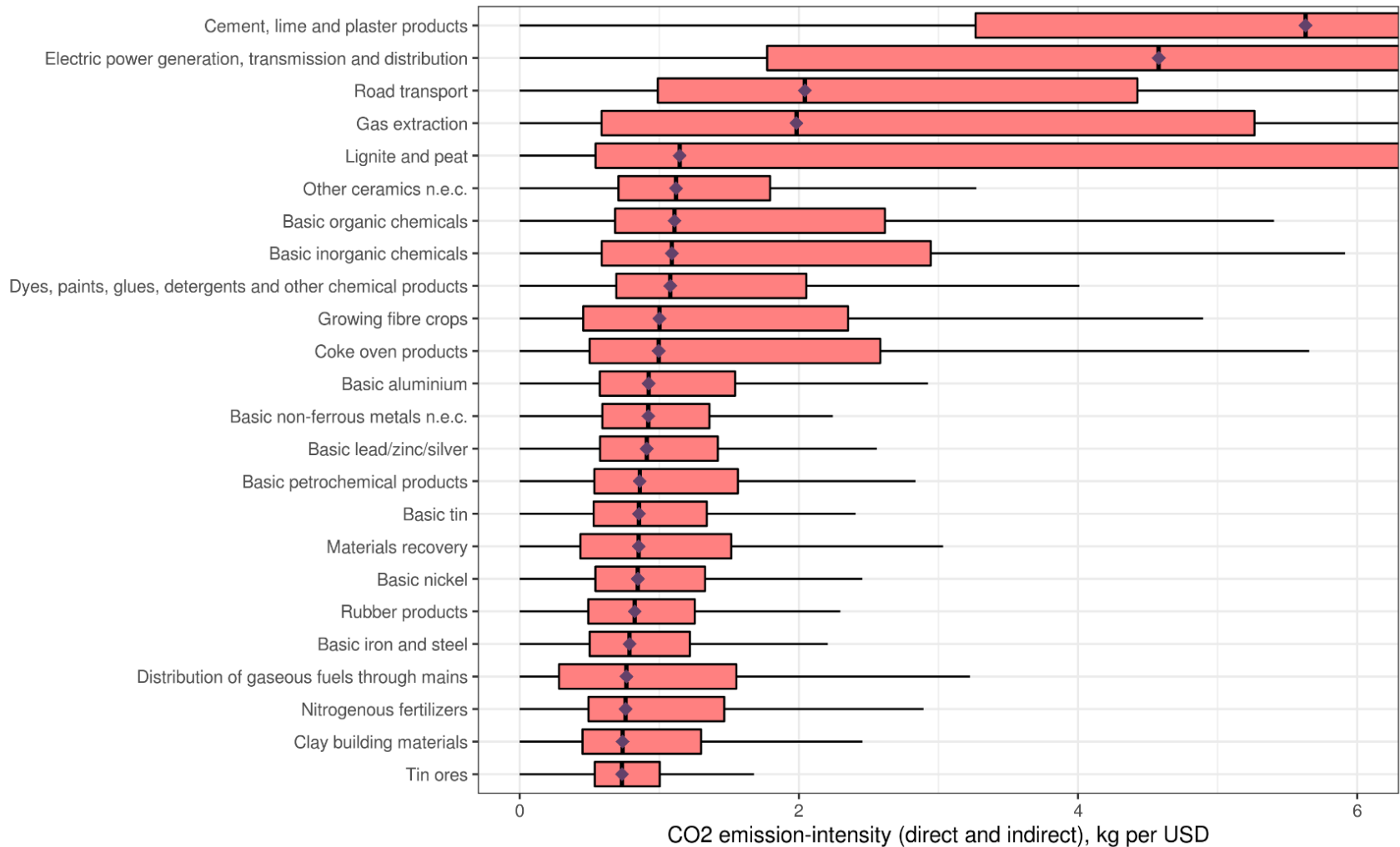
1. Multidimensional footprints
2. Multidimensional exposure

