How Should Bank Capital Regulation Respond to Climate Change?

Martin Oehmke

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Capital Requirements and Climate Change: Motivation

Climate change has become a major topic for financial regulators

- ECB, Bank of England have conducted climate stress tests
- Federal Reserve announced "pilot climate scenario analysis exercise"

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I will build on Oehmke and Opp (2024): "Green Capital Requirements"

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- Ineffective if bank capital is ample (or firms can access public markets)
- If impact is possible, it may require sacrificing financial stability
- Capital requirements may help facilitate carbon taxes if environmental regulation subject to commitment problem

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A single-period model, universal risk-neutrality

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Continuum of cashless, **bank-dependent firms**

- finite mass π_q of type $q \in \{\textbf{C}\text{lean}, \textbf{D}\text{irty}\}$
- invest I at $t = 0$, cash flow X_q at $t = 1$
- allow for arbitrary profitability distributions for types C and D
- type D produces higher emissions $\phi_D > \phi_C$

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A **regulator** who sets **capital requirements** $\underline{\mathbf{e}} = \{\underline{e}_C, \underline{e}_D\}$

- lower deposit insurance put and affect mass of funded firms ω_q

Roadmap

Preliminary analysis:

Banking sector equilibrium with heterogeneous borrowers

Policy analysis:

Ad-hoc green tilts to capital requirements:

- Brown penalizing factor (higher capital requirements for dirty loans)
- Green supporting factor (lower capital requirements for green loans)

Optimal prudential capital requirements:

- Considers financial stability, reacts to emerging climate risks

Welfare-optimal regulation:

- Accounts for all climate externalities, subject to regulatory constraints

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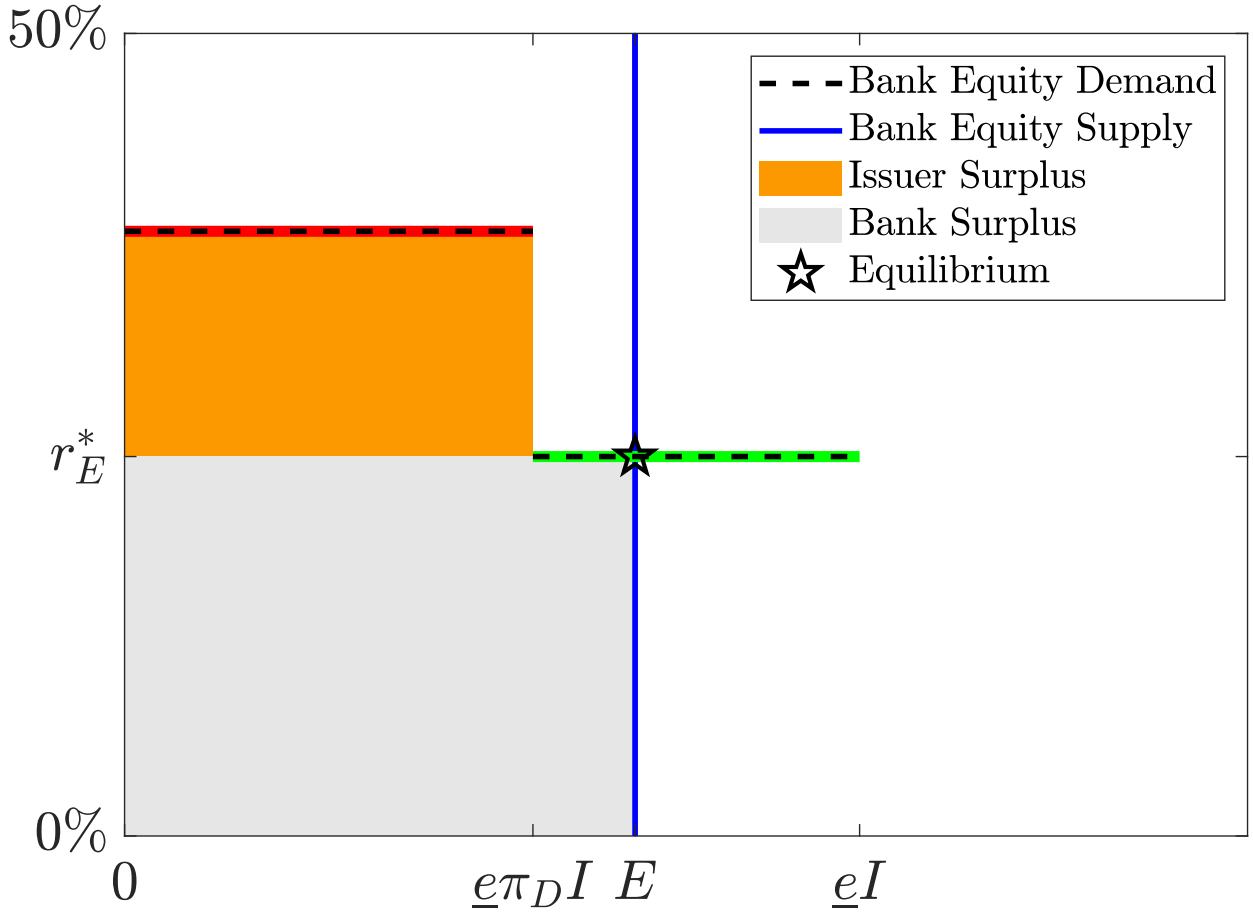
Demand curve: Maximum RoE type q can offer on a unit of bank equity:

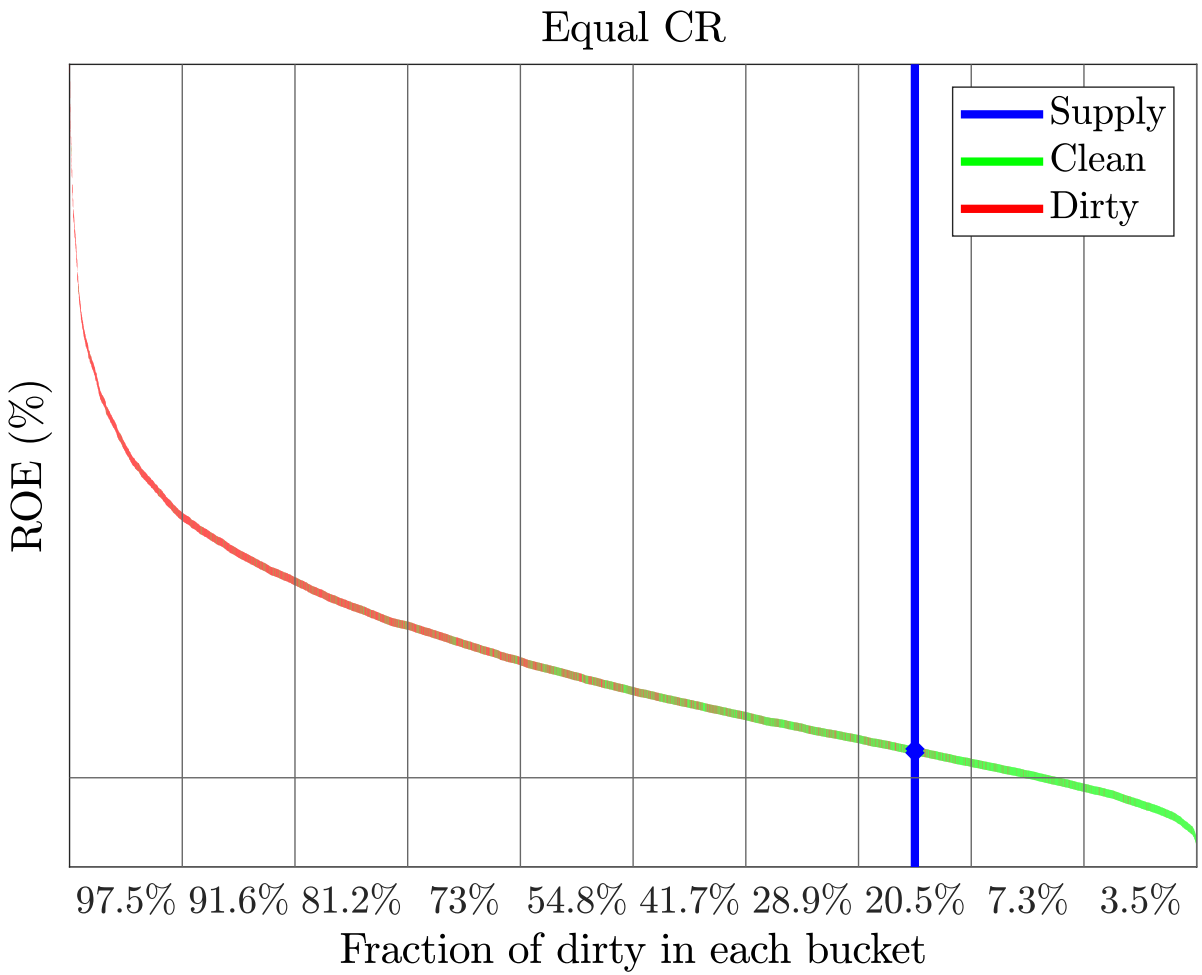
$$r_q^{max}(\underline{e}_q) = \frac{\text{NPV}_q + \text{PUT}_q}{I\underline{e}_q}$$

- **Numerator:** bilateral surplus (cash flow and deposit insurance put)
- **Denominator:** amount of bank equity taken up by the loan

Equilibrium Illustration



A Smoother Version (Heterogeneous Types)



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For illustration:

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- assume dirty loans rank above clean at initial capital requirements

