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A Framework for Measuring Financial Stress under Disruptive Energy Transition Scenarios

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DeNederlandscheBank

EUROSYSTEEM

Based on:

Vermeulen, Robert, Edo Schets, Barbara Kölbl, Melanie Lohuis, David-Jan Jansen and Willem Heeringa (2019):

"The Heat is on: A Framework for Measuring Financial Stress under Disruptive Energy Transition Scenarios."

DNB Working Paper No. 625.

Note:
Views expressed do not necessarily coincide with those of de Nederlandsche Bank or the Eurosystem.

Outline

- Questions
- Challenges
- Framework
- Details

Questions

1) How to quantify financial stability risks related to energy transition?
2) How large would such transition risks be (approximately)?

⇒ physical risks out of scope
⇒ application to Dutch financial system

Challenges

1) Uncertainty

2) How to model interactions between climate/economy/financial sector?

3) Granularity

4) Narratives

See also: Campiglio et al. (2018).

Framework

Stress test

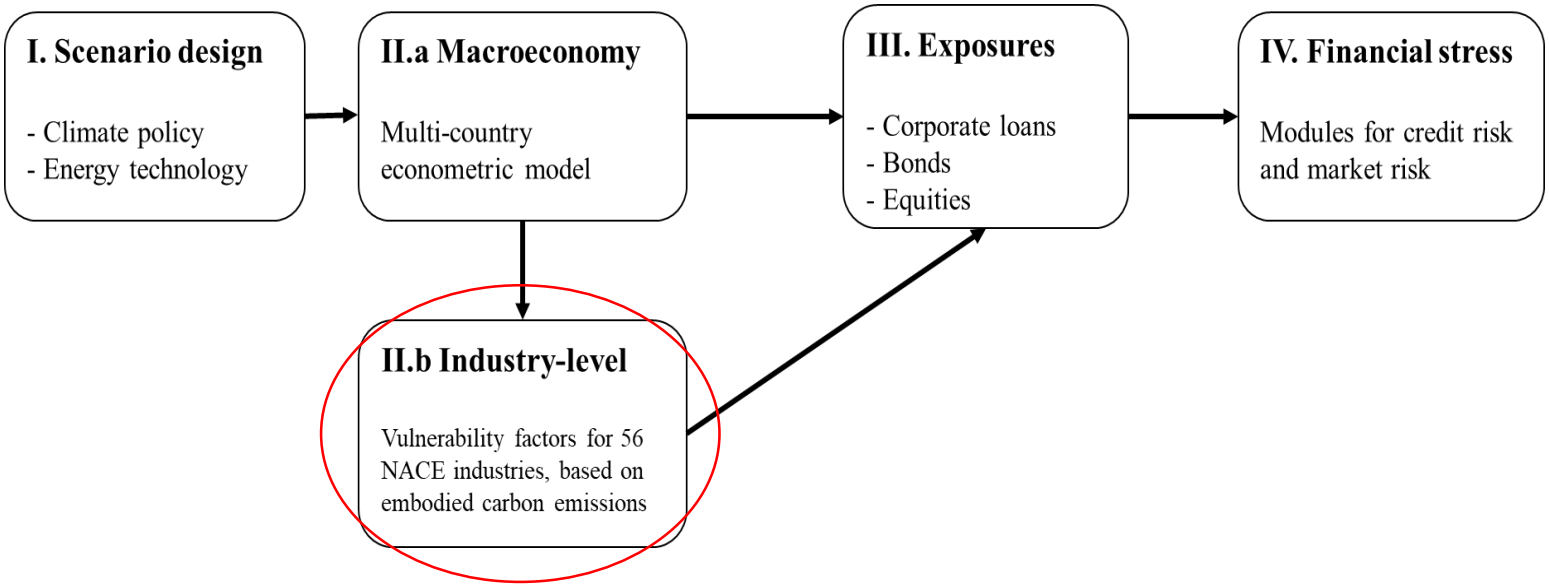
1) Account for uncertainty
2) Familiar instrument to identify vulnerabilities

⇒ Scenarios, not forecasts

⇒ Guiding principle: stay close to current methods for stress testing

⇒ ‘Severe, but plausible’

Stress test framework



Adressing the challenges

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1) Uncertainty => stress test / multiple scenarios