3. From exposure to risk

1. Exposure in different dimensions
2. Risk in developing and emerging economies

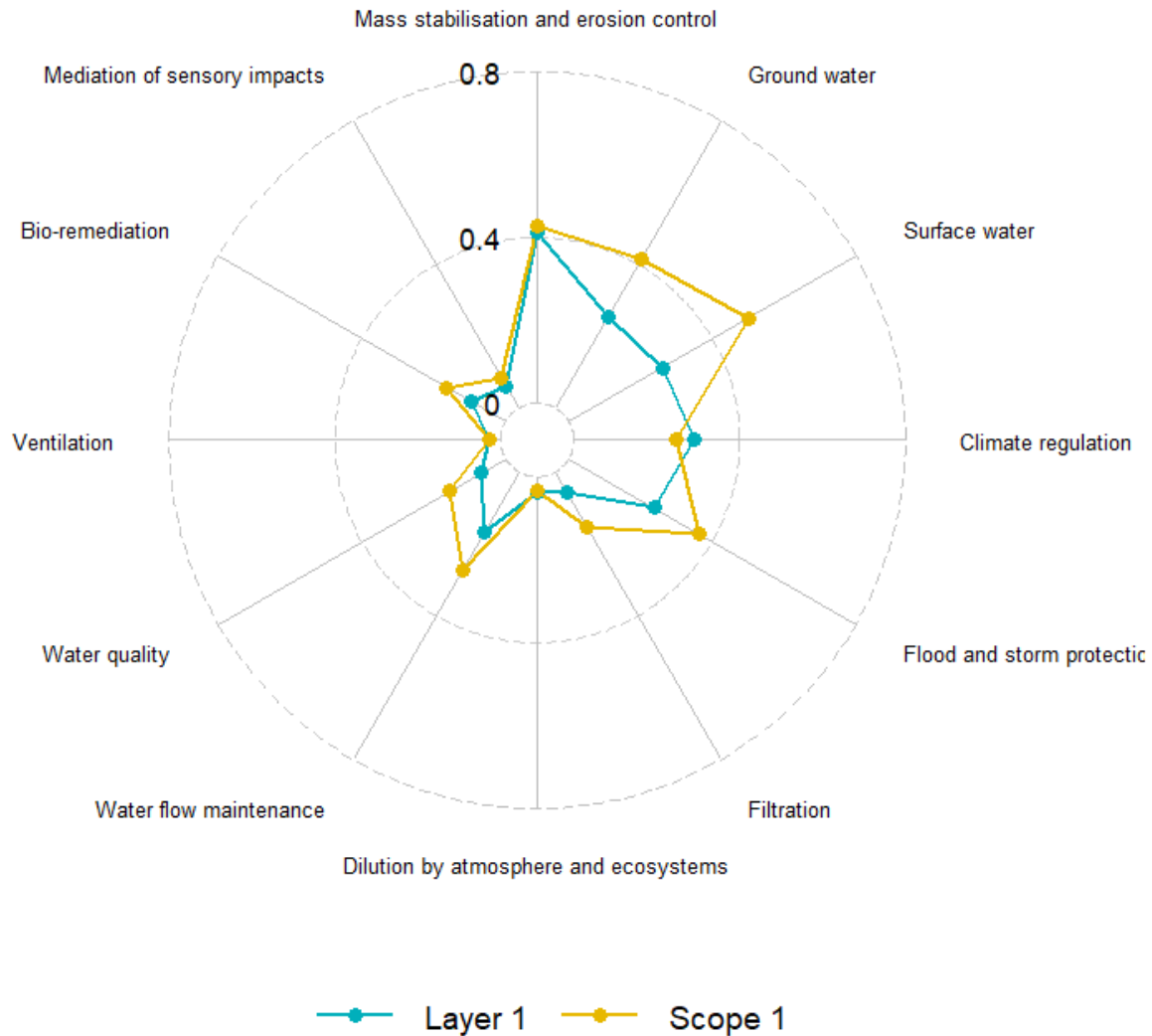
2.1 Multidimensional footprints

Defining potential sunset industries globally – CO₂e



2.1 Multidimensional footprints

Adding biodiversity



2.2

Multidimensional exposure

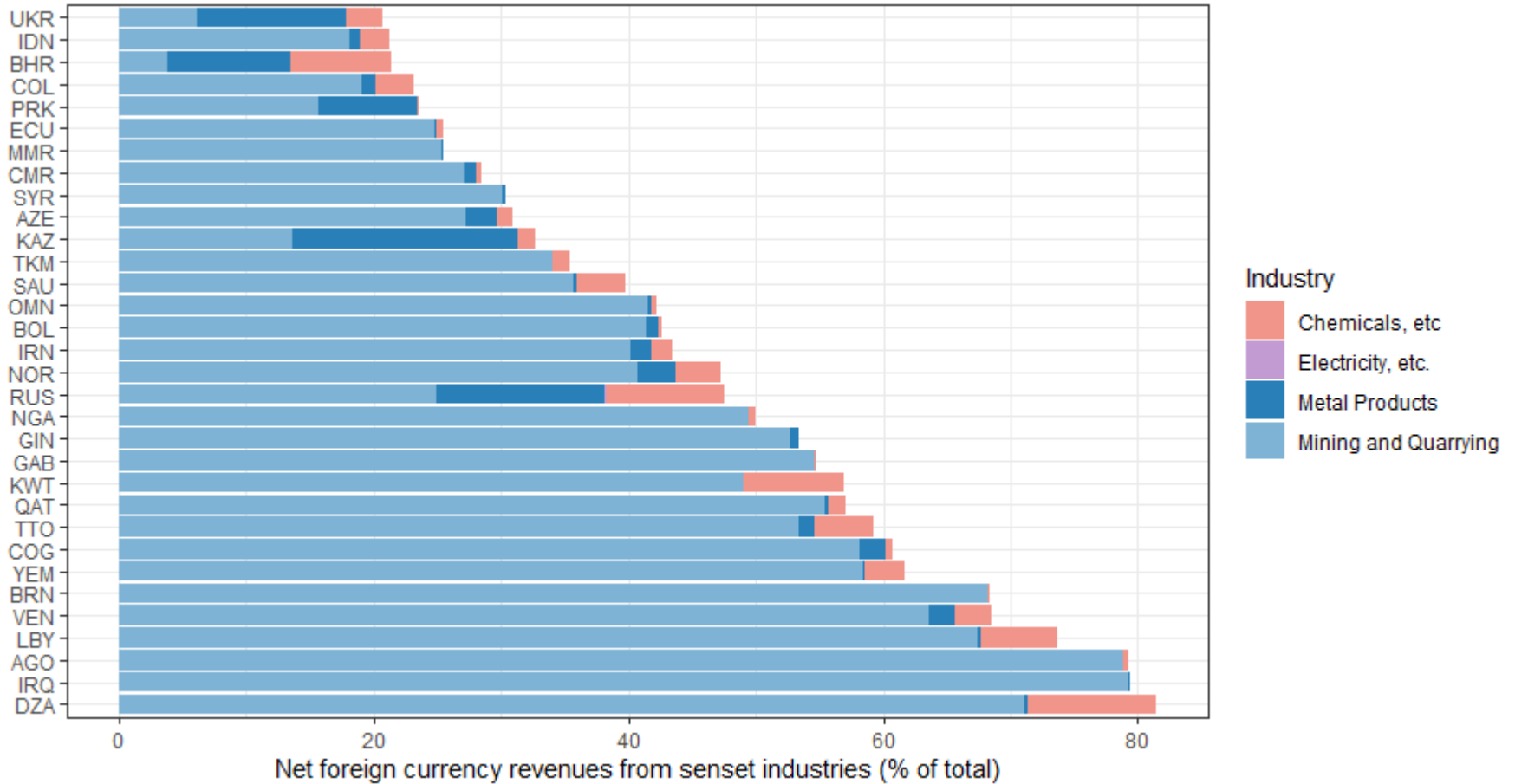
The different role of industries

- Transition risks: change in world demand impacts countries that depends on sunset industries; they are important for
 - Raising foreign currency and avoiding BoP constraints, especially because the transition demands imported inputs – **External exposure**
 - Avoiding fiscal imbalances, especially because the transition demands relevant public investments and expenses – **Fiscal Exposure**
 - Guaranteeing employment and wages – even though the impact is positive, it is not homogenous – **Social Exposure**

