Taxonomy alignment and transition risk: a country-level approach

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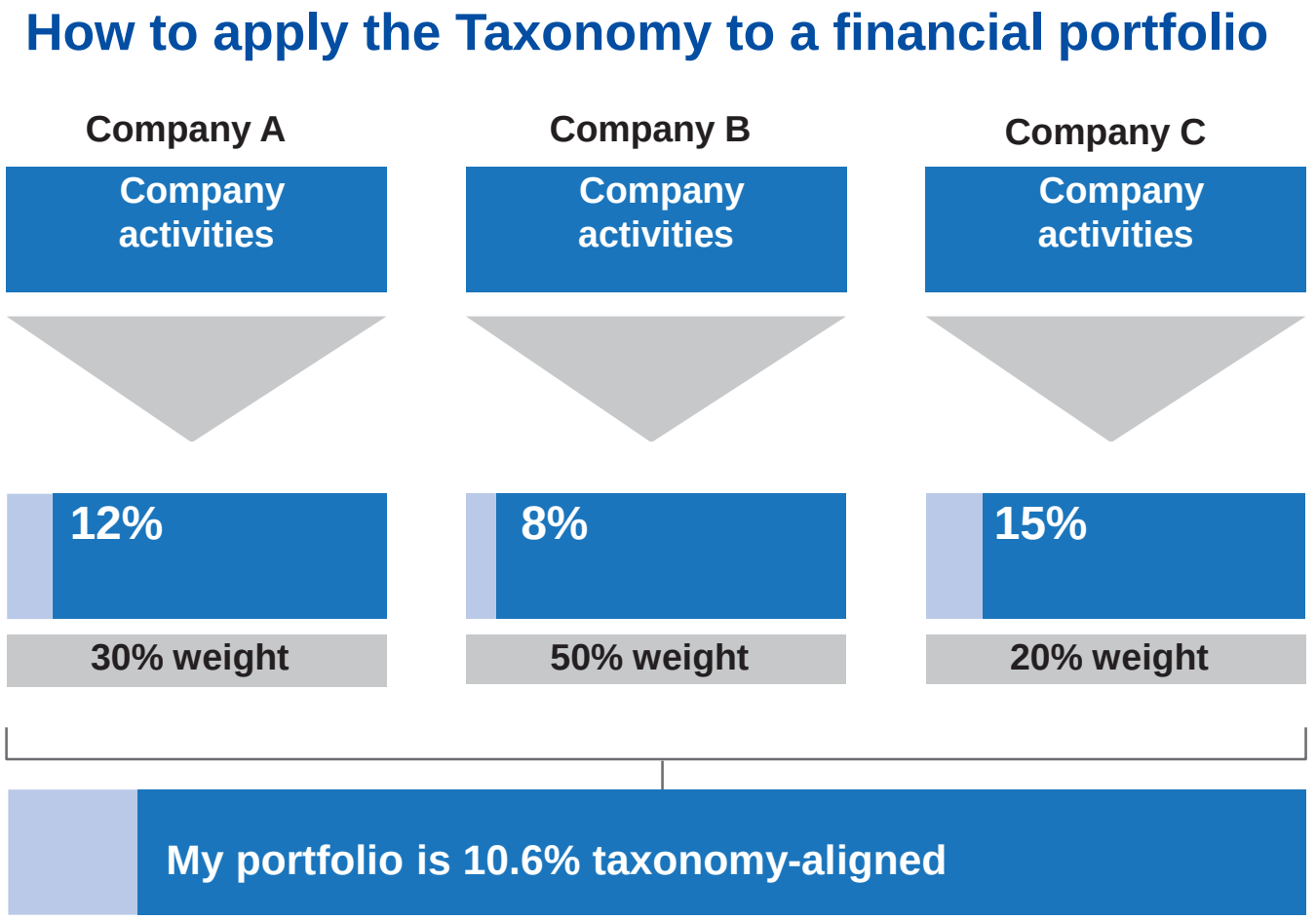
Context (I): gaps regarding “greenness”

- Flourishing literature on green finance, mostly taking for good the following definitions of “green”:
  - **Green bonds:** small fraction of global financial assets, only part of them are certified by third parties, certification schemes differ in criteria
  - **E scores:** differ across sustainability data providers (Berg et al., 2020; Billio et al., 2020), and tend to be based on self-reported data and qualitative features
  - **GHG emissions**: firms’ emissions can only be compared within sectors of activities, mostly look at Scope 1
- In contrast, to our knowledge, little scientific literature investigating:
  - common and **science-based** approaches to **define and measure “greenness”** of financial investments in a replicable and transparent way
  - how much of financial investments can be actually considered green

Our approach

- Use the **EU Taxonomy** to define the greenness of a portfolio
- Challenge: application of EU Taxonomy requires information on Taxonomy-alignment of individual firms, which is currently **not available** and will **never be** a **mandatory** disclosure for some categories of firms.



