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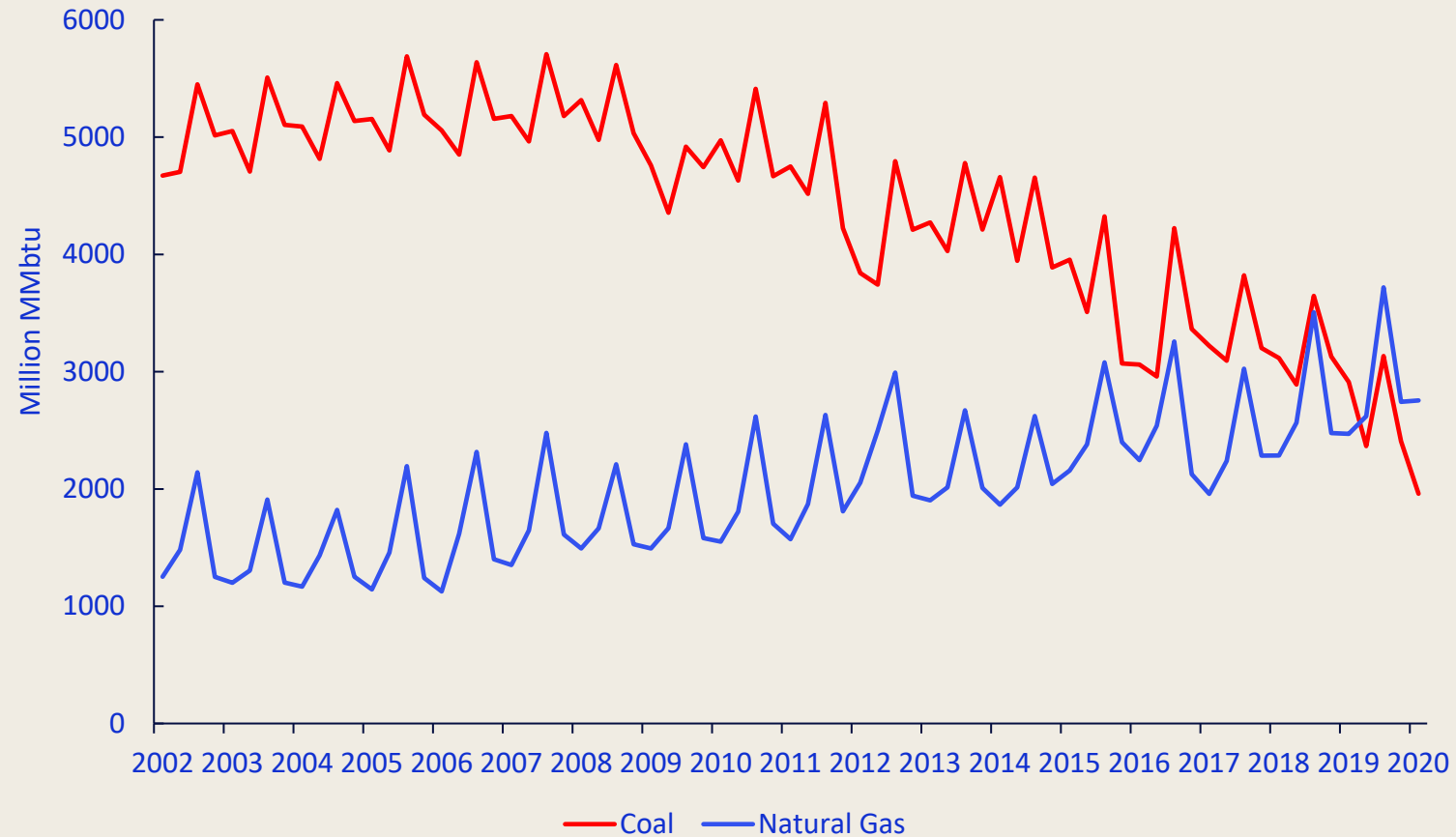
# Impacts of U.S. Shale Gas Boom on European Electricity Prices