2.2

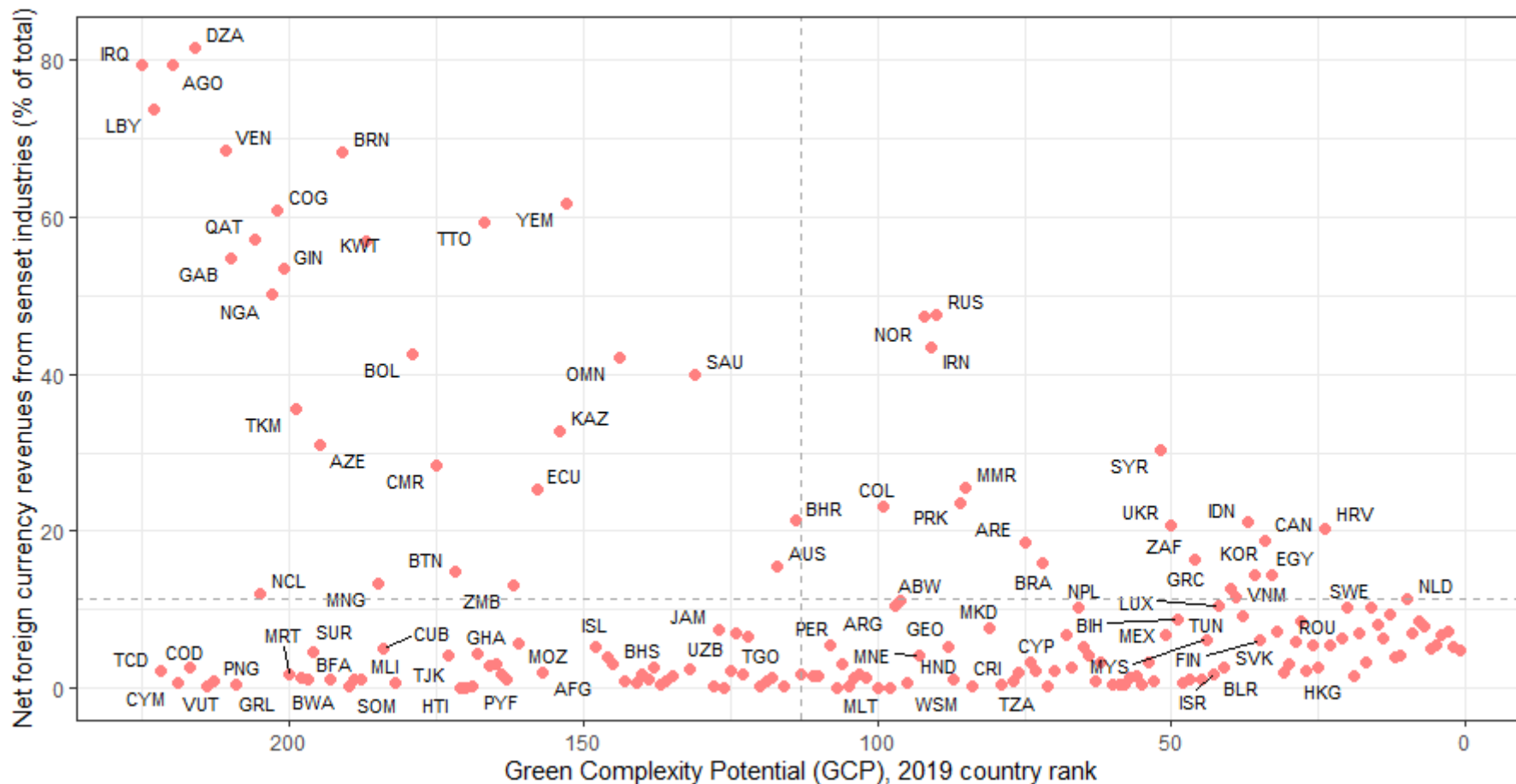
Country analysis

External exposure, by country



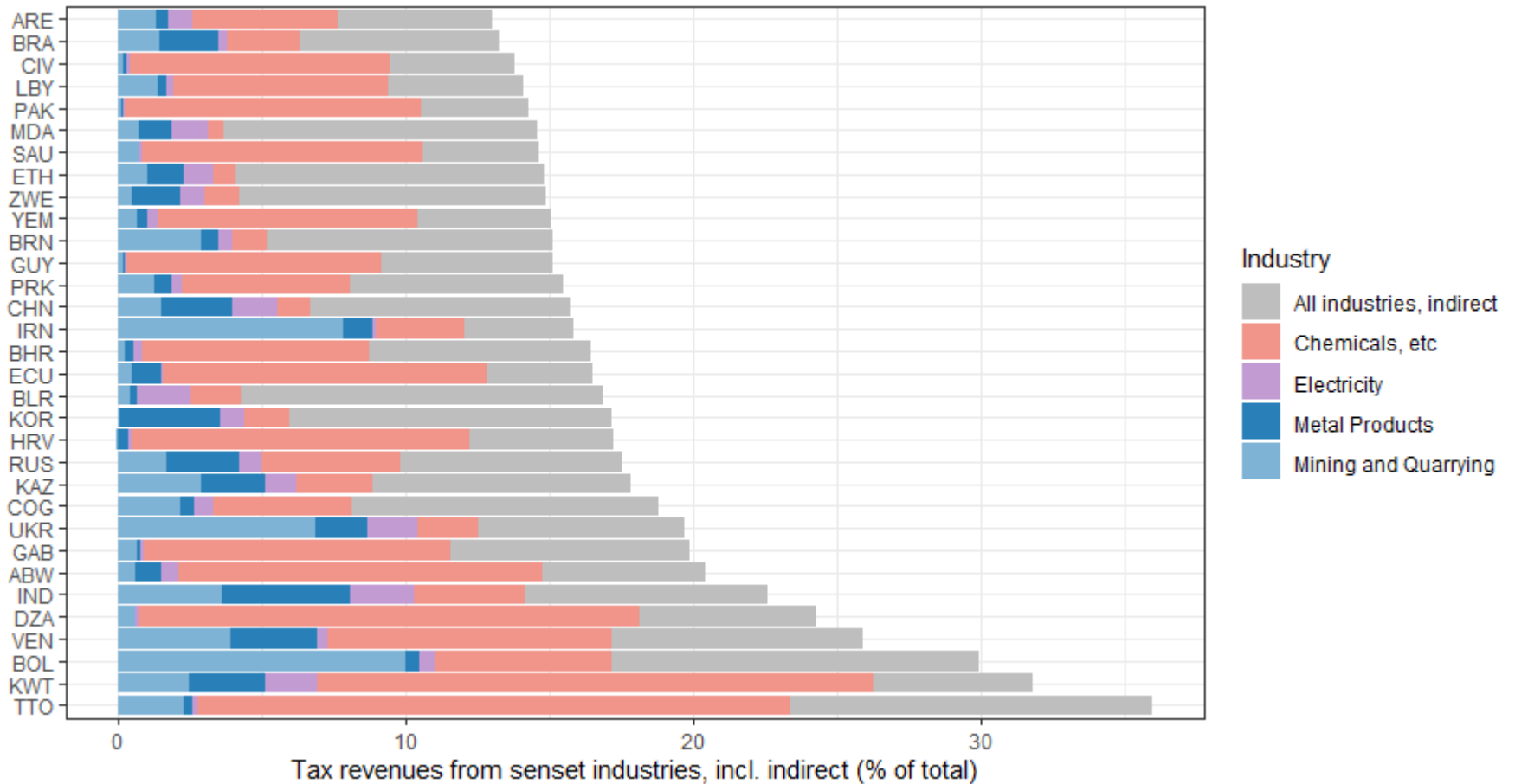
2.2 Country analysis

External vulnerability



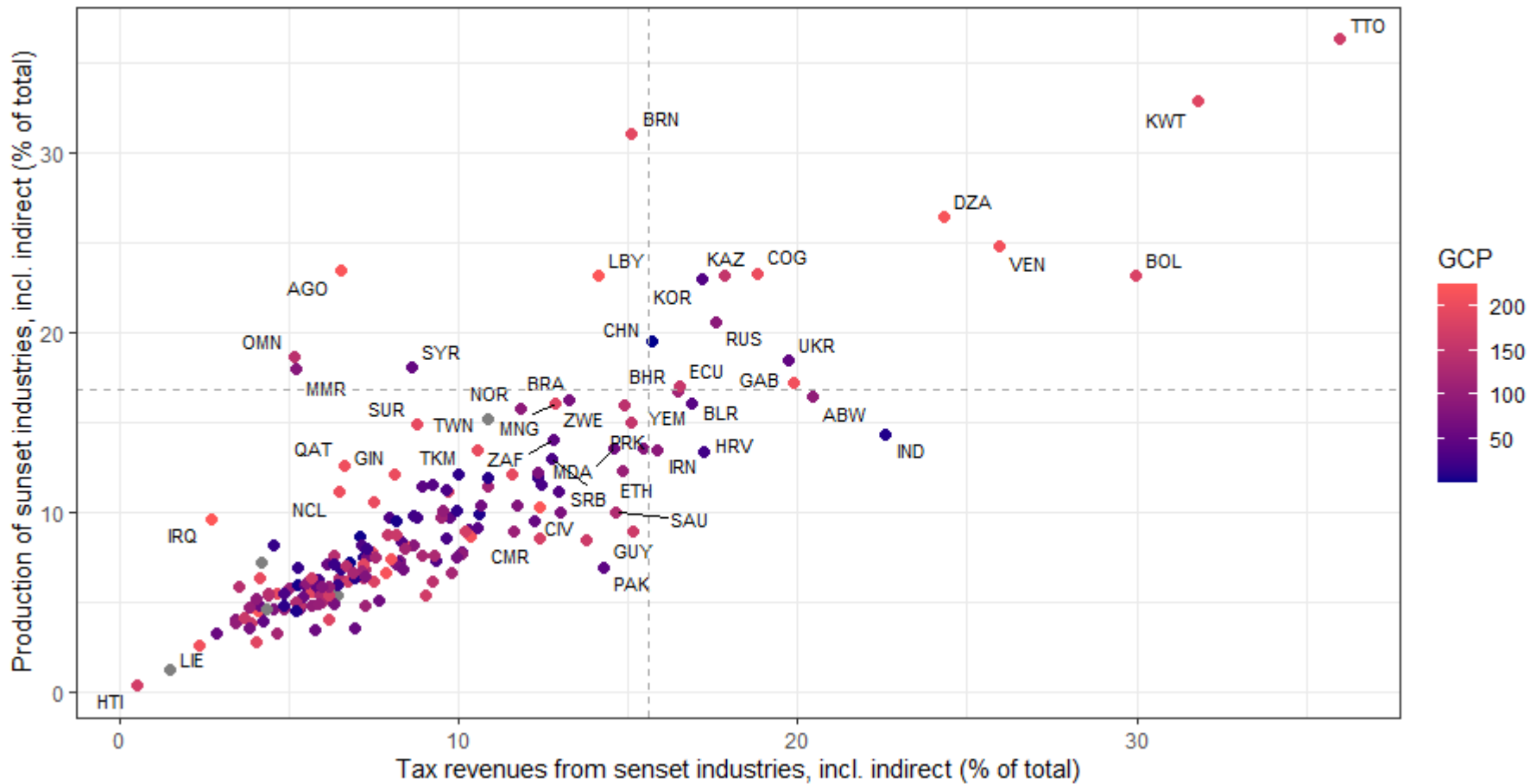
2.2 Importance of sunset industries for the country