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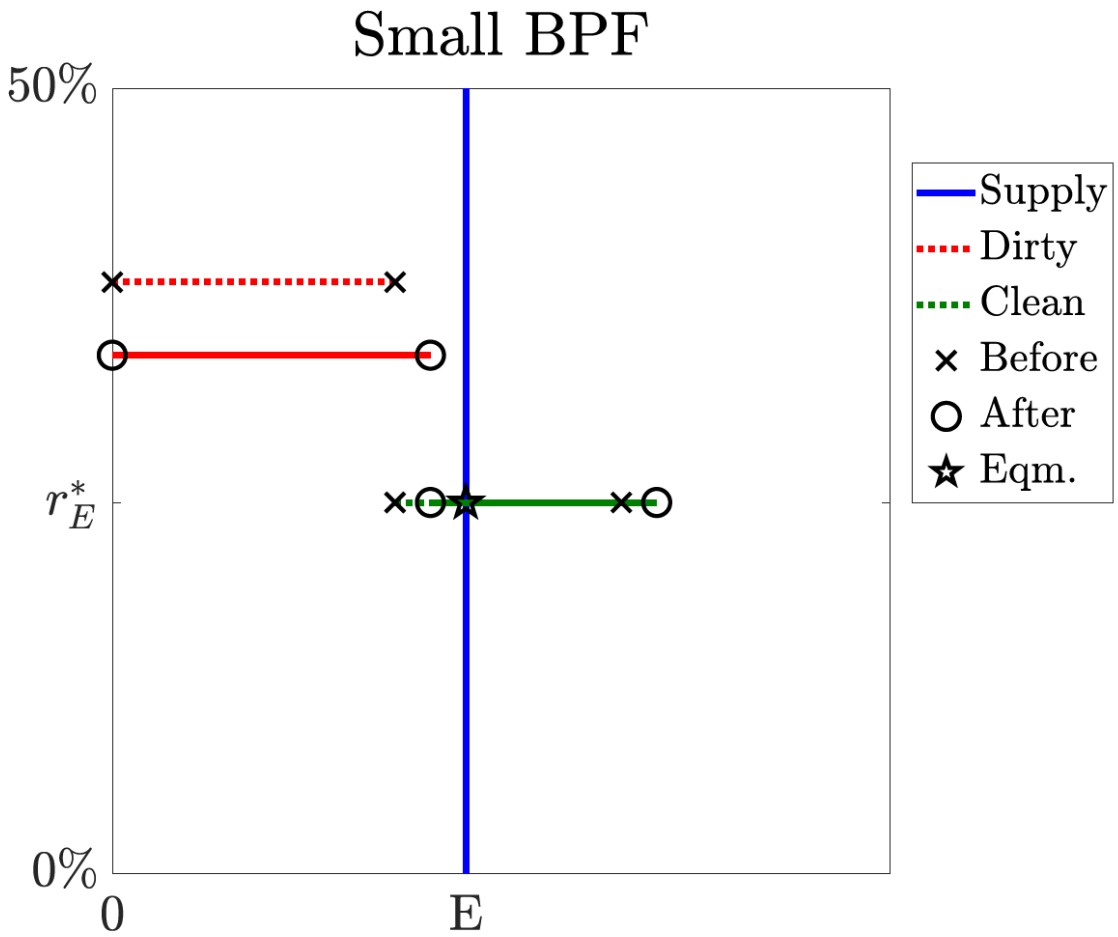
For now, ad-hoc interventions (but insights relevant for optimal regulation)