2) Modeling interactions => set of models

3) Granularity => 56 industries, using NACE classification

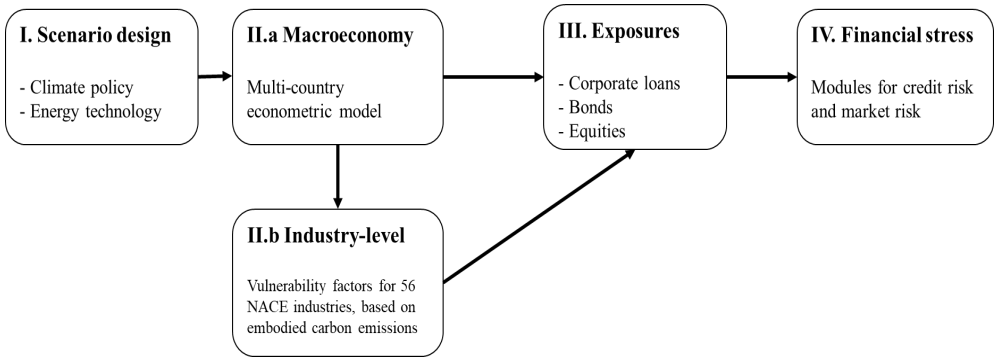
4) Narratives => climate policy / energy technology

Take-aways

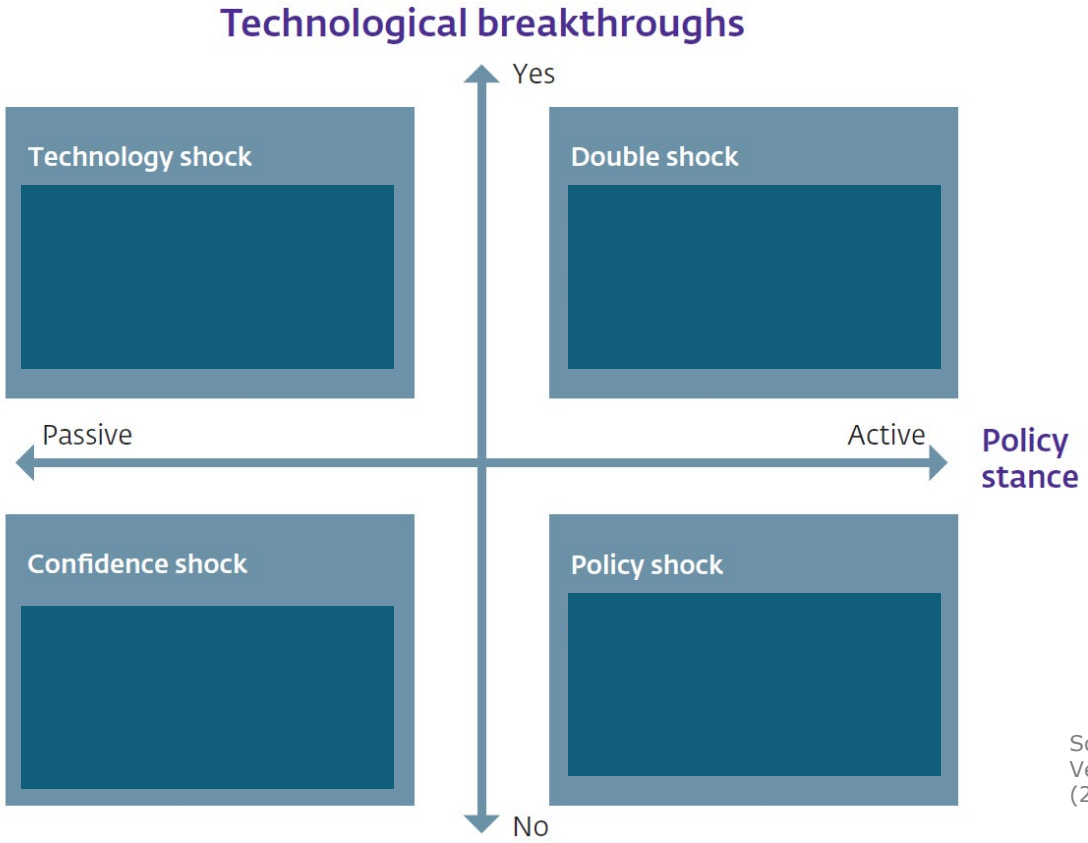
1) Financial stress under disruptive energy transition scenarios can be sizeable.

2) Framework can be applied by macroprudential supervisors or financial institutions.

3) Many important avenues for future research on financial stability implications.