# Introduction

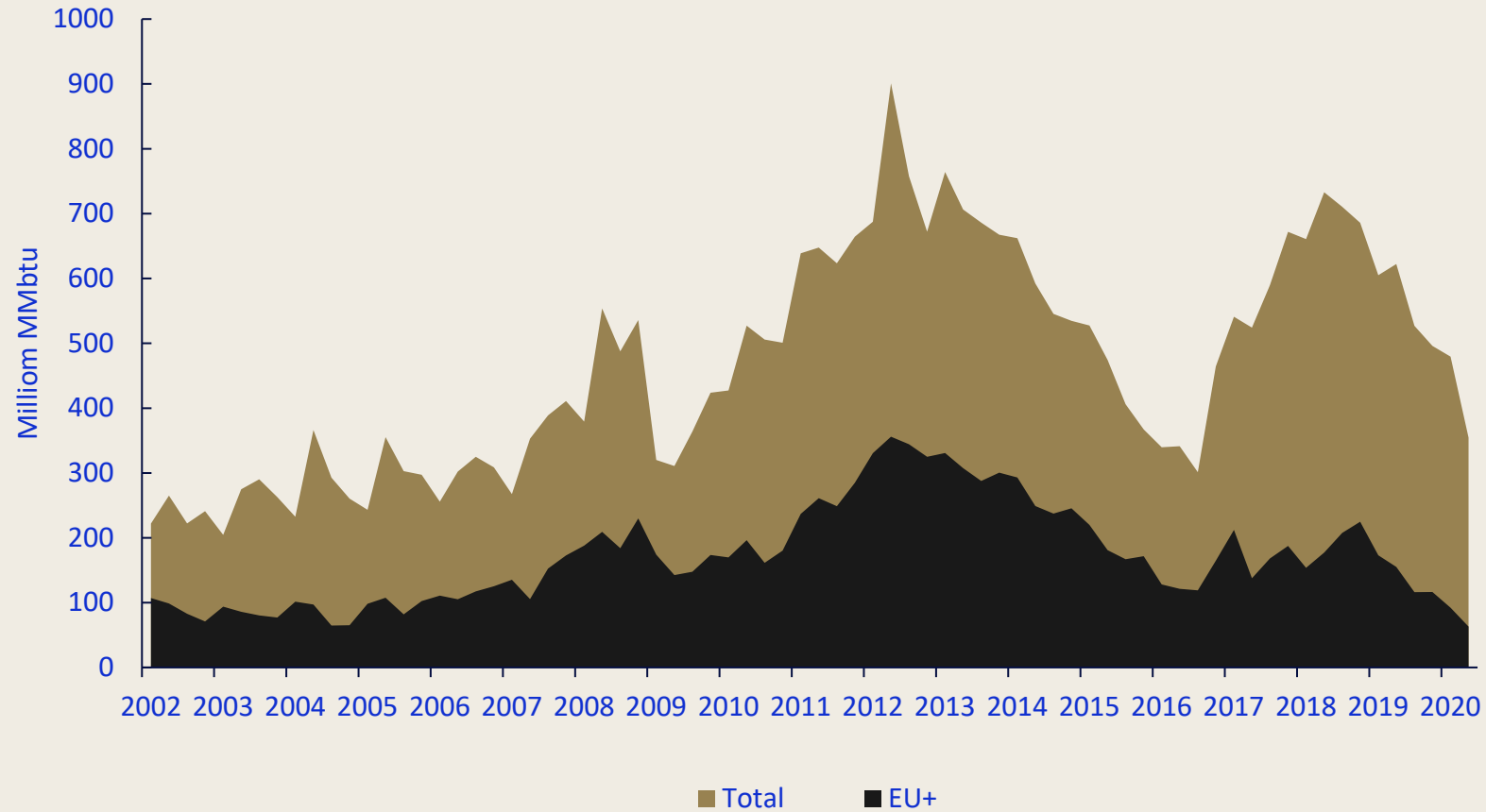
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- *Research Question:* Did cheaper EU coal imports following the U.S. shale boom affect European Electricity prices?
- We model Nord Pool Electricity price formation from 2008 to 2019 using ARDL model
- Price drivers investigated:
  - Hydrocarbon fuel source prices: Brent, North-West Europe (NWE) coal, NBP natural gas, Henry Hub Natural gas
  - Wind and hydro renewables production