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Taxonomy-alignment estimates for portfolios

Two approaches

Bottom-up

- Based on firm-level *estimates*, which are:
  - Computed by and different across market data providers
  - Based also on confidential information
  - Available for larger firms

Top-down

- Based on industry-wide assumptions
- Available for all exposures

A methodology to estimate the Taxonomy-alignment of a portfolio

Alessi and Battiston (*IRFA*, 2022)

- First Top-down approach to estimate taxonomy-alignment of portfolios
- Makes use of standardized coefficients (**TAC**s) by NACE sector of the obligor/investee company
- Can be applied to any portfolio, incl. SME lending
- Can be used whenever more granular info is not available
- Available for CC mitigation as Excel tool
- Used by ESMA (Advice on Art. 8 TR), EBA (EU-wide pilot exercise on climate risk) and ESRB (Climate-related risk and financial stability); suggested for use by ESAs (Advices on Art. 8), EBA (ITS on Pillar 3 ESG disclosures) and and Sustainable Finance Platform (Recommendations on Data and Usability of the EU Taxonomy)

Standardised taxonomy-alignment coefficients (TACs)

Electricity, gas, steam and air conditioning supply

4-dgt NACE	Activity	TAC activity	TAC	Rationale
D35.1.1	Production of Electricity from Solar PV	1	0.35	Renewables
D35.1.1	Production of Electricity from Concentrated Solar Power	1	0.35	Renewables
D35.1.1	Production of Electricity from Wind Power	1	0.35	Renewables
D35.1.1	Production of Electricity from Ocean Energy	1	0.35	Renewables
D35.1.1	Production of Electricity from Hydropower	1	0.35	Renewables
D35.1.1	Production of Electricity from Geothermal	1	0.35	Renewables
	[...]			
D35.2.1	Manufacture of biogas and biofuels for use in transport and of bioliquids	1	0.01	Biogas share
D35.3.0	District Heating/Cooling Distribution	0.32	0.21	Renewables
D35.3.0	Installation and operation of Electric Heat Pumps	1	0.21	Renewables
	[...]			

Standardised taxonomy-alignment coefficients (TACs)

Example: Manufacturing

4-dgt NACE	Activity	TAC (activity)	TAC (NACE)	Rationale
C23.5.1	cement	0.05	0.05	ETS approach (*).
C24.4.2	aluminium	0.05	0.05	ETS approach
C24.1.0 C24.2.0 C24.3.1 … C24.5.1 C24.5.2	iron and steel	0.05	0.05	ETS approach
C20.1.1	hydrogen	n.a.	0	negligible
	[…]			

(*) The threshold corresponds to the avg value of the top 10% installations (ETS approach). Assuming installations are uniformly distributed, 5% would then meet the requirements.

Context (II): transition risk

- Approaches on greenness do not provide explicit information on transition risk: two portfolios with equal greenness could include investments into firms with very different levels of transition risk

- E(SG) risk scores: same limitations as E(SG) scores

- Climate Policy Relevant Sectors (CPRS, Battiston et al. 2017): this framework does not translate directly into a risk measure

Standardised transition-exposure coefficients (TECs)