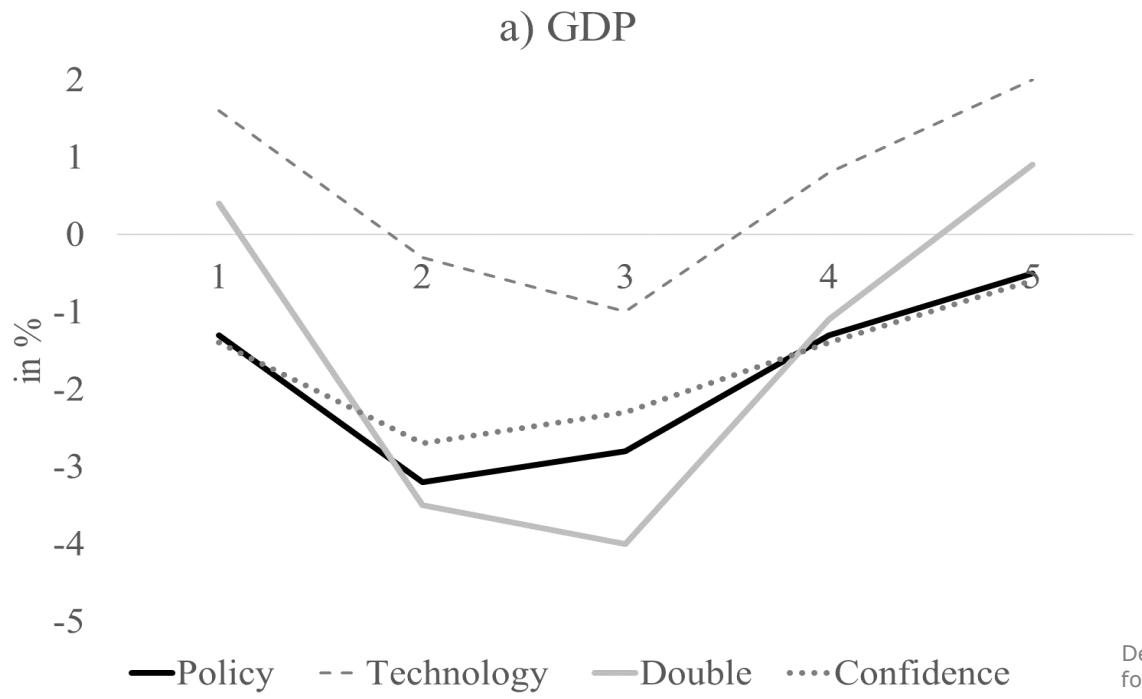


I. Scenarios



Source:
Vermeulen et al. (2018).

II.a Macroeconomy



Deviations from baseline level in four disruptive scenarios.

II.b Industry effects

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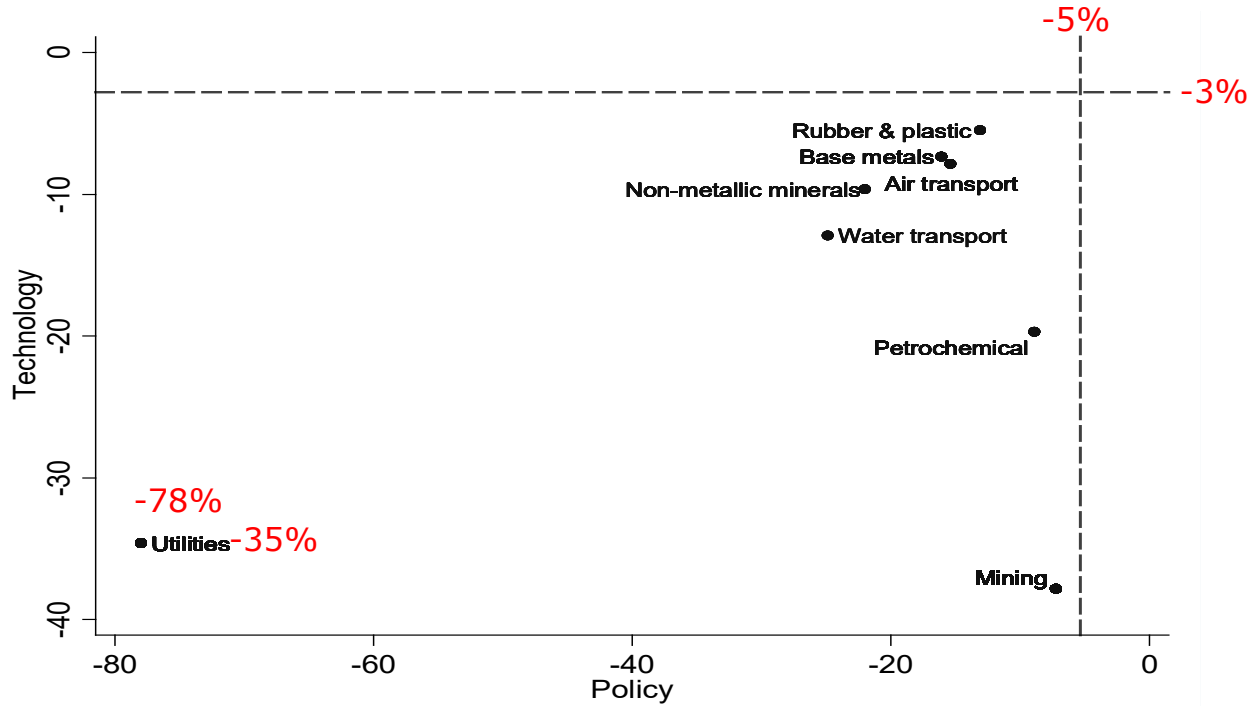