Fiscal exposure, by country



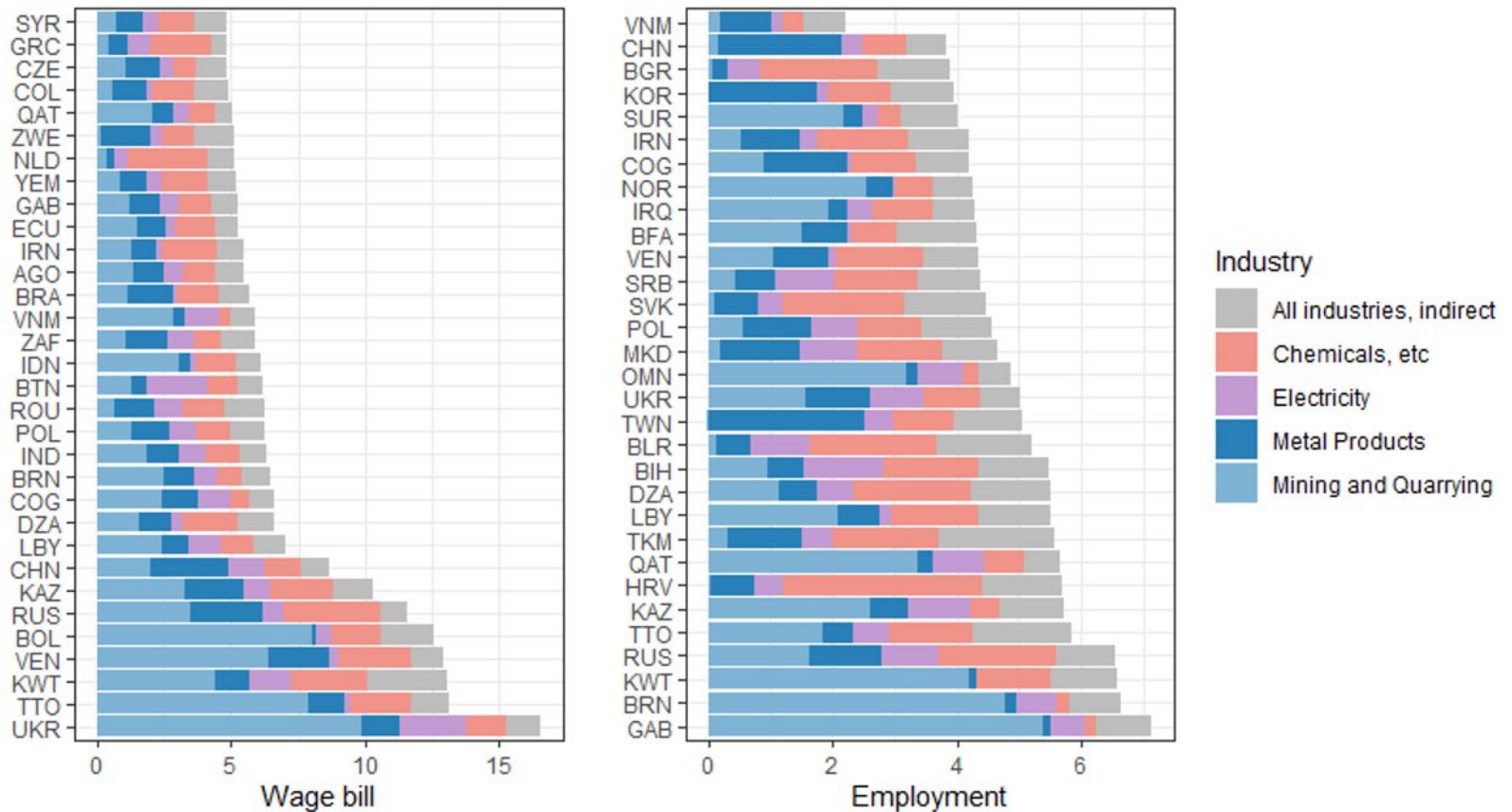
2.2 Importance of sunset industries for the country

Fiscal vulnerability



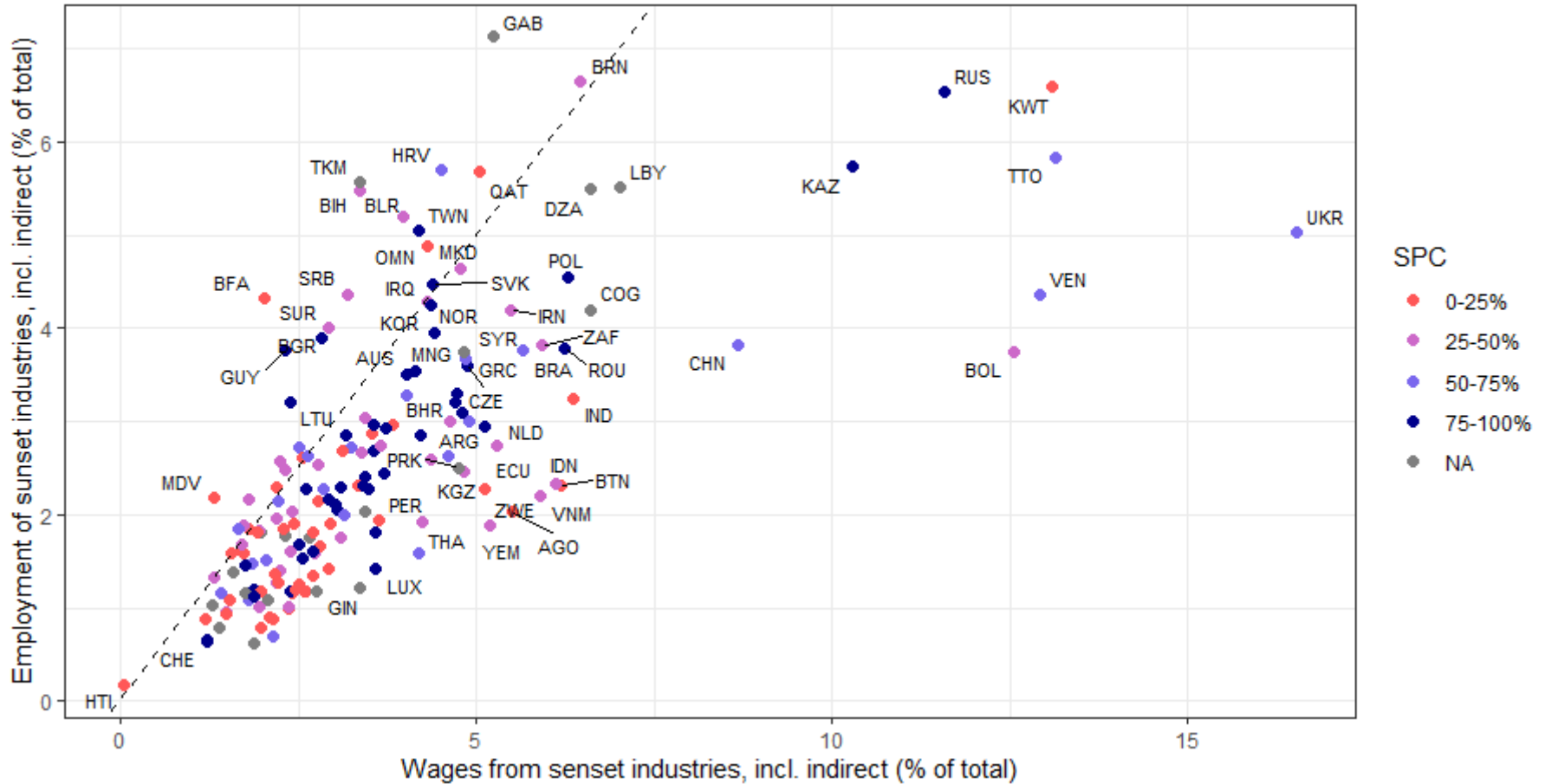
2.2 Importance of sunset industries for the country