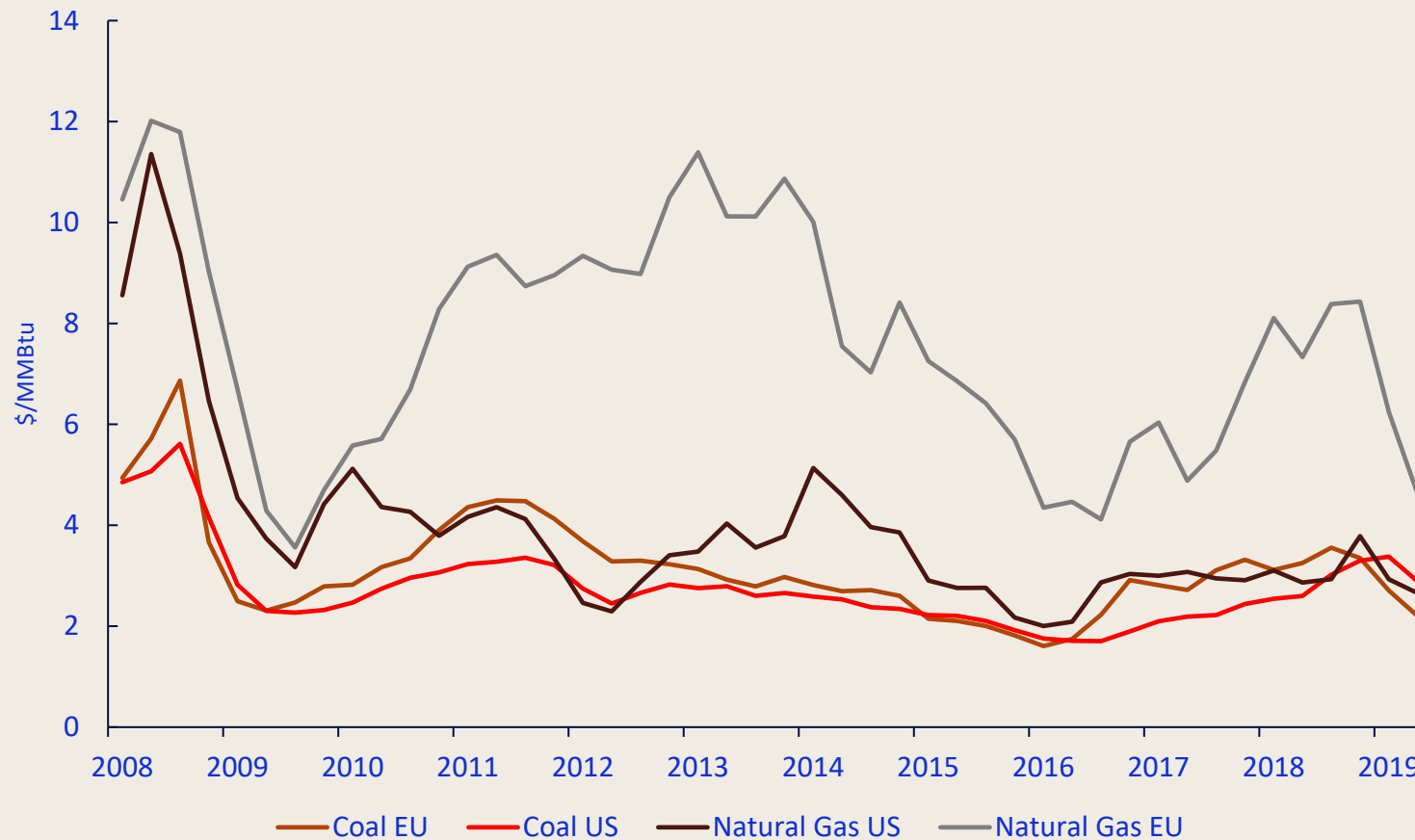
# Coal vs. Natural Gas in U.S. Electricity Generation



