Navigating Structural Change: Evidence from Municipal Finances and Bond Market Pricing During the Coal Transition

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Federal Reserve Board

14th Annual Municipal Finance Conference

July 22, 2025

Disclaimer: The views expressed do not necessarily reflect the position of other members of the research staff or the Board of Governors of the Federal Reserve System.

Local Fiscal Risks from Structural Change

- Technological progress and policy shifts have long driven major economic transformations, reshaping regional economies
  - **Recent structural changes** from automation in manufacturing to the rapid expansion of fracking created new opportunities, but also left some communities behind.

- **Our contribution:** Empirical evidence on fiscal risks from structural change
  - How do local governments adjust to industrial decline?
  - How do bond market investors anticipate and price these fiscal changes?

- This is important for policymakers, as these changes affect a community's ability to fund essential services.

Local Fiscal Risks through the Lens of Coal Transition

- Three critical **research questions**:
  1. How does coal's decline impact municipal finances and borrowing costs?
  2. What do bond yields reveal about investors' perceptions of the decline in coal (short- vs. long-term shifts)?
  3. Are some communities better positioned to minimize the effects of coal decline?

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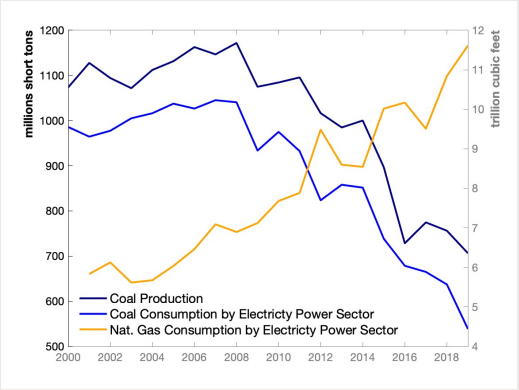

- **Quasi-natural experiment:** Structural shift in electricity generation during fracking boom.
- The share of electricity generated by coal-fired plants down from 50% to under 20%.
- **Exogenous shift:** from the perspective of local communities.

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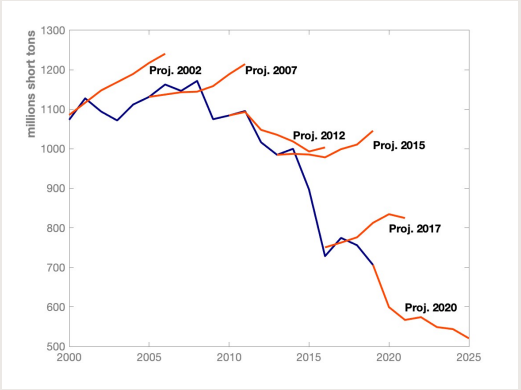


- **Quasi-natural experiment:** Structural shift in electricity generation during fracking boom.
- The share of electricity generated by coal-fired plants down from 50% to under 20%.
- **Exogenous shift:** from the perspective of local communities.
- **Unexpected secular decline:** forecasts consistently optimistic, failing to anticipate decline in coal.

Data Sources and Key Variables

Coal Mining Activity

- Coal employment
- Coal production data

Source: MSHA
Years: 2000–2019

Municipal Finances

- Municipal debt levels
- Revenue figures
- Interest payments

Source: Census of Governments
Years: 2002–2019

Analysis: County-level Impact of Coal Decline

$$\mathbf{C}_{i,t} \quad \mapsto \quad Y_{i,t}$$

Municipal Bonds

- Bond yields
- Bond characteristics (credit rating, maturity, issued size)
- Issuer's county