Socio-economic exposure, by country



2.2

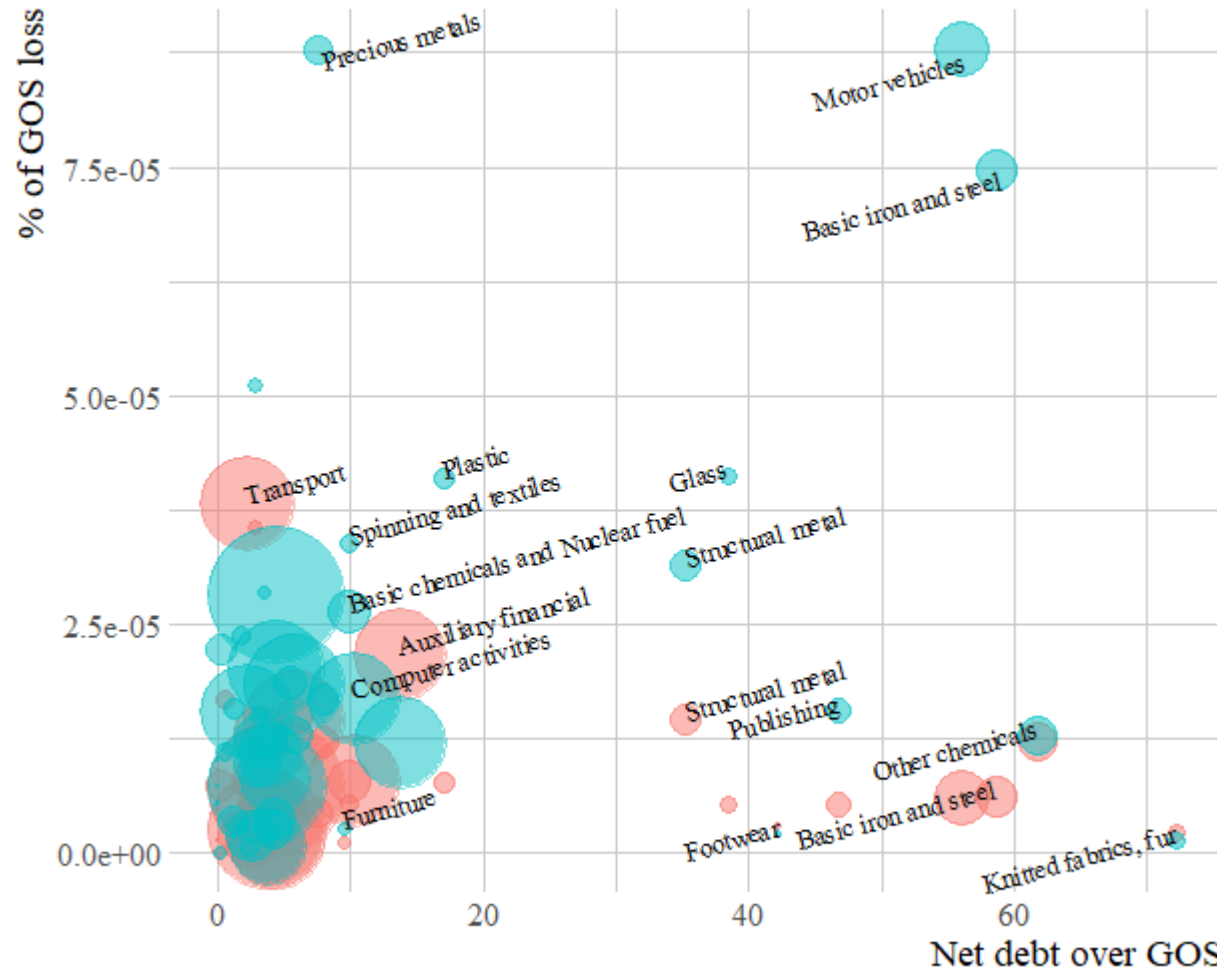
Importance of sunset industries for the country Socio-economic vulnerability



2.2

Adding financial variables

Combining financial fragility with financial impacts

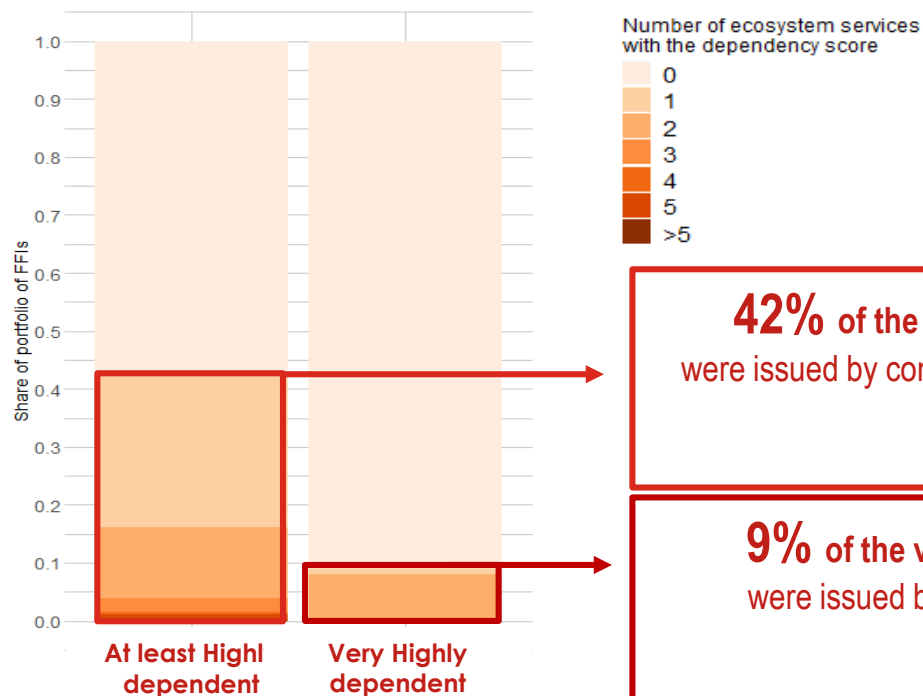


Source: Godin, A. & Hadji-Lazaro, P. (2022). Identification des vulnérabilités à la transition induites par la demande : application d'une approche systémique à l'Afrique du Sud. *Revue économique*