# U.S. exports of coal



# Prices of EU and US coal and natural gas



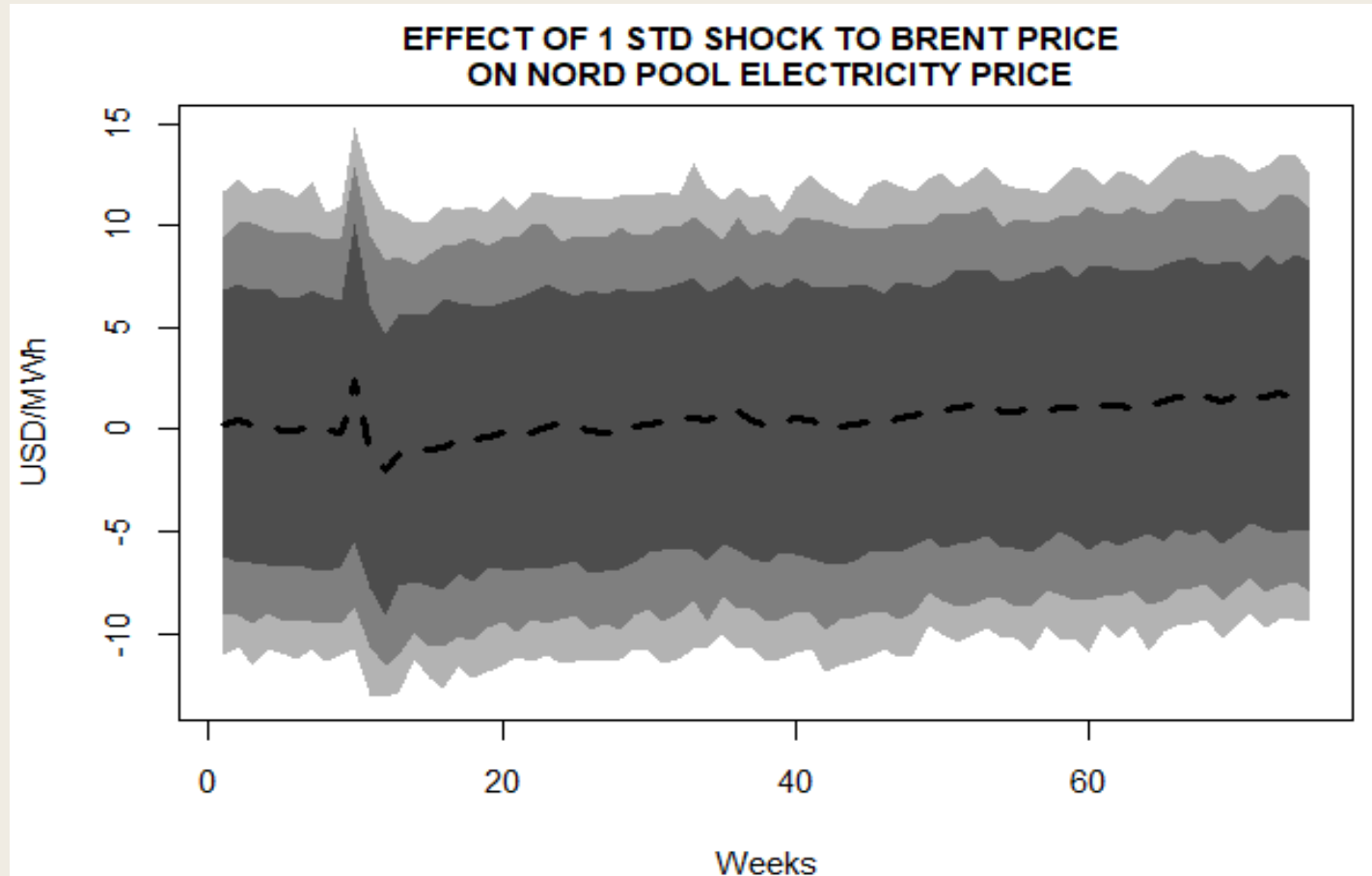
# Nord Pool Electricity Price Determination