Equity indices in policy (x-axis) and technology (y-axis) scenarios. Dotted lines indicate aggregate changes in the respective scenarios.

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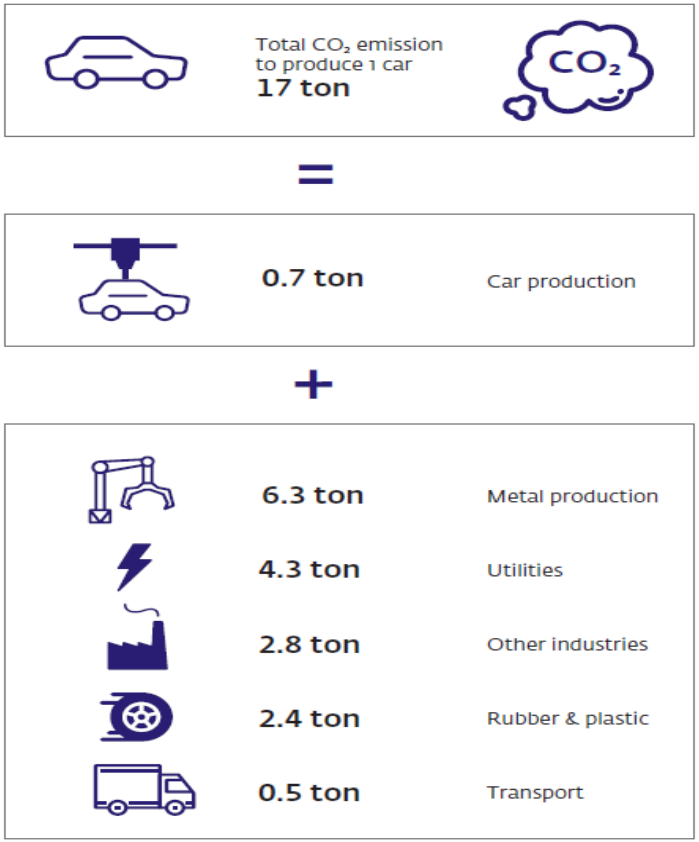
II.b Industry effects

Transition vulnerability factors:

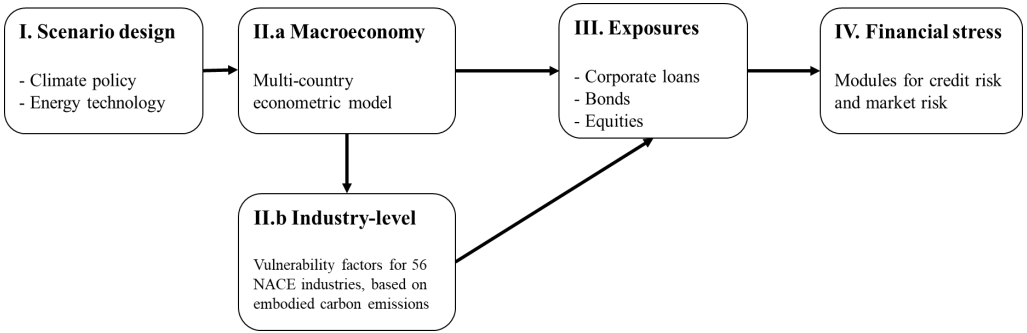
- measure transition risks at the industry-level
- based on an input-output analysis
- reflect embodied CO_2 emissions



Source: Vermeulen et al. (2018).