Example: Fossil-fuels

NACE	Activity	TEC	Rationale
B.05	Mining of coal and lignite	1.00	Revenues depend entirely from extraction, manufacturing or sale of fossil fuel.
B.06	Extraction of crude petroleum and natural gas	1.00	Revenues depend entirely from extraction, manufacturing or sale of fossil fuel.
B.08.92	Extraction of peat	1.00	Revenues depend entirely from extraction, manufacturing or sale of fossil fuel.
B.09.1	Support activities for petroleum and natural gas extraction	1.00	Revenues depend entirely from extraction, manufacturing or sale of fossil fuel.
C.19	Manufacture of coke and refined petroleum products	1.00	Revenues depend entirely from extraction, manufacturing or sale of fossil fuel.
D.35.2	Manufacture of gas; distribution of gaseous fuels through mains	1.00	This NACE code contains 4 digit codes with TEC 0.99 and 1. We thus take the maximum.
D.35.23	Trade of gas through mains	1.00	Revenues depend entirely from extraction, manufacturing or sale of fossil fuel.
G.46.71	Wholesale of solid, liquid and gaseous fuels and related products	1.00	Revenues depend entirely from extraction, manufacturing or sale of fossil fuel.
G.47.3	Retail sale of automotive fuel in specialised stores	1.00	Revenues currently depend entirely from extraction, manufacturing or sale of fossil fuel.

Standardised transition-exposure coefficients (TECs)

Example: Electricity production

4-dgt NACE	Activity	TEC	Rationale
D35.1.1	Production of Electricity	0.35	Electricity produced from fossil fuels

Example: Manufacturing

4-dgt NACE	Activity	TEC	Rationale
C23.5.1	cement	0.50	Taxonomy DNSH criteria for Adaptation
C24.4.2	aluminium	0.50	Taxonomy DNSH criteria for Adaptation
C24.1.0, C24.2.0, C24.3.1, …, C24.5.1,C24.5.2	iron and steel	0.50	Taxonomy DNSH criteria for Adaptation
	[…]		

TAC & TEC
Operative workflow

TAC & TEC tool

NACE	TAC	TEC
06.20	0	1
19.20	0	1
29.10	0.02	0.97
35.11	0.35	0.39
…	…	…

(+) JOIN

Holding data: exposure at issuer/borrower level with NACE classification

Issuer	NACE	Holding (Eur)	TAC	TEC
issuer1	06.20	100	0	1
issuer2	06.20	100	0	1
issuer3	35.11	100	0.35	0.39
issuer4	35.11	100	0.35	0.39
…		…	…	…

=

Portfolio level alignment and transition risk exposure

NACE	Holding (Eur)	TA	TE
06.20	200	0	200
35.11	200	0.35*200= 70	0.39*200= 78
	…	…	…

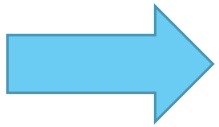
Granularity
- TAC: each economic activity listed in the EU Taxonomy, either single NACE 4 or in one/more NACE codes
- TEC: each economic activity as NACE4

Sources and methods
- climate-relevant technologies included in NACE4 (e.g. electricity generation, automotive)
- available literature on figures at EU level
- Taxonomy regulation criteria
- Average estimate based on simple models documented

A country-level approach
Non-ETS sectors

- Statistics that are at the basis of EU-wide coefficients
- Mostly Eurostat for EU MS
- Comparable statistics for non-EU