2.2 Adding financial variables

Dependency of the French financial portfolio to ecosystem services

Share of the portfolio dependent (through scope 1, direct operations) to n ecosystem services at least Highly or at least Very Highly



42% of the value of securities held by French financial institutions were issued by companies that are **directly highly or very highly dependent on at least one ecosystem service** (≈ 420 billion EUR)

9% of the value of securities held by French financial institutions were issued by companies that are **directly very highly dependent on at least one ecosystem service** (≈ 90 billion EUR)

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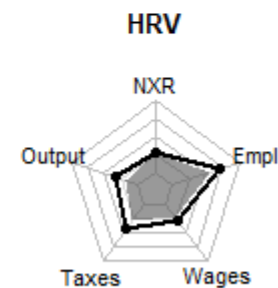
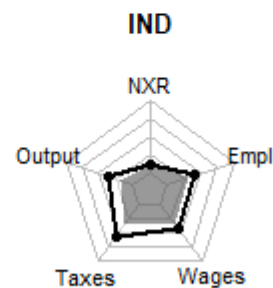
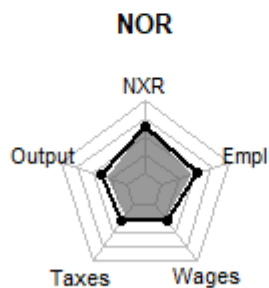
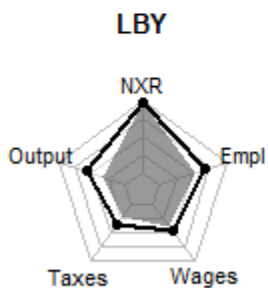
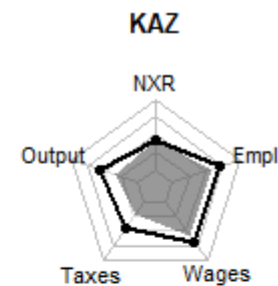
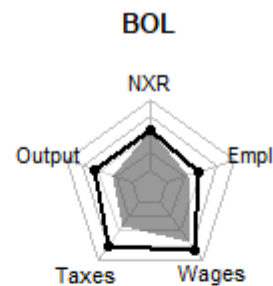
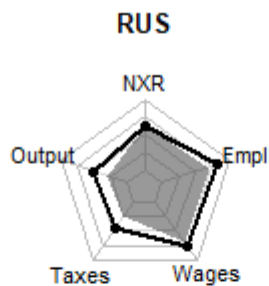
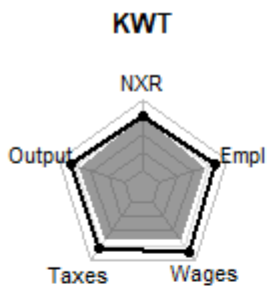
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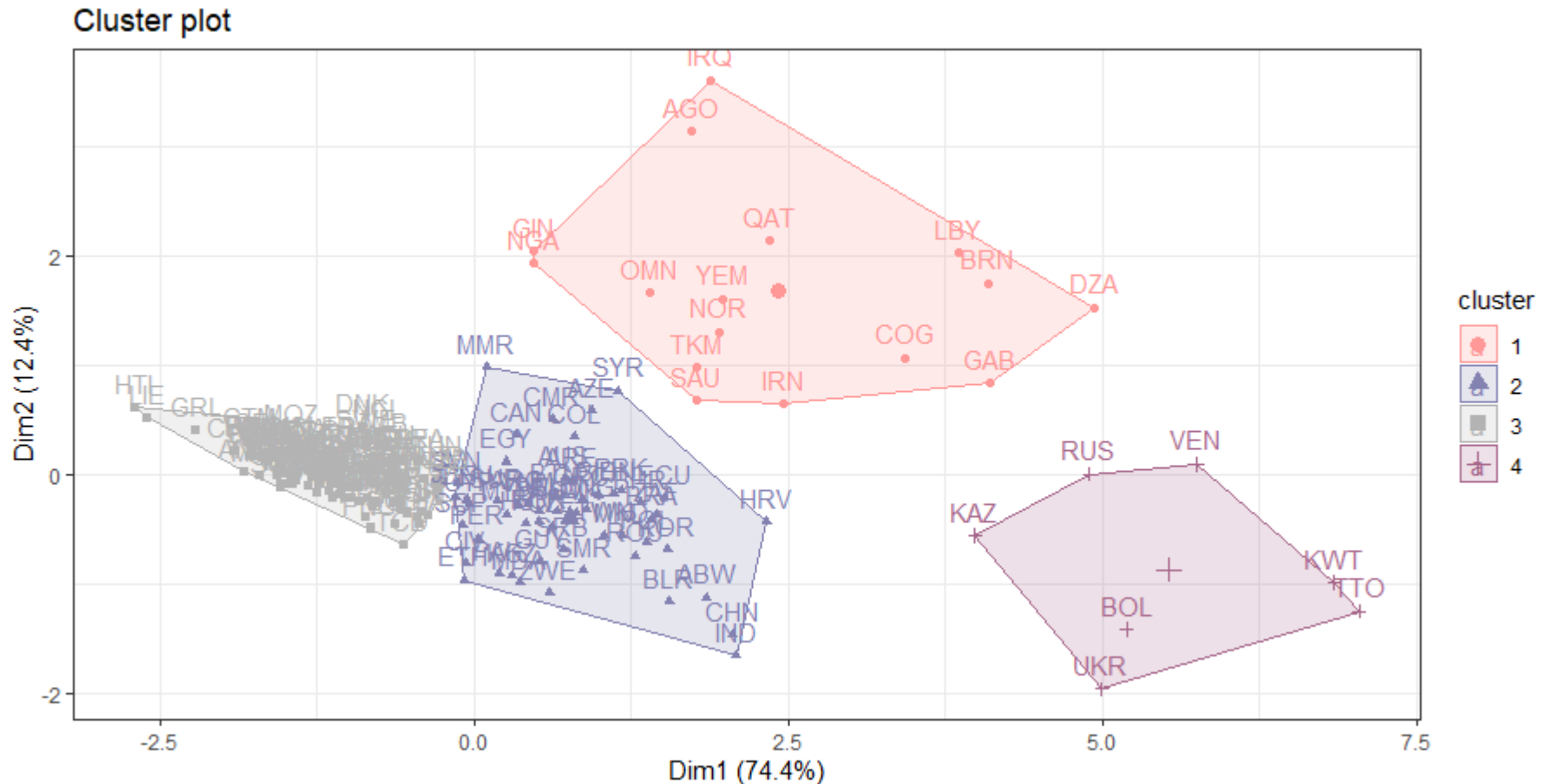
3.1 From exposure to risk