III. Exposures

- EUR 2.3 trillion
- 80 financial institutions in NL
  - Bond & equity holdings
  - For banks, also corporate loans
- Positions at end 2017



IV. Risk modules

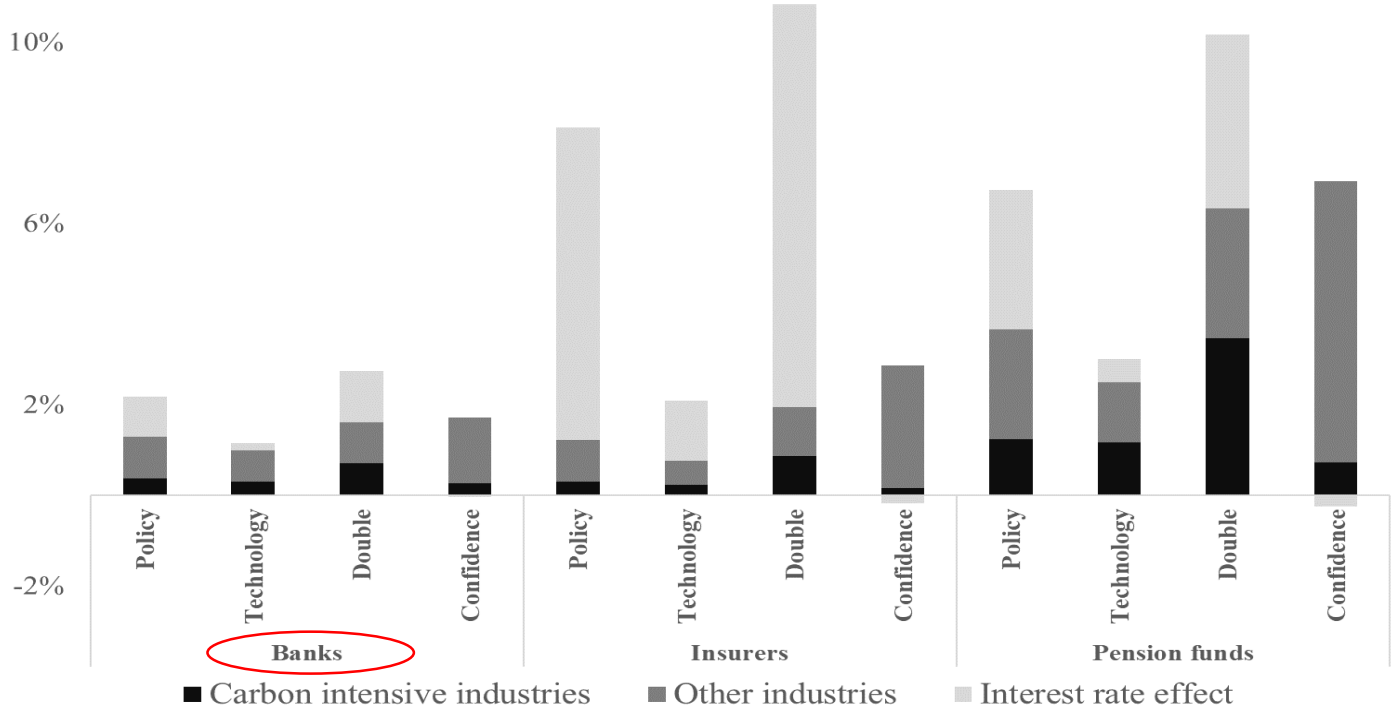
Credit risk: additional losses on corporate loans over five-year period

Market risk:

- bonds: interest-rate shock / credit spreads
- equities: industry-specific shocks

Calculations using top-down stress test model at de Nederlandsche Bank (Daniels et al. 2017).

IV. Losses under disruptive transition scenarios



% losses on asset positions for banks, insurers and pension funds in four transition scenarios.
Source: Vermeulen et al. (2019).

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References

Campiglio, Emanuele, Yannis Dafermos, Pierre Monnin, Josh Ryan-Collins, Guido Schotten, and Misa Tanaka (2018). Climate change challenges for central banks and financial regulators. *Nature Climate Change* 8: 462–468.

Daniels, T., Duijm, P., Liedorp, F. and Mokas, D. (2017), A top-down stress testing framework for the Dutch banking sector, DNB Occasional Studies 2017 No. 3.

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Vermeulen, Robert, Edo Schets, Barbara Kölbl, Melanie Lohuis, David-Jan Jansen en Willem Heeringa (2019) The heat is on: A Framework for Measuring Financial Stress under Disruptive Energy Transition Scenarios. DNB Working Paper No. 625.