TAC Proxy: % of sales of battery electric vehicles
Source: mostly IEA
TEC=1-TAC



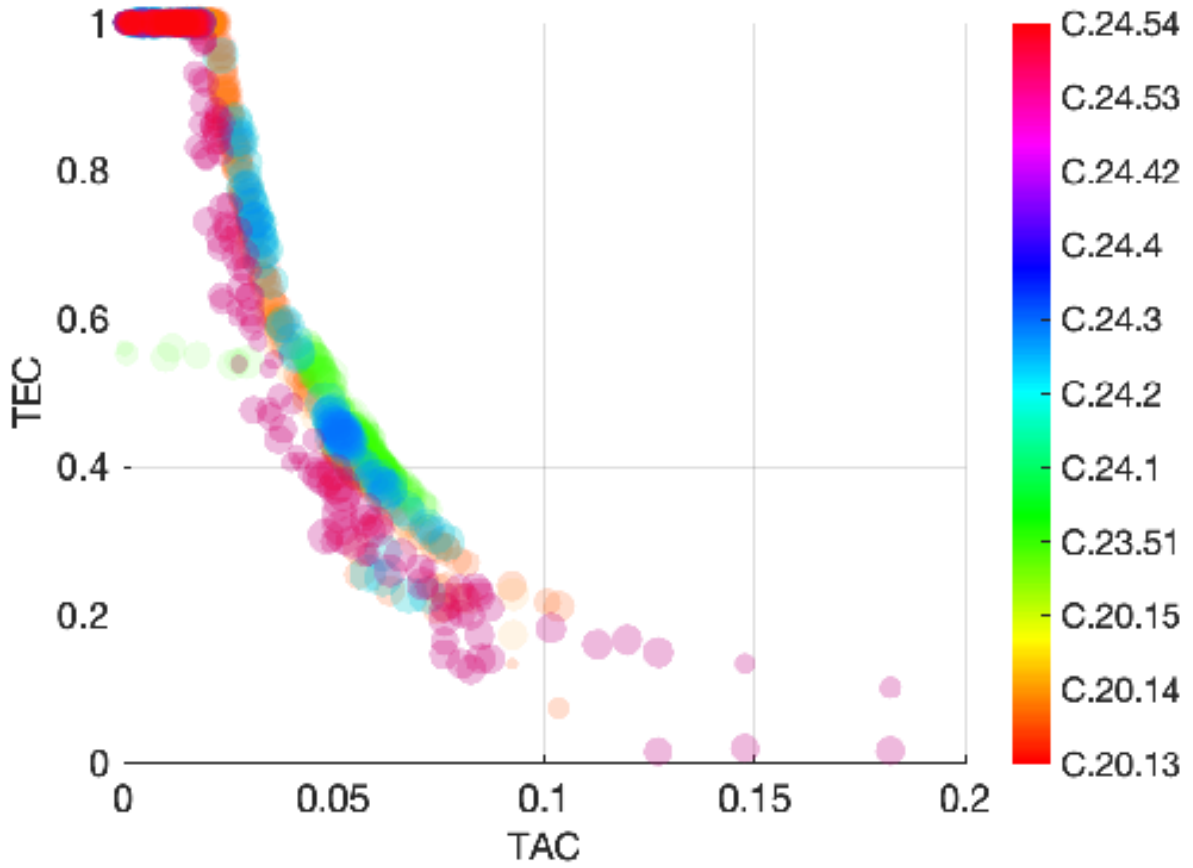
Example: Country TACs and TECs for NACE C.29.1 Manufacture of motor veichles

	TAC	TEC		TAC	TEC
AU	0.03	0.97	JP	0.01	0.99
AT	0.20	0.80	LV	0.05	0.95
BE	0.18	0.82	LT	0.06	0.94
BR	0.00	1.00	LU	0.16	0.84
BG	0.02	0.98	MT	0.09	0.91
CA	0.07	0.93	MX	0.01	1.00
CL	0.00	1.00	NL	0.20	0.80
CN	0.16	0.84	NO	0.86	0.14
HR	0.01	0.99	PL	0.01	0.99
CY	0.01	0.99	PT	0.13	0.87
CZ	0.02	0.98	RO	0.02	0.98
DK	0.16	0.84	RU	0.00	1.00
EE	0.01	0.99	SK	0.01	0.99
FI	0.12	0.88	SI	0.03	0.97
FR	0.13	0.87	KR	0.06	0.94
DE	0.19	0.81	ES	0.04	0.96
GR	0.01	0.99	SE	0.23	0.77
HU	0.05	0.95	CH	0.22	0.78
IN	0.00	1.00	TR	0.00	1.00
IE	0.05	0.95	GB	0.13	0.87
IL	0.05	0.95	US	0.05	0.95
IT	0.10	0.91			

A country-level approach
ETS sectors

- Mostly energy-intensive manufacturing
- The TAC of a given country-sector is proportional to the country-sector efficiency
- Constraint: the weighted avg of country TACs equals the TAC at EU level
- Same for TECs, based on emission intensity
- Data issues: different sources and sector aggregation for emissions (UN CRF) and production (PRODCOM)
- For non-EU: distributional assumptions