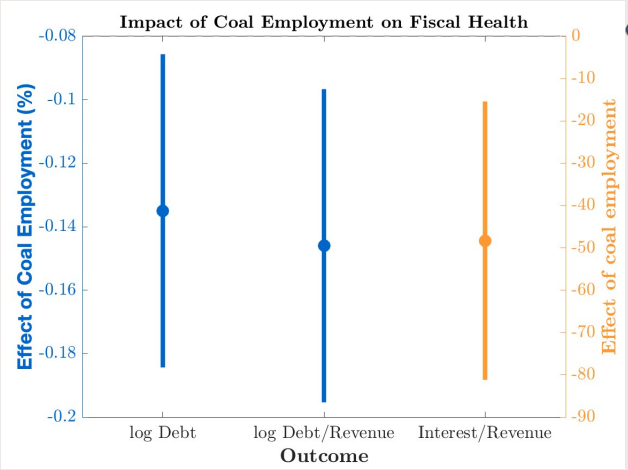
Source: Mergent, Refinitiv, ICE
Years: 2004–2019

Local Economic Indicators

- GDP, employment across industries, population
- Fracking prospectivity
- Wind and solar potential

Source: Several sources
Years: 2000–2019

Key Finding 1 – Coal Decline Deteriorates Fiscal Health



- A one standard deviation decline in coal employment leads to a ...
  - 14% annual increase in debt levels
  - 15% annual increase in the debt-to-revenue ratio
  - 1/2 percentage point annual increase in interest payments as a share to revenue.

$$y_{i,t} = \beta\, \mathbf{C}_{i,t-1} + \theta'\, \mathbf{Z}_{i,t} + \theta_{r,t} + \mu_i + \varepsilon_{i,t}$$

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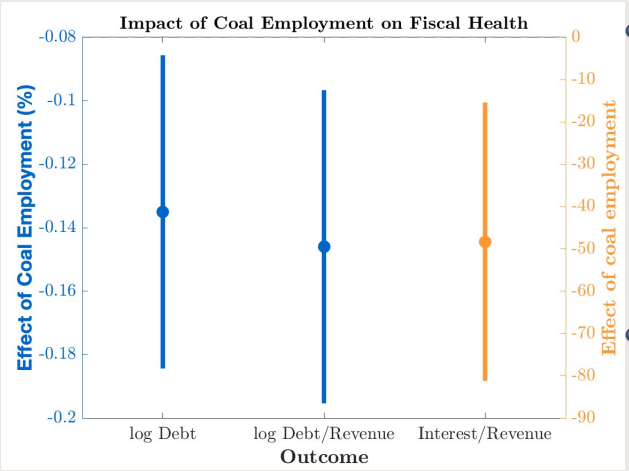

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  - 14% annual increase in debt levels
  - 15% annual increase in the debt-to-revenue ratio
  - 1/2 percentage point annual increase in interest payments as a share to revenue.
- **Implication:** As coal jobs disappear, local governments are facing a severe fiscal squeeze.

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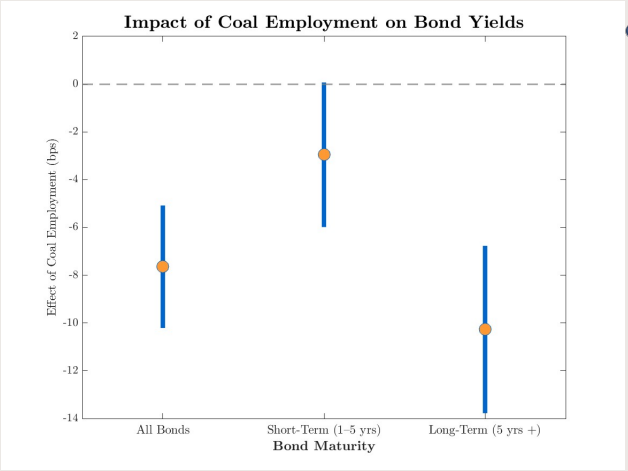
Key Finding 2 – Coal Decline Increases Muni Bond Yields



- A one standard deviation decline in coal employment leads to
  - An 8 basis point increase in municipal bond offering yields
  - This effect is equivalent to almost 20% of the average offering spread