Brown Penalizing Factor



Small BPF crowds out marginal loan, which can be clean

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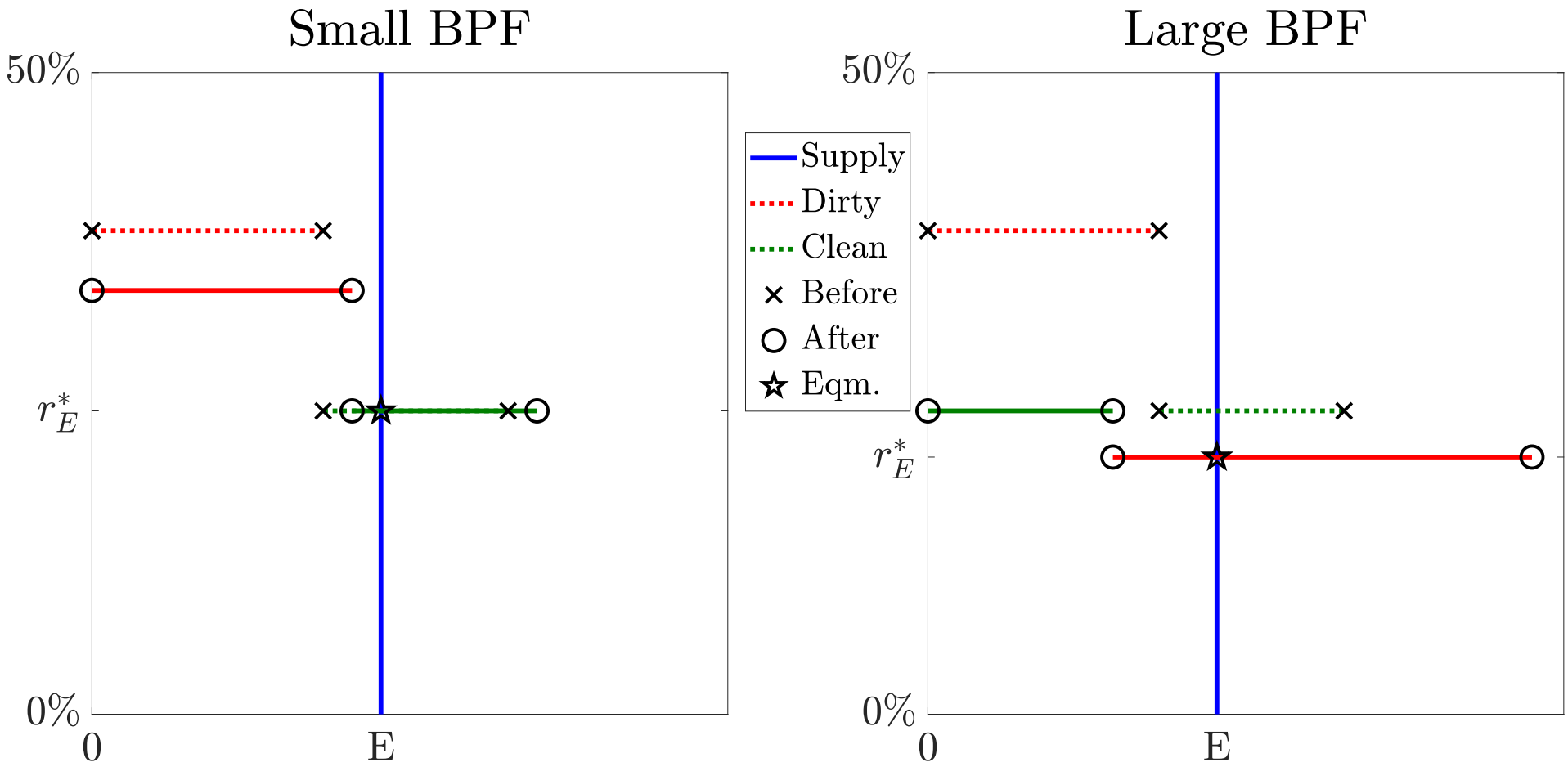

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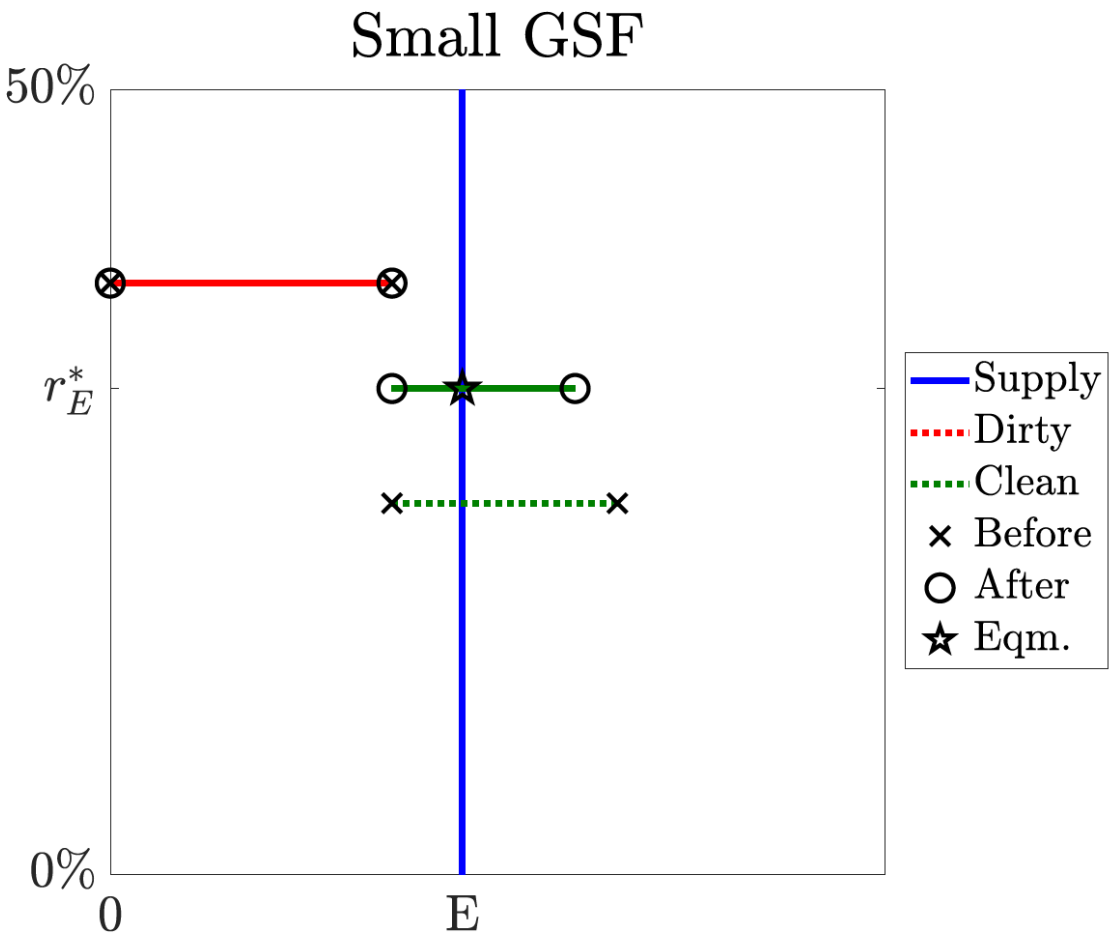