TAC vs TEC for ETS country-sectors across EU countries



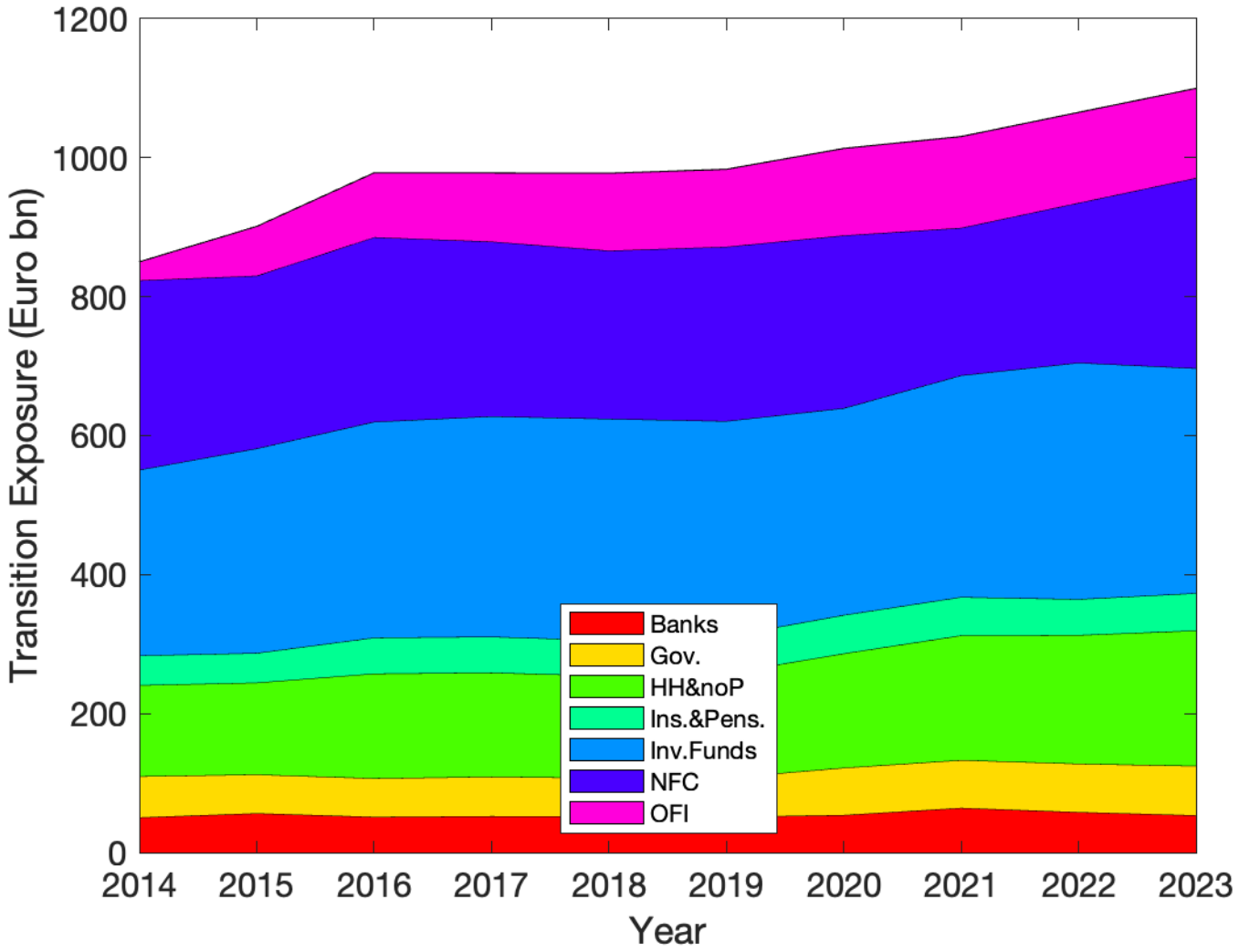
Empirical application
Data

- **Securities Holding Statistics (SHS) Database** - Sector module: confidential security-by-security holdings of EU investors aggregated at the level of ESA2010 sectors, and by country
- **EIKON Refinitiv**: info on instruments, e.g. prices and issuers, notably including the issuer's NACE sector of activity
- Yearly data from 2014Q1 to 2023Q1
- Focus on equities and bonds