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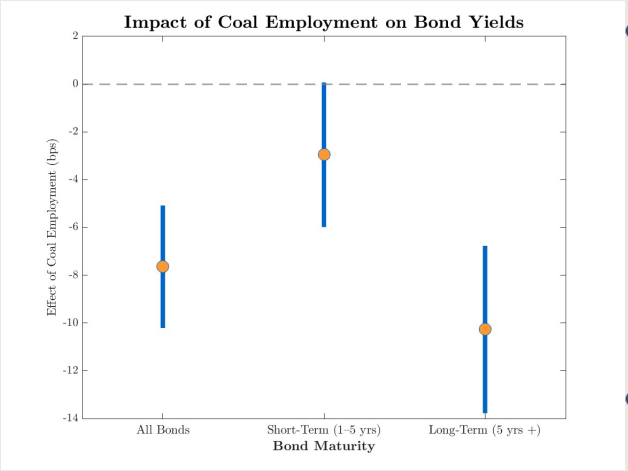

- A one standard deviation decline in coal employment leads to
  - An 8 basis point increase in municipal bond offering yields
  - This effect is equivalent to almost 20% of the average offering spread
  - This effect is three times larger for long-term bonds than for short-term bonds.
- **Implication:** Investors are pricing in a long-term structural decline rather than cyclical fluctuations.

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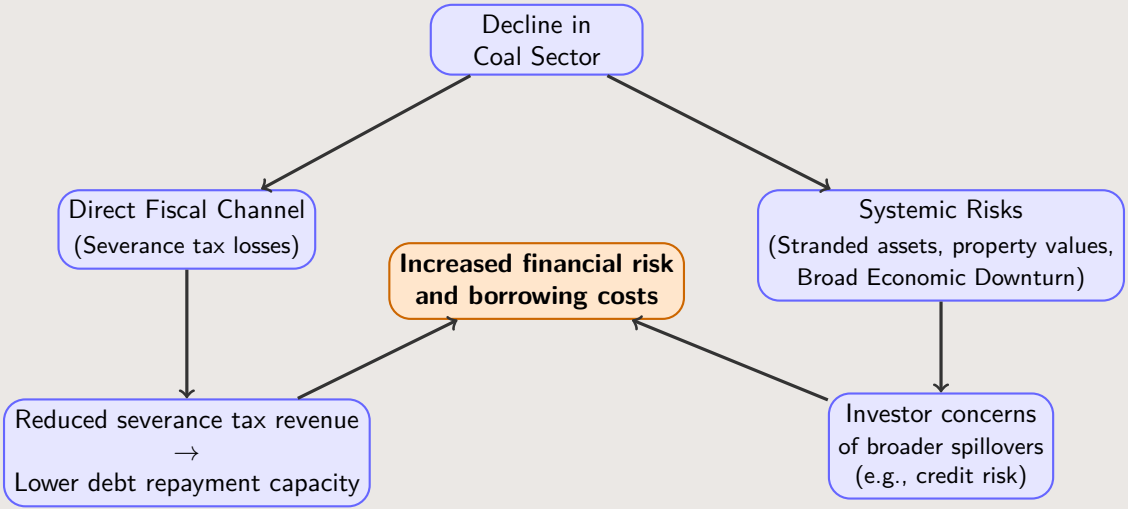
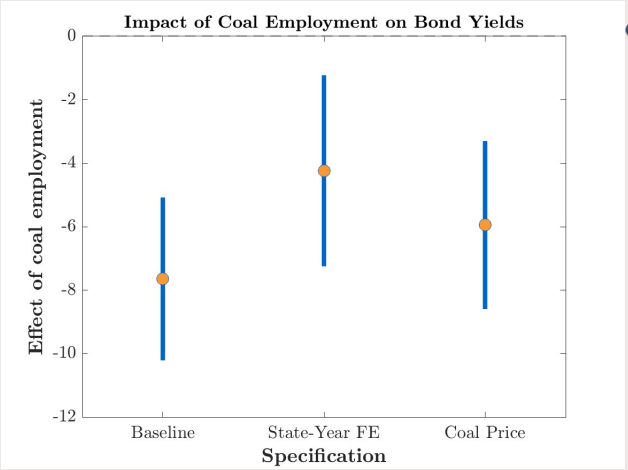
Risks from the Shift Away from Coal