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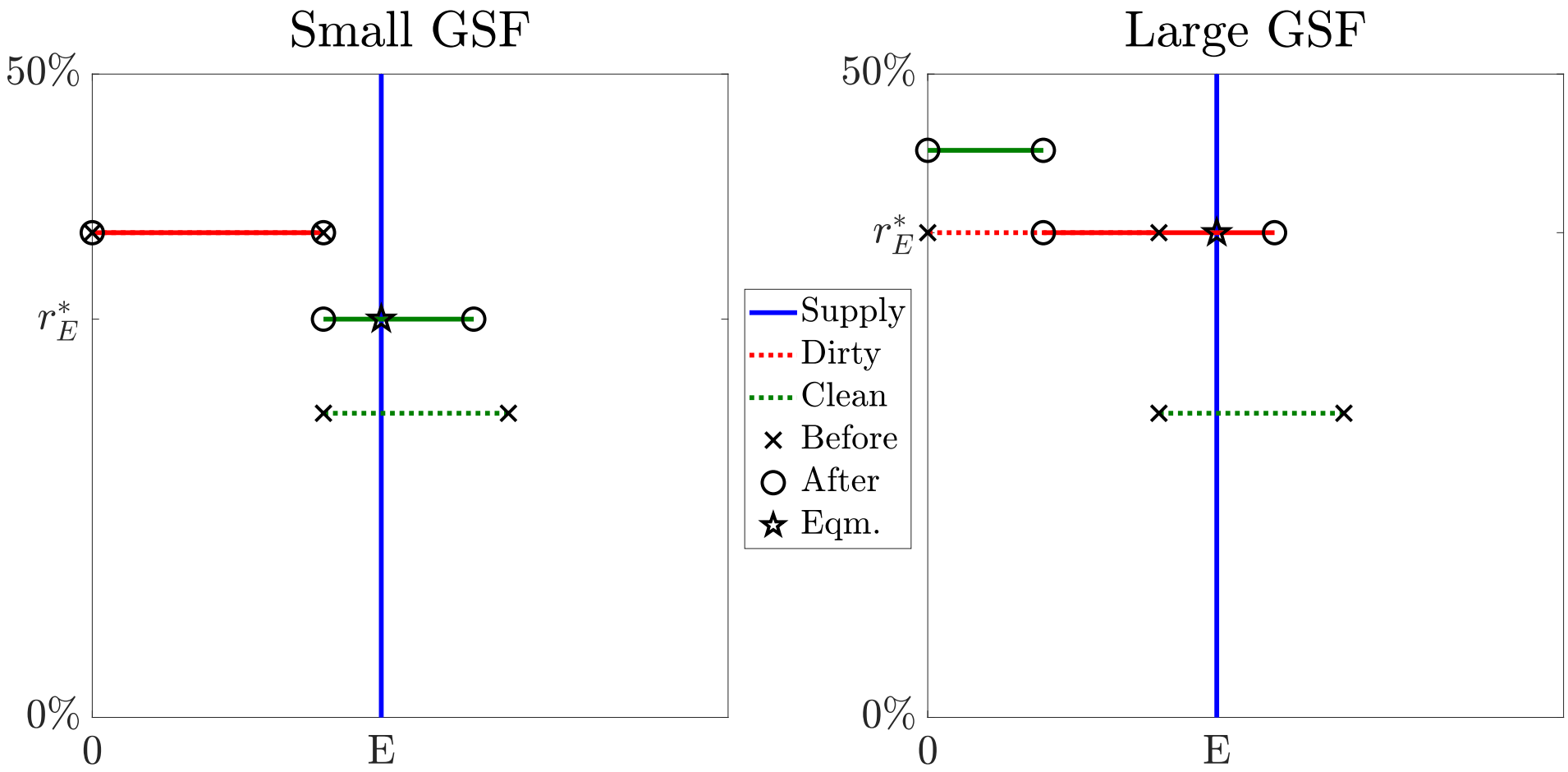