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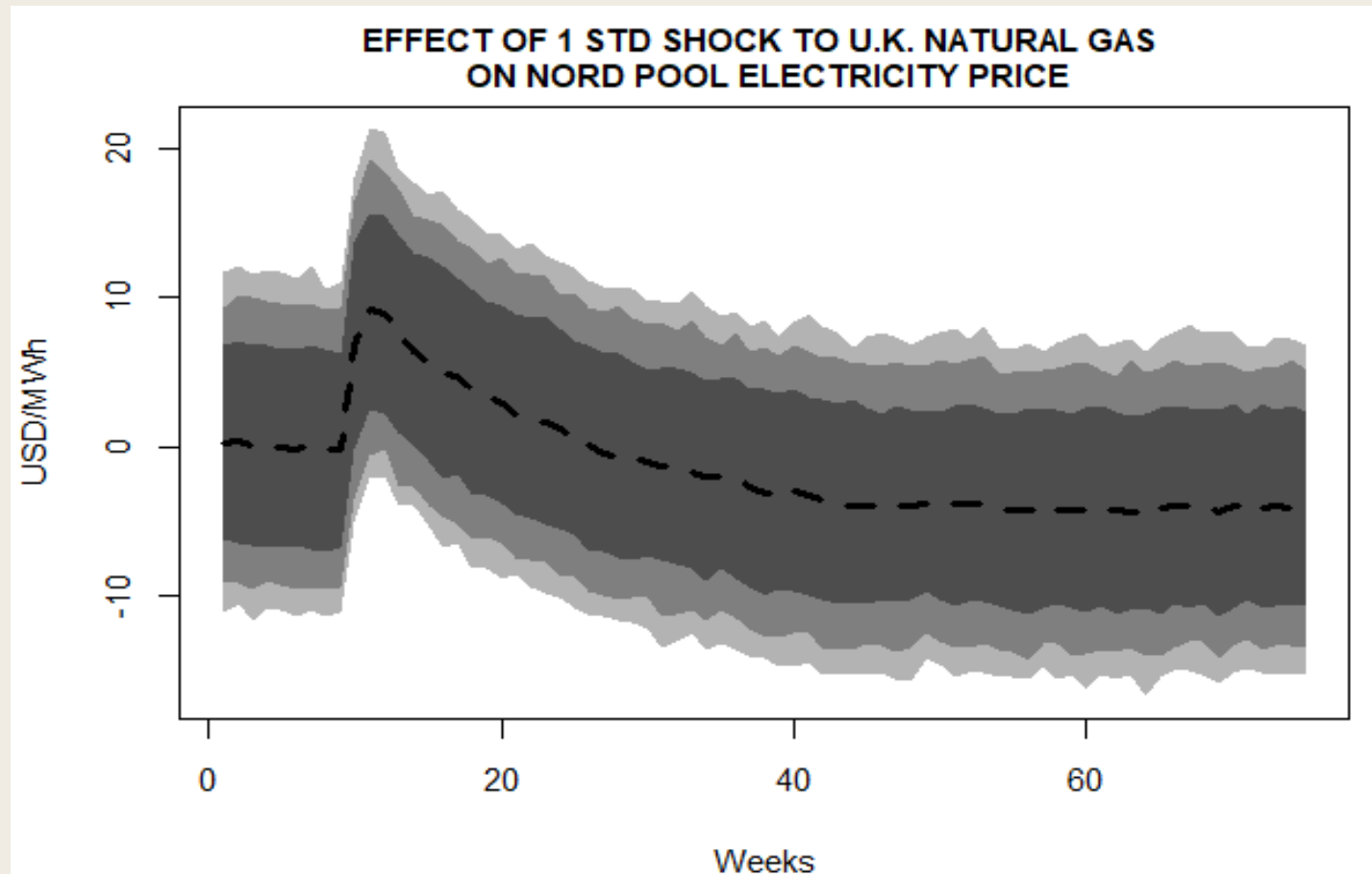
- Dependent variable: weekly average Nord-Pool system price in USD/Mwh. from week 1 in 2008 to week 20 in 2019
- Independent Variables:
  - Crude Oil (Brent spot), Coal (North-West Europe Front Month Forward), and Natural Gas (NBP ICE day ahead price)
  - Nord-Pool hydro reserve and wind power generation
- Method: ARDL model