Increase in Muni Bond Yields Points to Broader Systemic Risks



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  - State-by-year fixed effects
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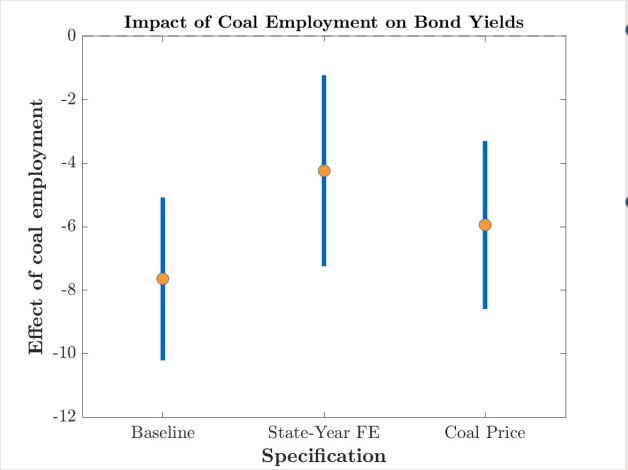

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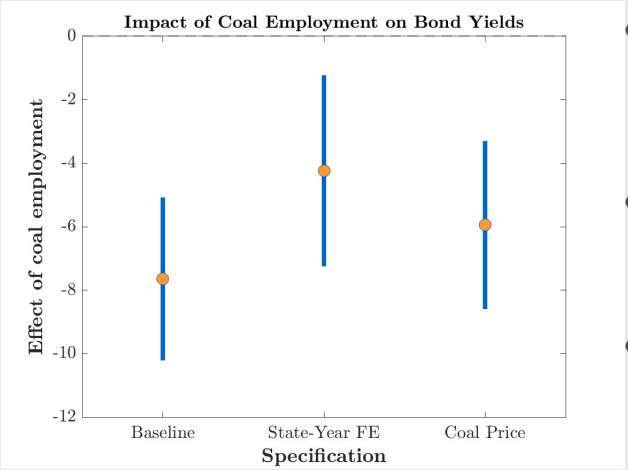
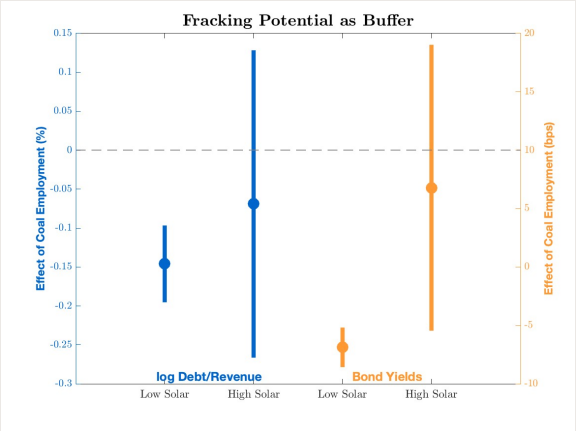


- To control for state-level variation in severance tax rates
  - State-by-year fixed effects
  - Regional coal prices.
- Effect of coal is somewhat smaller but remains statistically and economically significant.
- **Implication:** Direct fiscal channels explain only a fraction of the effect of coal.