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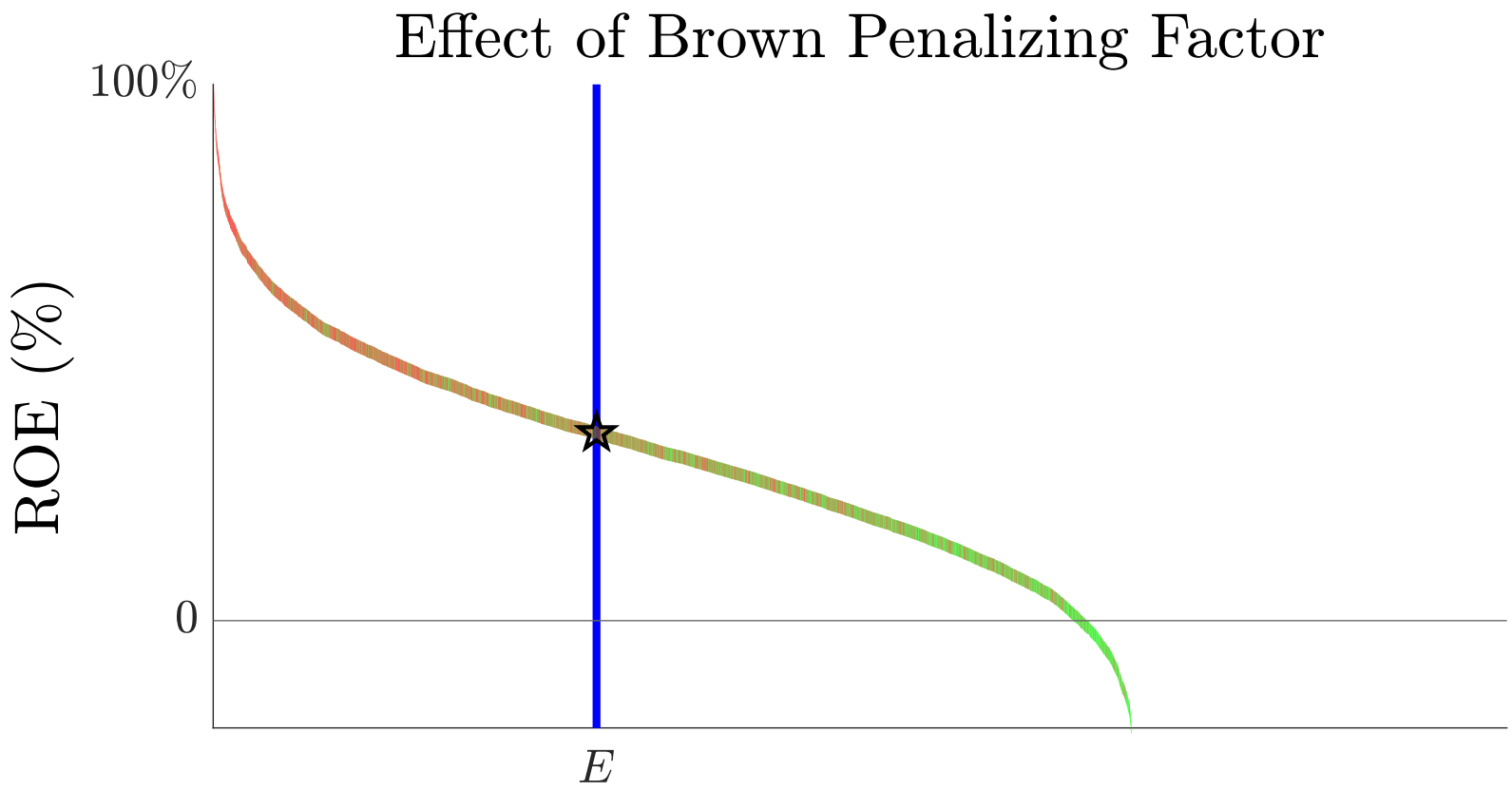
Positive Analysis: Broader Takeaway

Green tilts to capital requirements have **substitution** and **income** effects:

- **Substitution effect:** relatively cheaper to fund clean loans
- **Income effect:** Banks can afford to fund more/less of both types
  GSF and BPF have different income effect sign!