Exposure in different dimensions



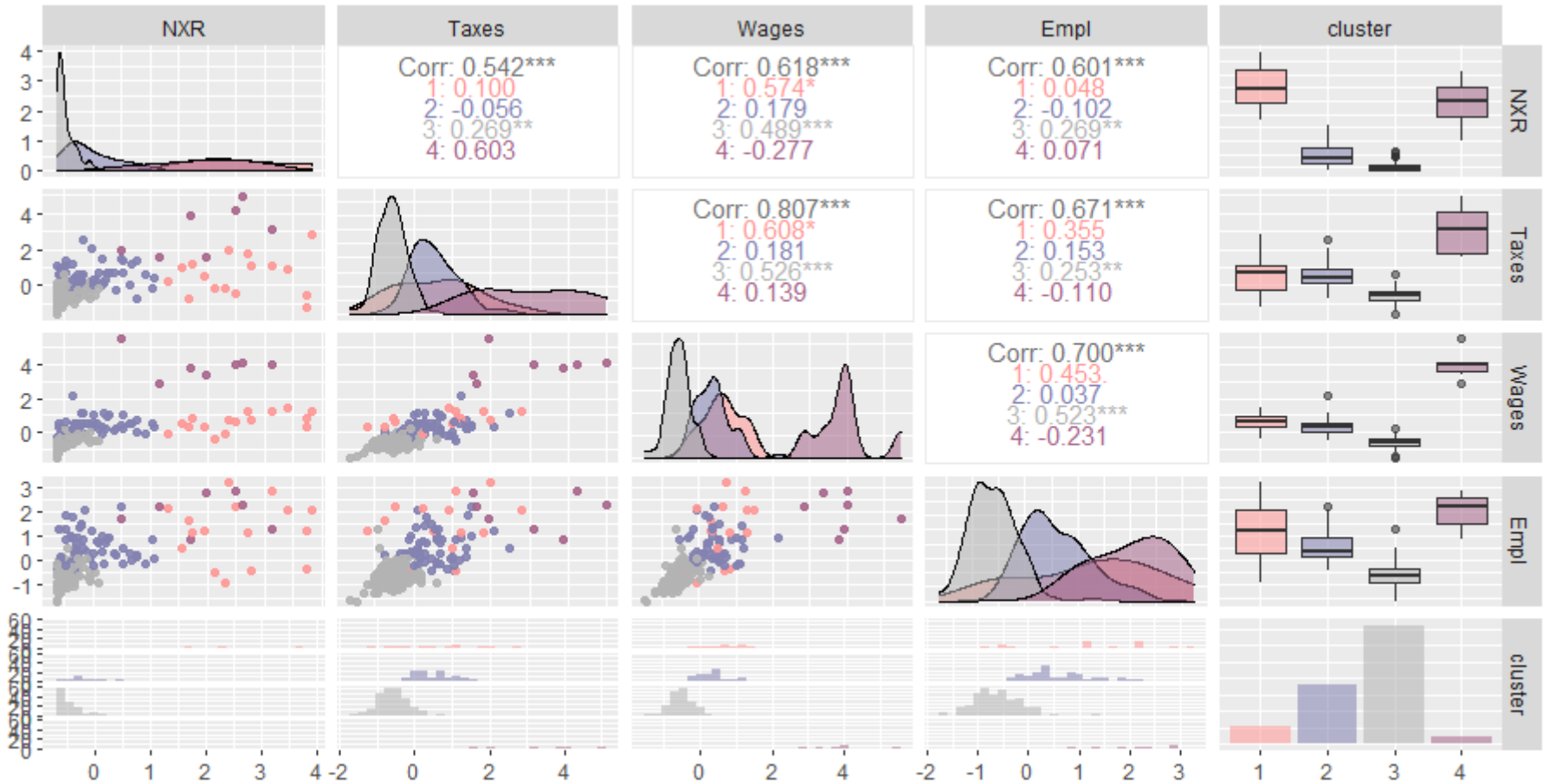
3.1 From exposure to risk

Clustering countries



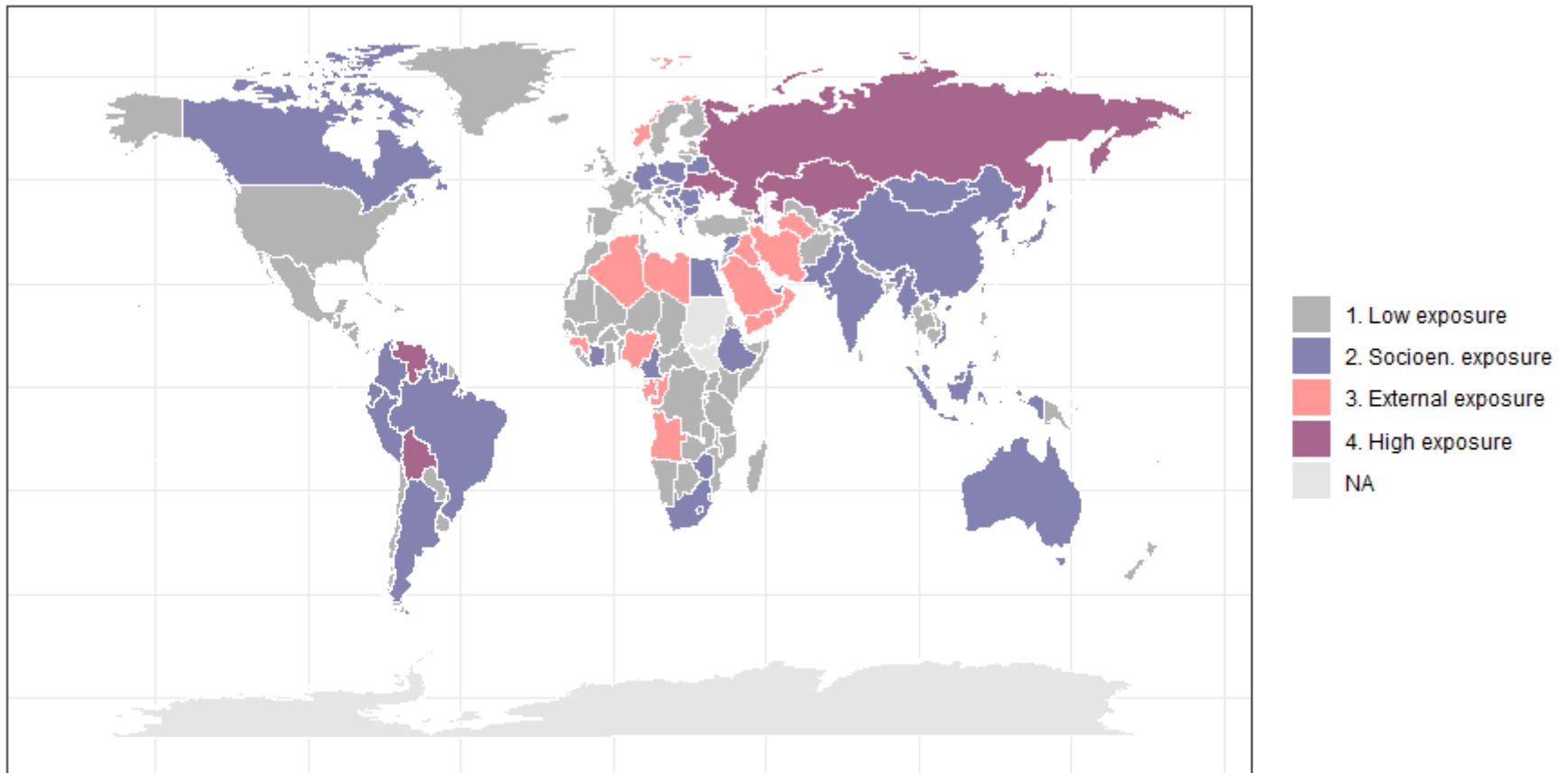
3.1 From exposure to risk

Clustering countries



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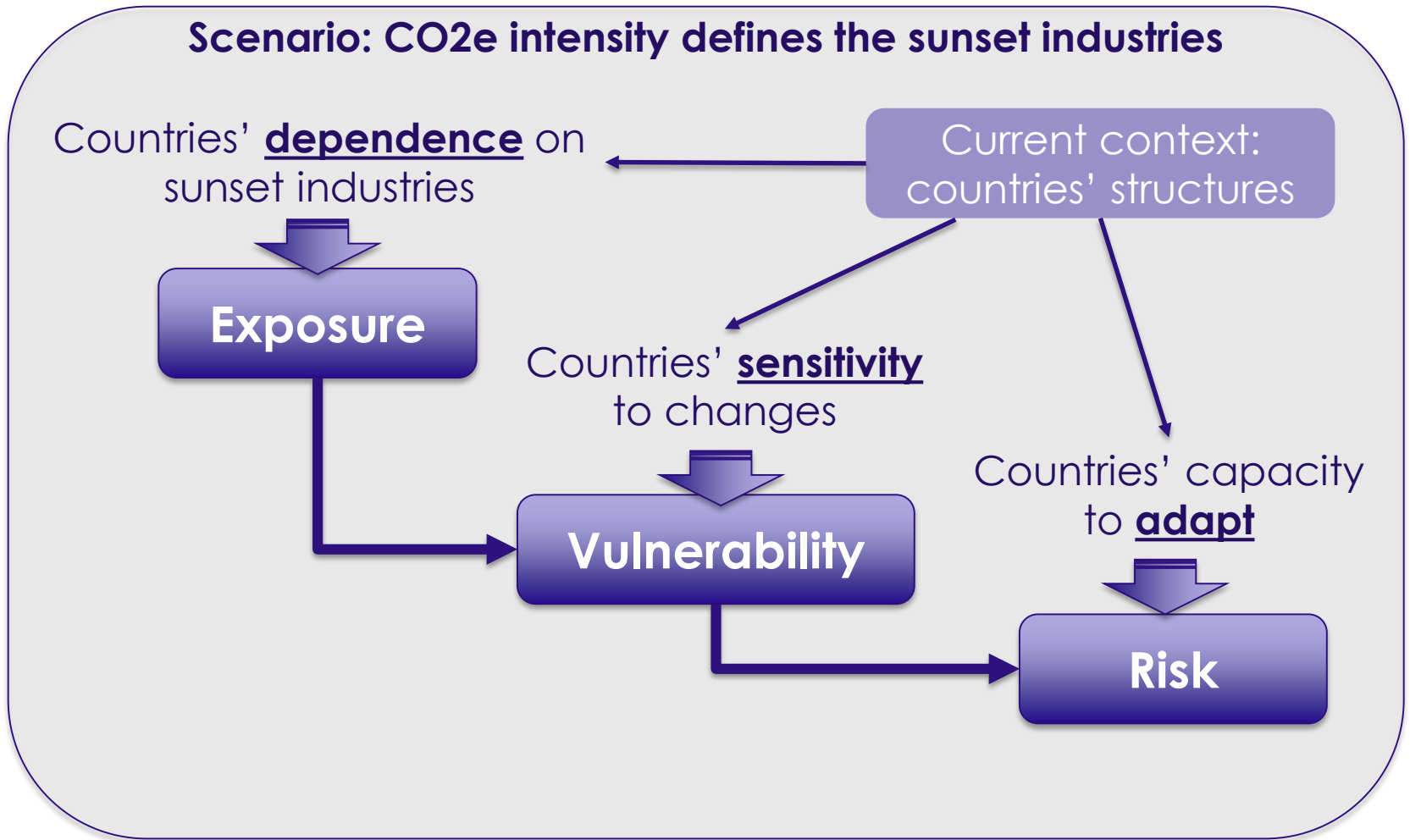
Clustering countries



3.2

From exposure to risk

Exposure, vulnerability and risk



3.2

From exposure to risk

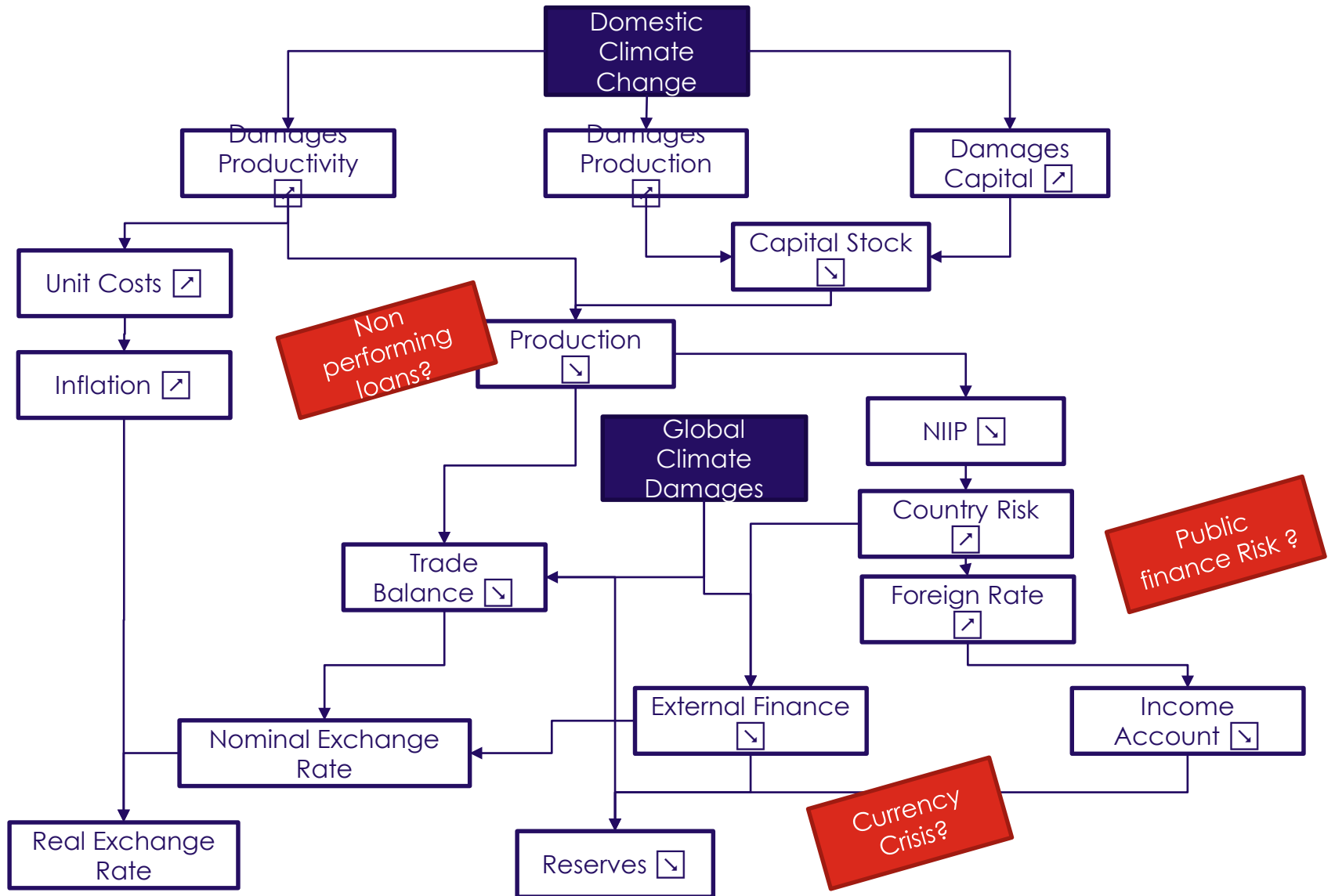
Risk in developing and emerging economies

- **Structure of the economy matters**
 - Domestic and international cascading effects
 - Demand and supply constraints, with different timing
- **Consider multidimensional impacts**
 - Dependency to climate and biodiversity
 - Impacts on climate and biodiversity
 - Role of industries and objectives of policy
- **Institutional analysis**
 - Context matters: risk will materialize in a specific socio-politico-ecological context
 - Macro-financial vulnerabilities which could transform a vulnerable sector into a risky one

3.2

Example of dynamic physical risk

For a small open developing economy





THANK YOU

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