Evolution of TE holdings across EU investors

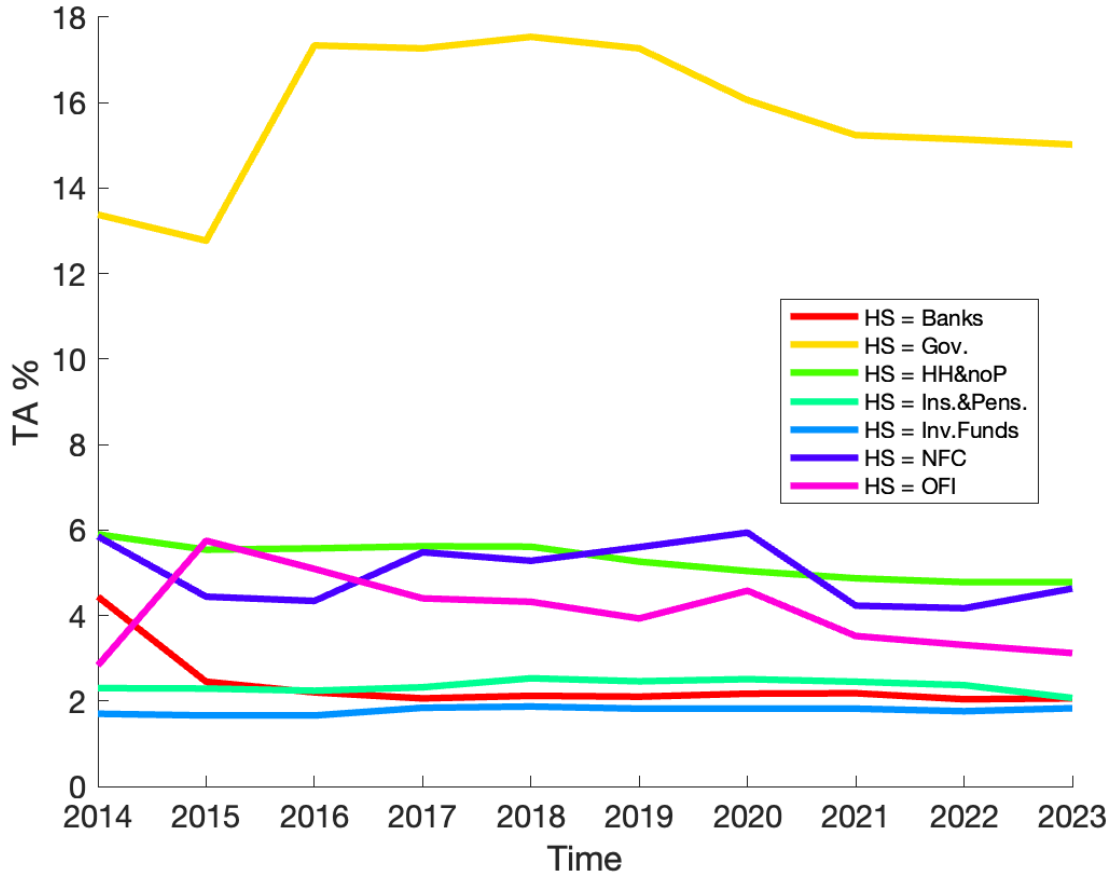
- OFI grow from 5.5% to 18.3% of total transition-risk exposure from 2014 to 2023

- **Transition risk is being taken up by less regulated parts of the financial system** (Alessi at al. 2023, JFS)