# Brent Price Impact on Nord Pool Price

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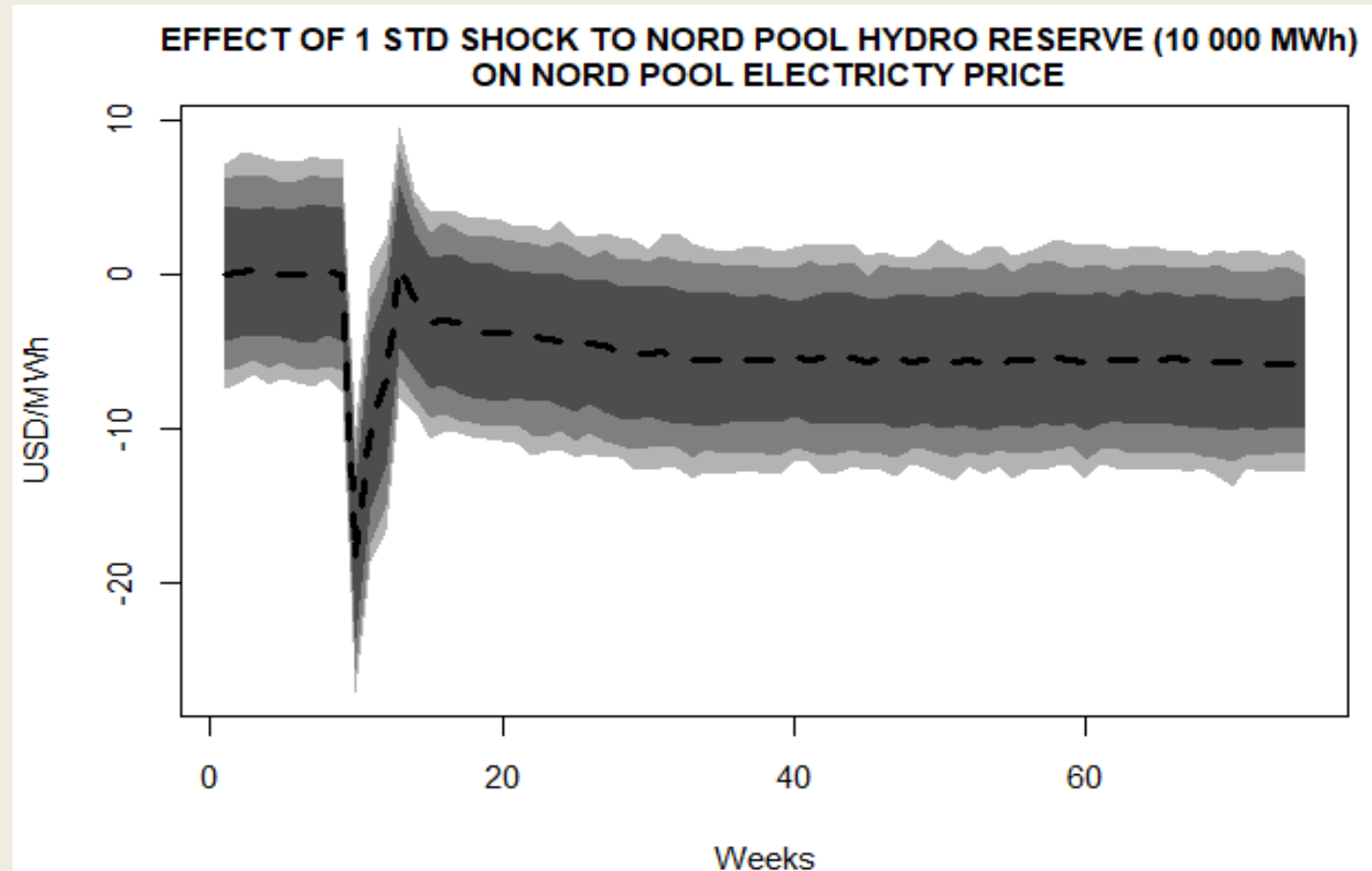