General insights also apply in heterogeneous-type setting

Effect of BPF with Heterogeneous Types



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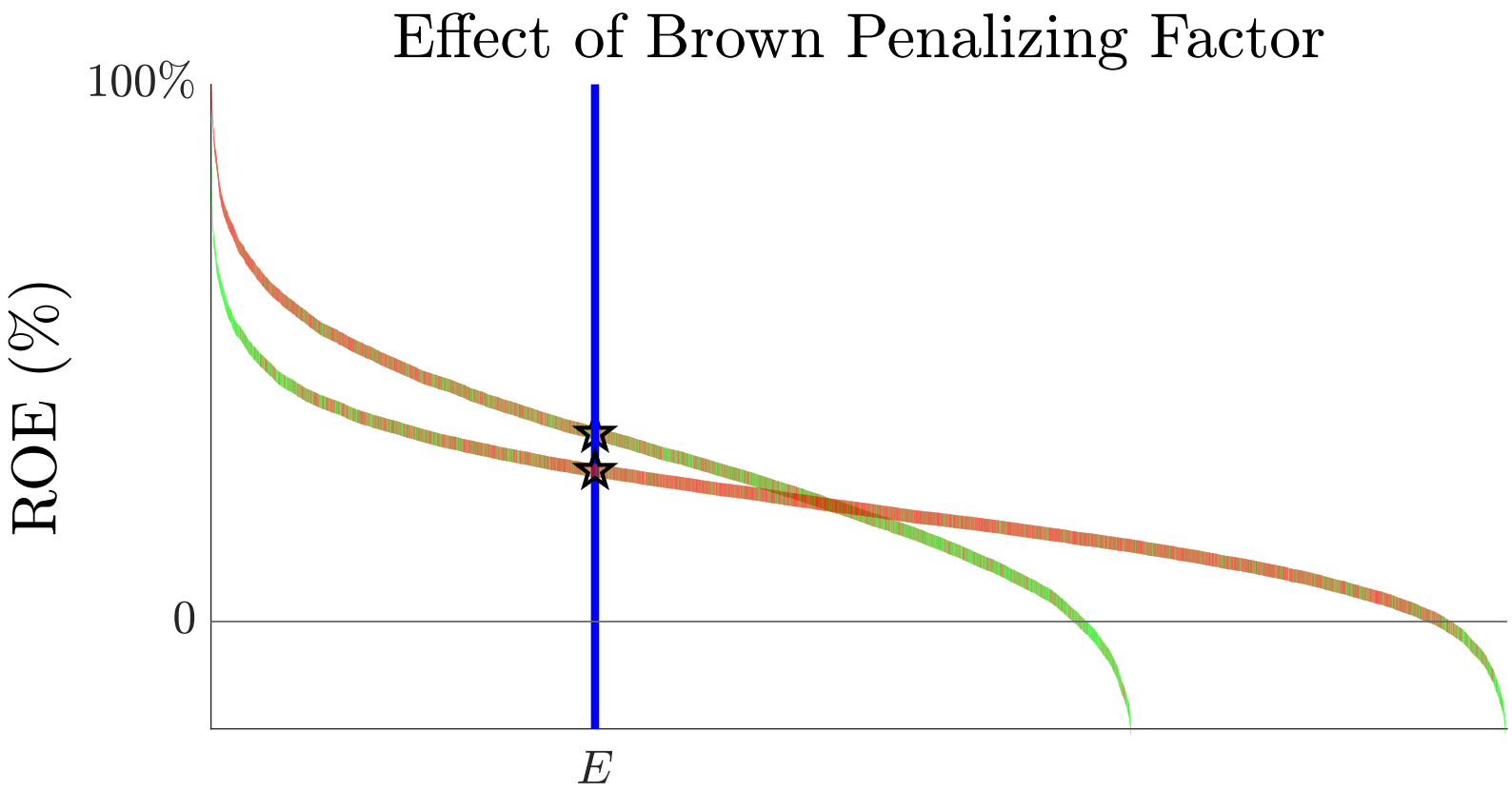

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where $\tilde{\omega}_q$ is fraction of equity allocated to type q and