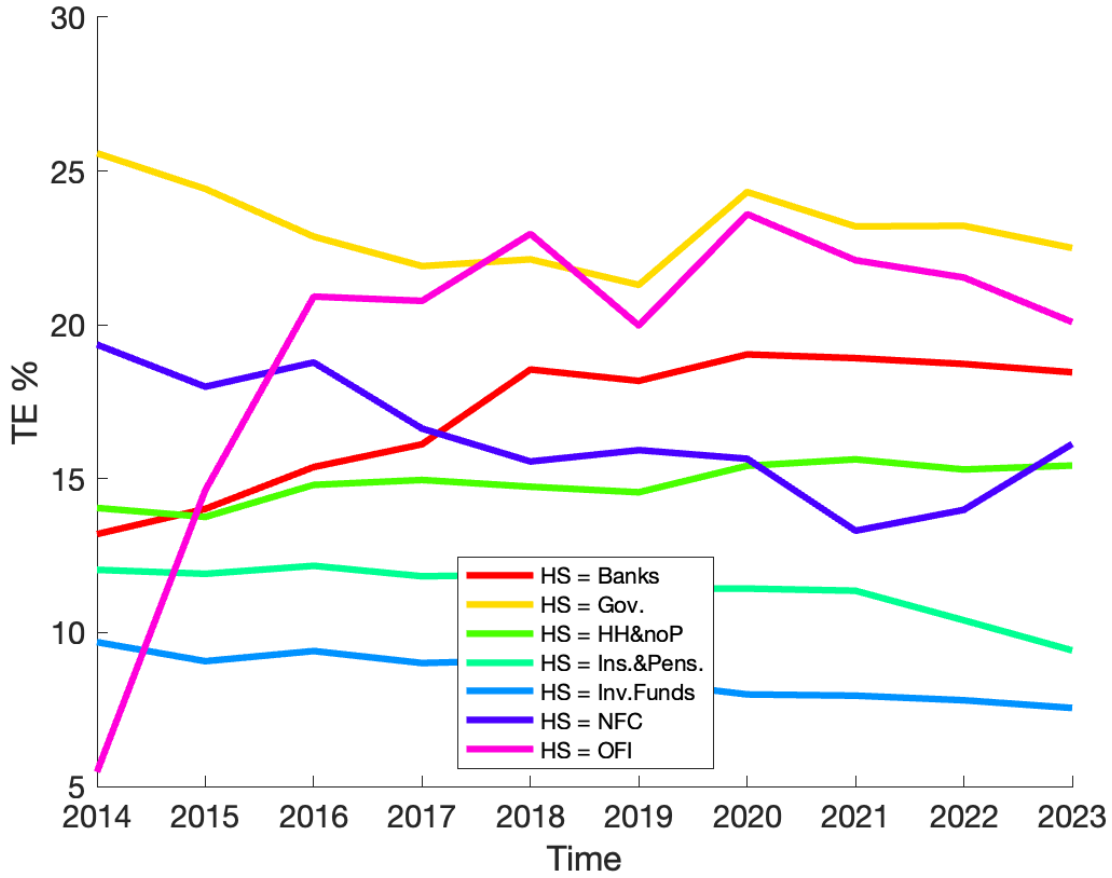


Evolution of TA and TE shares by sector

Avg Taxonomy-Alignment is 3%

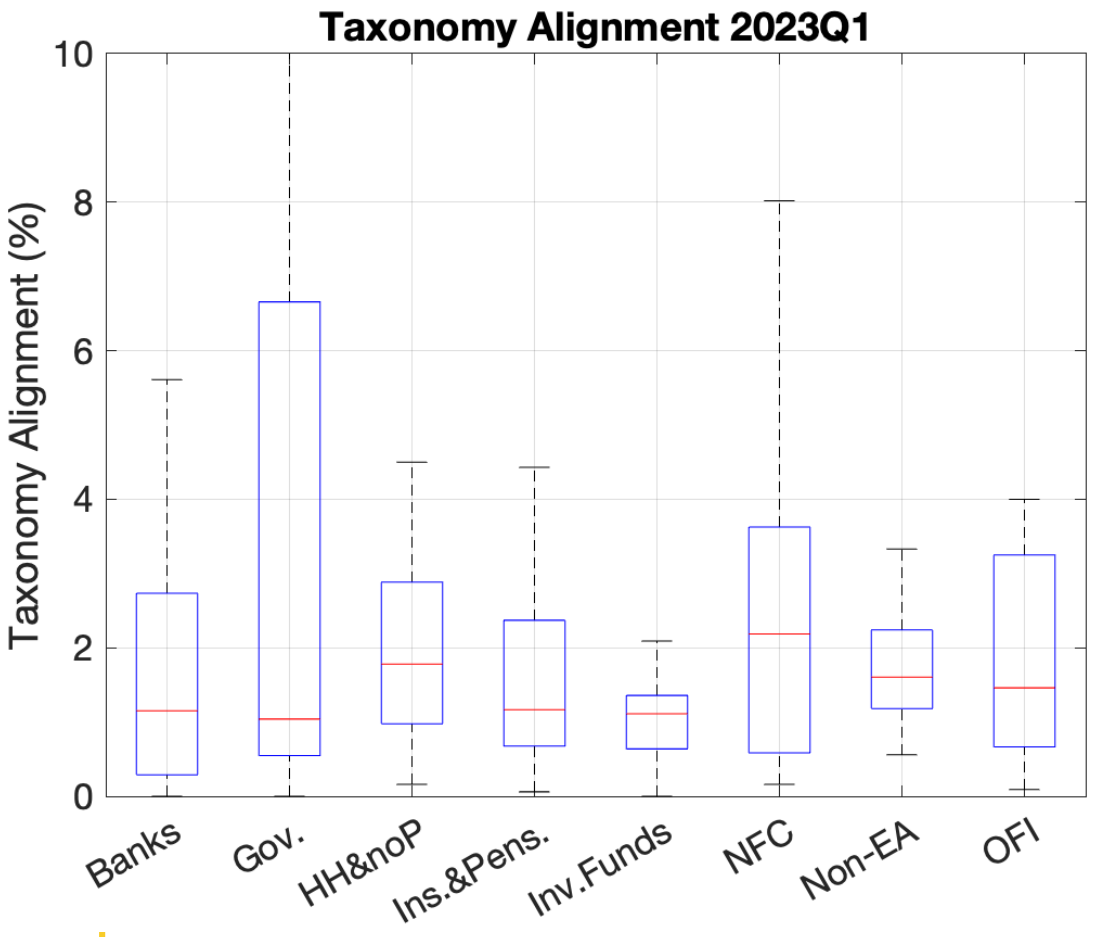


Avg Transition-risk Exposure is 11%