Key Finding 3 – Economic Diversification Buffers Fiscal Risks



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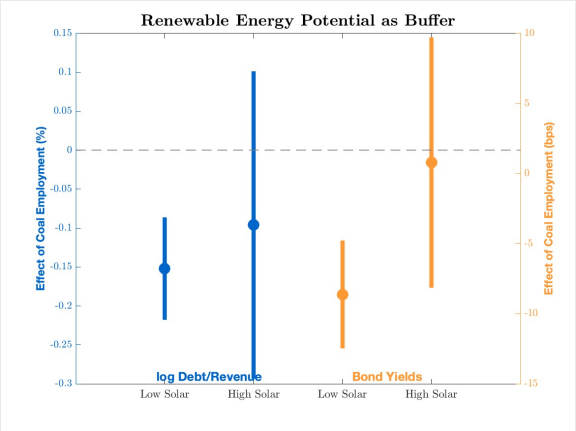

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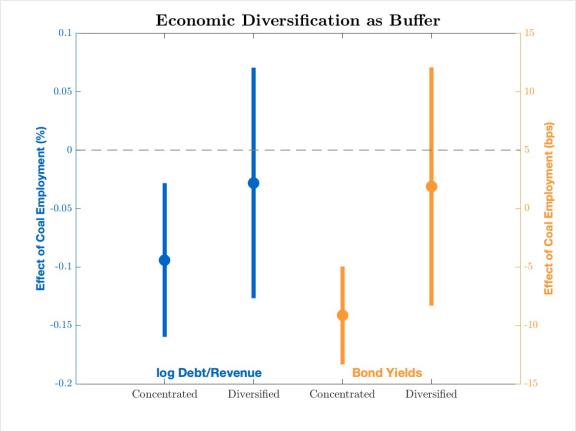
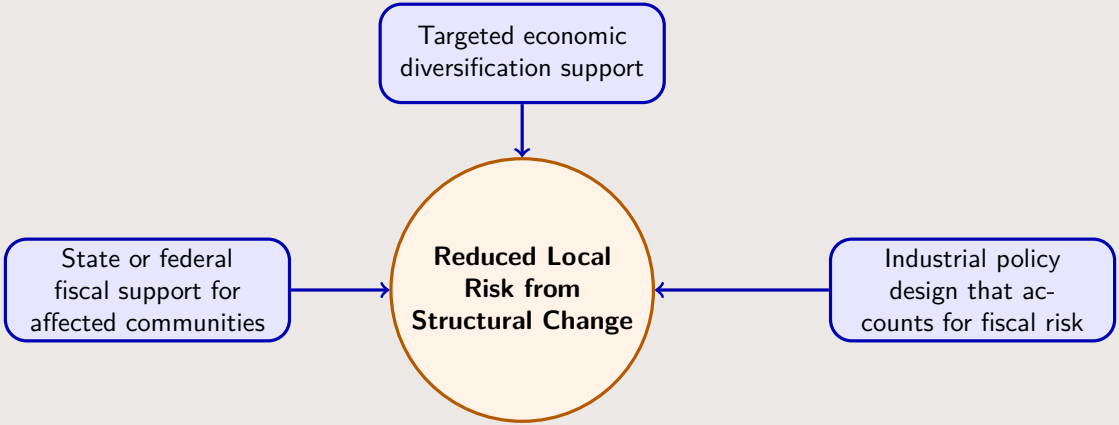


- Our heterogeneity analysis reveals:
  - Counties with high fracking potential see 40% smaller increases in debt
  - Areas with high renewable energy potential experience no economically significant increase in yields
  - Employment diversification buffers the effects of coal on debt and yields.
- **Implication:** Communities that have managed to diversify their economies can weather this storm much better.

Policy Tools for Reducing Risks from Structural Change



The road ahead is challenging, but our research shows it's not impossible.

Conclusion

- The shift from coal to gas, driven by **fracking**, provides a **quasi-natural experiment** to examine the fiscal implications of structural shifts for local municipalities.

- **How does coal's decline impact municipal finances and borrowing costs?**
  Coal's decline erodes the fiscal health of local governments: Debt and debt-to-revenue ratios increase, while municipal bond yields rise.

- **What do bond yields reveal about investors' perceptions?**
  Bond market investors price long-term risks: Bond yields rise, especially for long-term bonds, reflecting expectations of persistent fiscal weakness.

- **Are some communities better positioned to minimize these effects?**
  Economic diversification buffers risk: More diverse economies experience markedly smaller increases in fiscal strain and borrowing costs.