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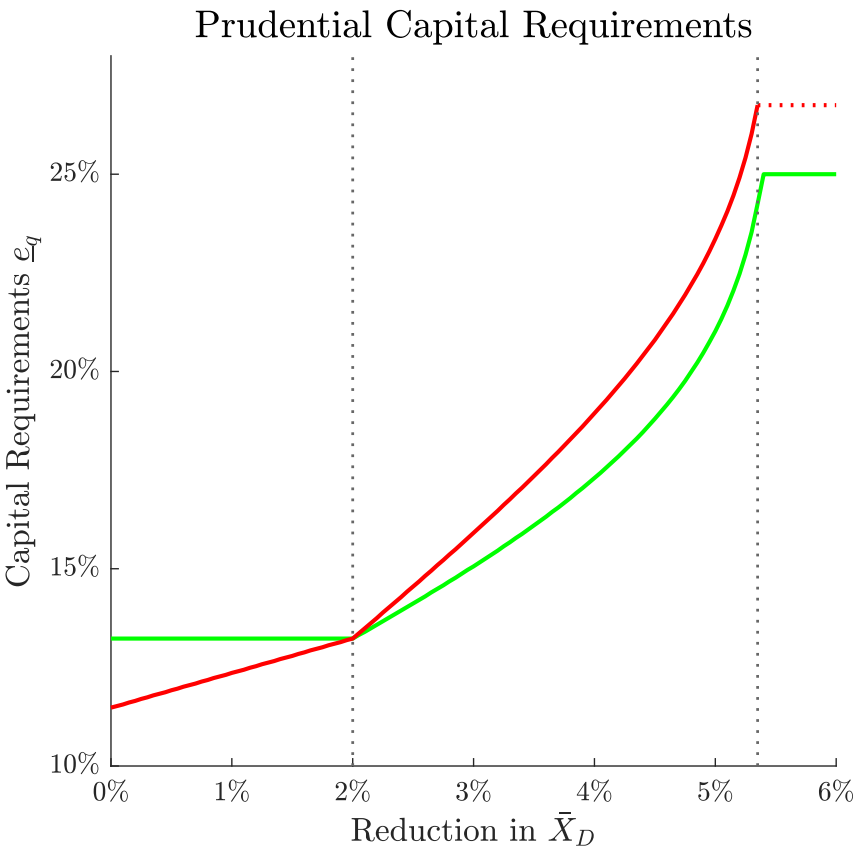
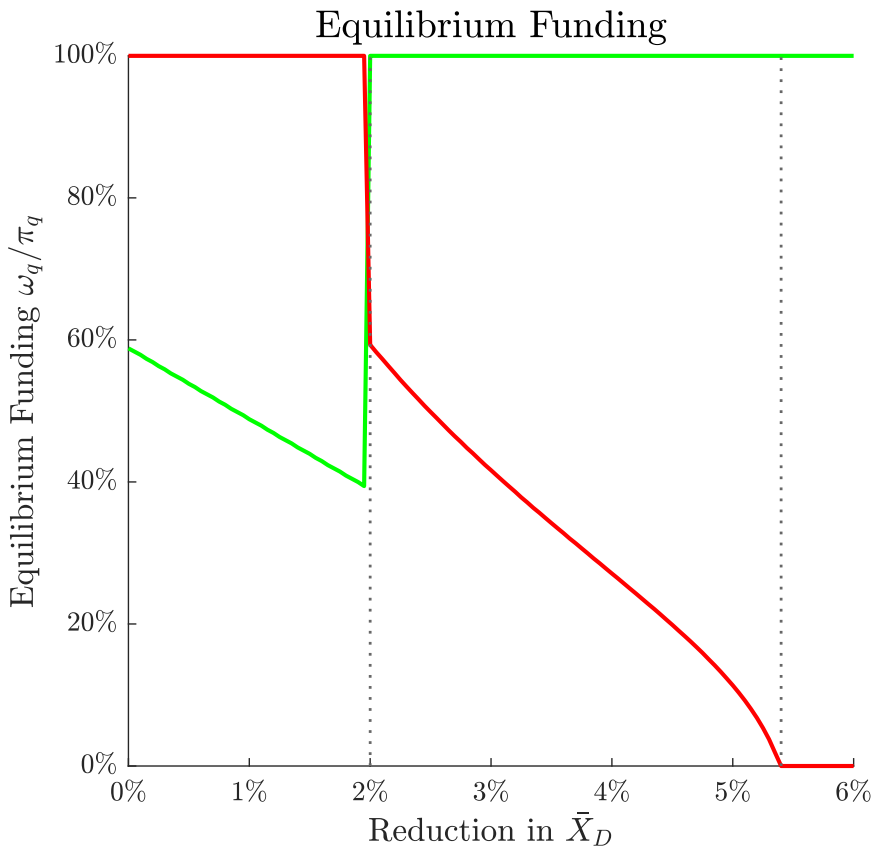
Climate-related financial risk enters via NPV & deposit insurance put

Incorporating Transition Risks





Welfare-Optimal Regulation: First-Best Benchmark

Planner has **carbon tax** and **capital requirements** as policy tools

Planner **prevents** projects with **negative social value**:

- set capital requirement of 100% (no deposit insurance put distortion)
- set expected carbon tax $\overline{\tau}_q = \phi_q$ (aligning private and social value)
- assess carbon tax without causing additional bank defaults

Endogenous Prudential Mandate:

- suppose government sets optimal carbon taxes
- then a bank regulator with a prudential mandate maximizes welfare

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Carbon Taxes under Non-Commitment

Carbon taxes may be absent due to government **commitment problem**:

- government fears carbon tax imposes significant losses on banking sector (**stranded asset risk**)
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Higher **capital requirements** can help **facilitate optimal carbon taxes**
NB: specific conditions needed, no blank cheque for intervention

Summary

Flexible framework to study **green capital requirements** under varying assumptions about the severity of climate risks and objective functions.

Positive analysis: brown penalizing factor can crowd out clean loans

Normative analysis:

- **Prudential regulation** can deal with climate-related financial risks and is **welfare-maximizing in presence of optimal carbon tax**
- In absence of optimal carbon tax, **reducing pollution via capital requirements not always possible** and can require sacrificing financial stability
- **Capital requirements** can reduce stranded asset risk and **facilitate carbon tax**