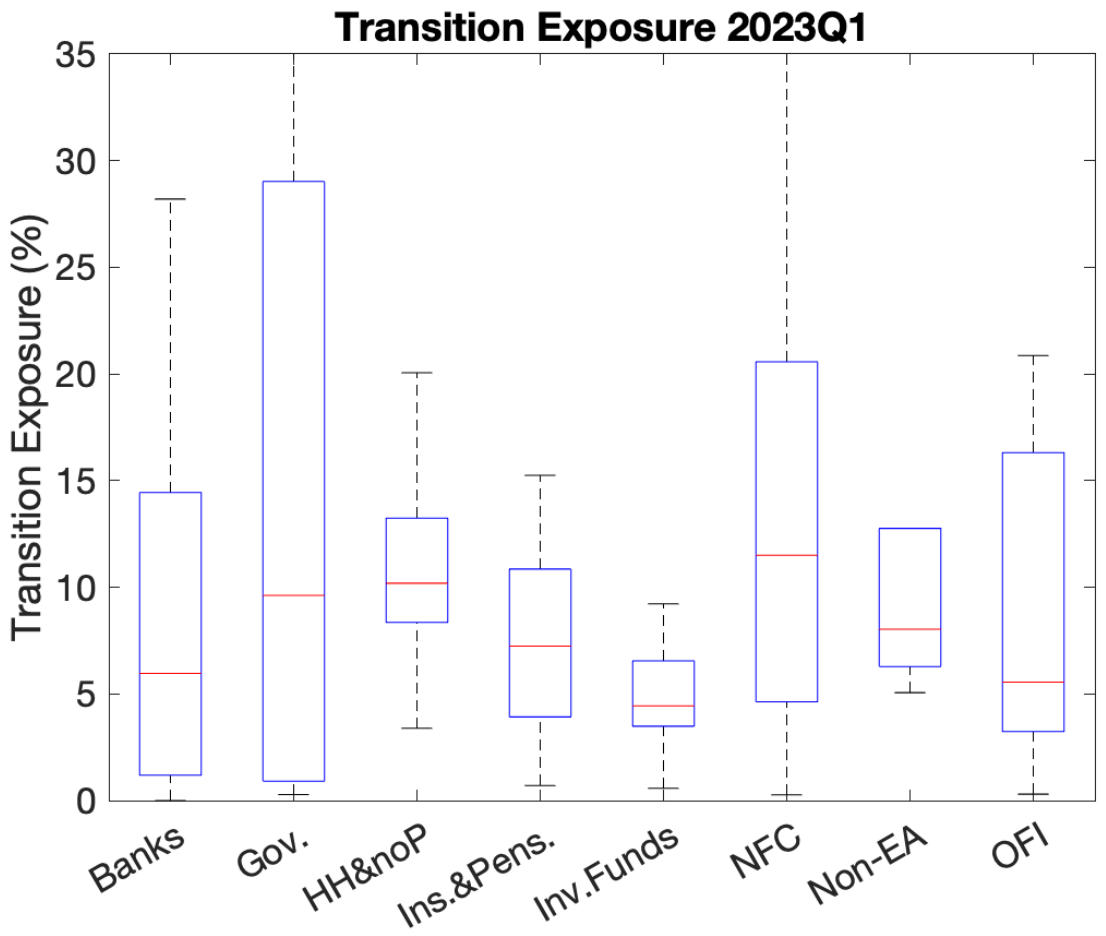


Cross-country heterogeneity

In several cases IQR>median



TE even more dispersed than TA



Thank you

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