# U.K. Natural Gas Price Impact



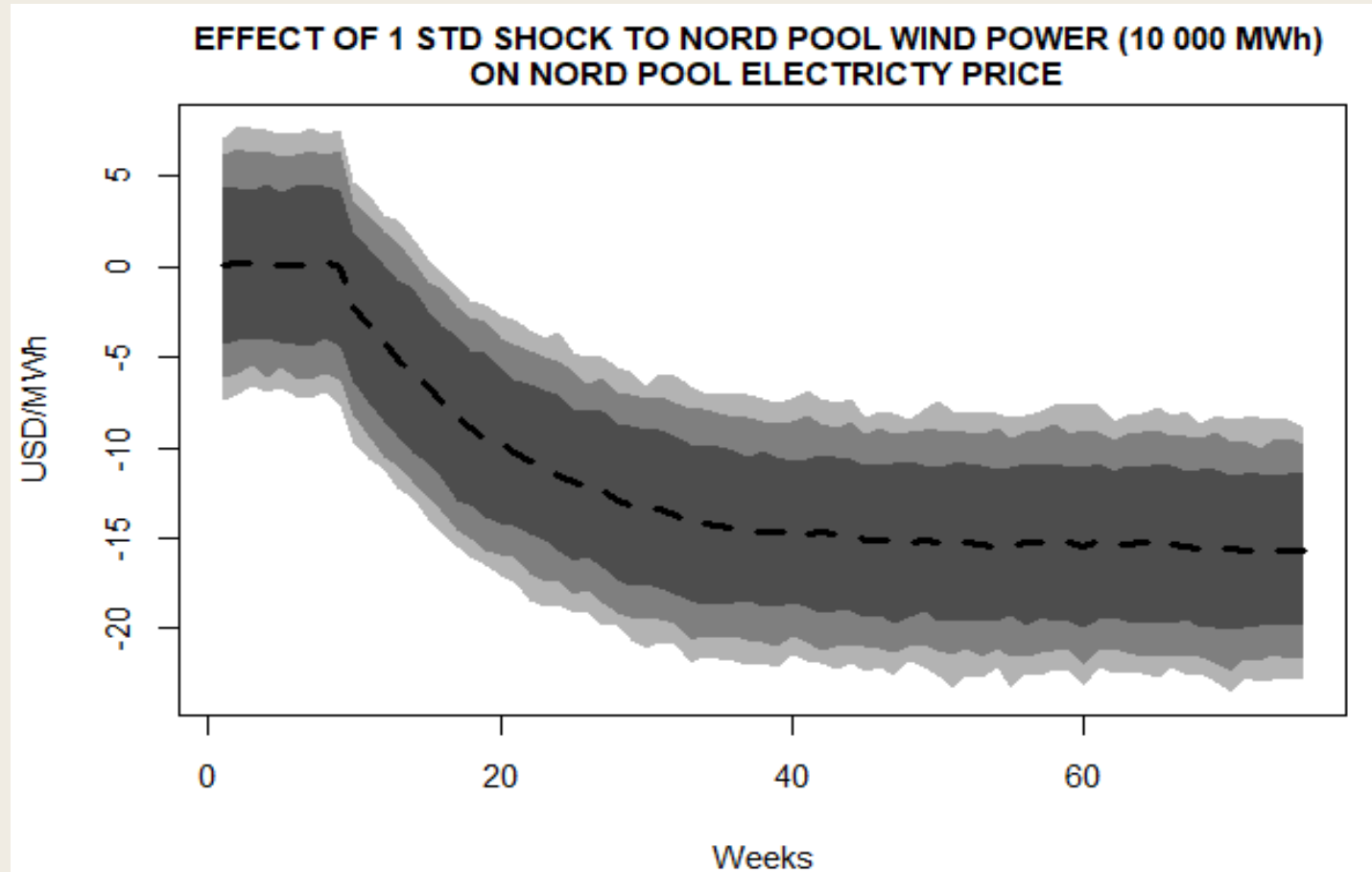


# Hydro Reserve Impact on Electricity Price



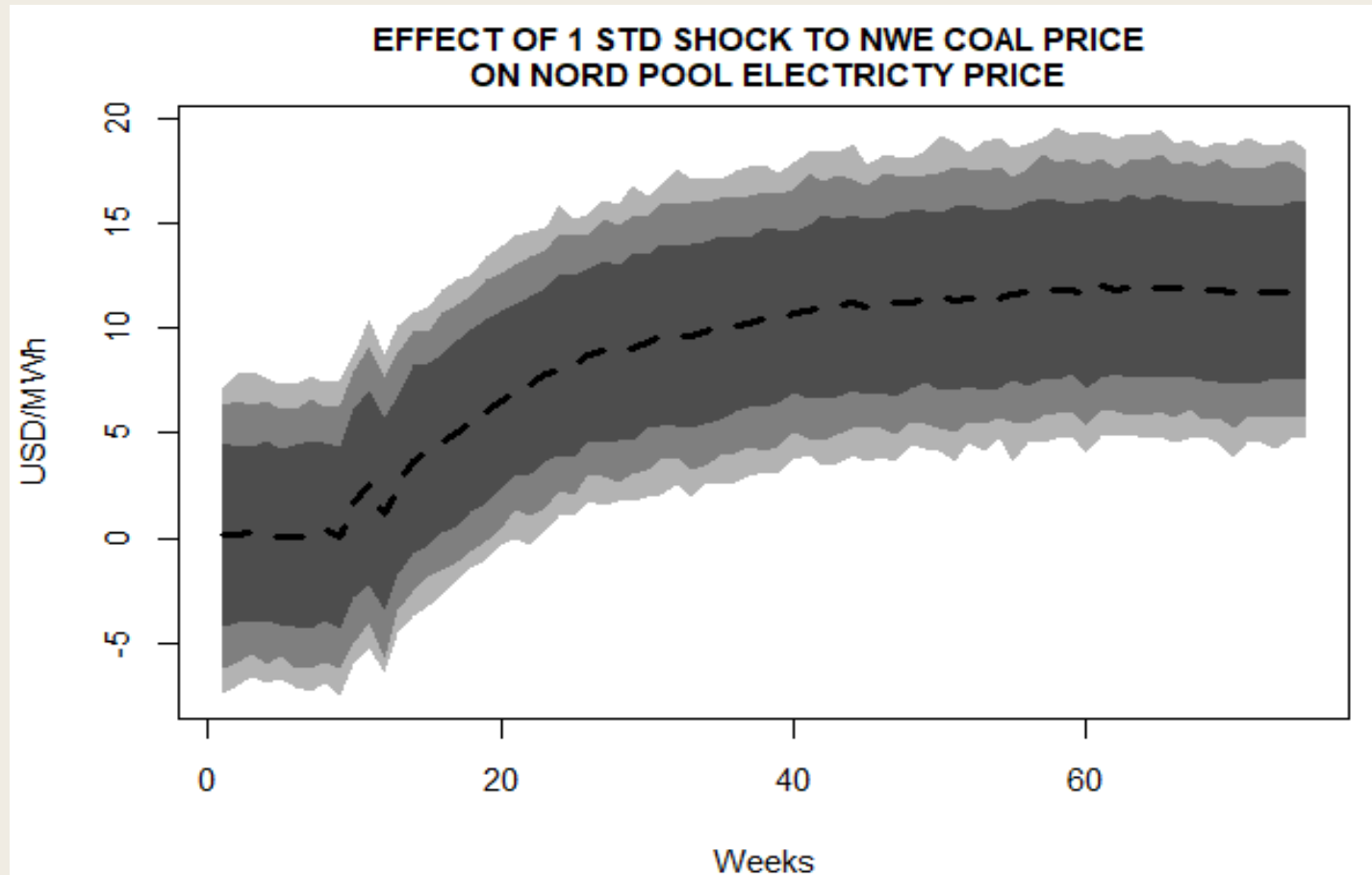
# Wind Power Generation Impact on Nord Pool Price

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# NWE Coal Price Impact on Nord Pool Price

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# What about U.S. natural gas?

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- U.S. natural gas price Granger causes NWE coal price in the sample period
- U.S. natural gas price trend also Granger causes Nord Pool electricity price in trend in the sample period
  - Using HH natural gas as an instrument for NWE coal produces similar impact on the Nord pool electricity price as directly using the NWE coal price.
- Suggests the effect of NWE coal on depressing Nord Pool electricity price can be explained by the U.S. shale gas revolution
  - The U.S. phasing out coal domestically in favor of natural gas pushed additional coal onto the international market

# Conclusion

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- Relatively cheap coal in the period 2009-2019 contributed to cheaper European electricity prices
  - Effect similar to the effect of expanding wind power generation
- Results suggest the U.S. shale boom indirectly affected European energy markets through cheaper coal imports
  - Coal did not face the same export constraints in the U.S. as natural gas
  - Highlights the complex connections between energy markets through energy substitution and international trade.