

# Spatial Effects of Carbon Pricing on Agriculture and Bioenergy in the United States

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H.R.763 - Energy Innovation and Carbon Dividend (EICD) Act of 2019:

*“There is hereby imposed a carbon fee on any covered entity’s emitting use, or sale or transfer for an emitting use, of any covered fuel.”*

Evaluation of the effects of a U.S. carbon tax on agriculture:

- Agricultural cost of production, commodity prices, farm income, land allocation, and trade

Two part analysis:

- Global analysis by Dumortier & Elobeid (2021): [Effects of a carbon tax in the United States on agricultural markets and carbon emissions from land-use change](#). *Land Use Policy* 103, 105320.
- Regional U.S. analysis (this presentation) based on production cost from global analysis

## Characteristics of the EICD Act of 2019:

- Starting carbon tax of \$15 per metric ton of CO<sub>2</sub>-equivalent
- Increase of the carbon tax by \$10 (adjusting for inflation) per metric ton in each of the subsequent years
- Cessation of the carbon tax: *“actual emissions of greenhouse gases from covered fuels is not more than 10 percent of the greenhouse gas emissions from covered fuels during the year 2016”*

## Exemptions for agriculture:

- Covered fuel or its derivative if used on a farm for farming purposes
- No carbon tax on non-fossil fuel emissions from agriculture (e.g., livestock, fertilizer application)

## Other characteristics:

- Carbon Dividend
- Border Fee Adjustment

# Modelling Approach I

Simulation models for generating a baseline and carbon tax scenarios:

- Little historical data on the effects of a carbon tax despite **existence of regional and national carbon pricing schemes**
- Model difference between the results are due to the carbon tax

2020 Annual Energy Outlook (AEO) from the U.S. Energy Information Administration (EIA) as the basis for macroeconomic indicators:

- Long-term projection of energy consumption and production in the U.S. including prices
- Reference case with status quo policies (Baseline)
- Scenarios with a carbon tax rising at 5% differentiated only by starting price: \$15, \$25, and \$35 (GHG 15, GHG 25, and GHG 35)

Carbon price at the end of the projection period: \$62 to \$144 t<sup>-1</sup> CO<sub>2</sub>-e

# Modelling Approach II

Energy prices and Wholesale Price Index (WPI) from 2020 AEO:

- Prices for gasoline, diesel, natural gas, electricity, jet fuel
- WPI for All Commodities, Fuel and Power, Metal and Metal Products

Agricultural cost of production module from the CARD Model

- No fuel or fertilizer exemption for agriculture

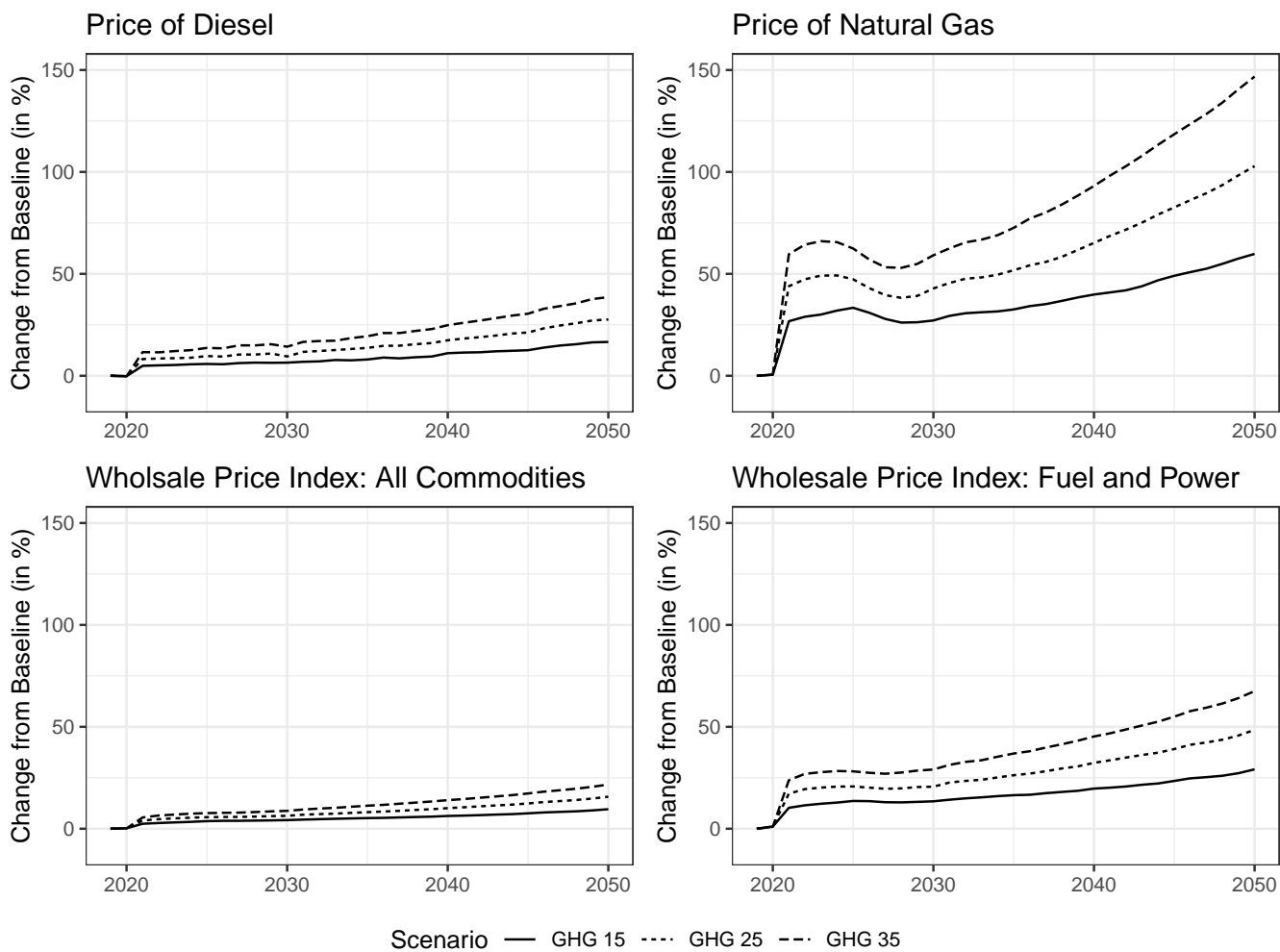
County-level model to determine land-use allocation, production cost, and prices

- Geographic differences in production cost and yield

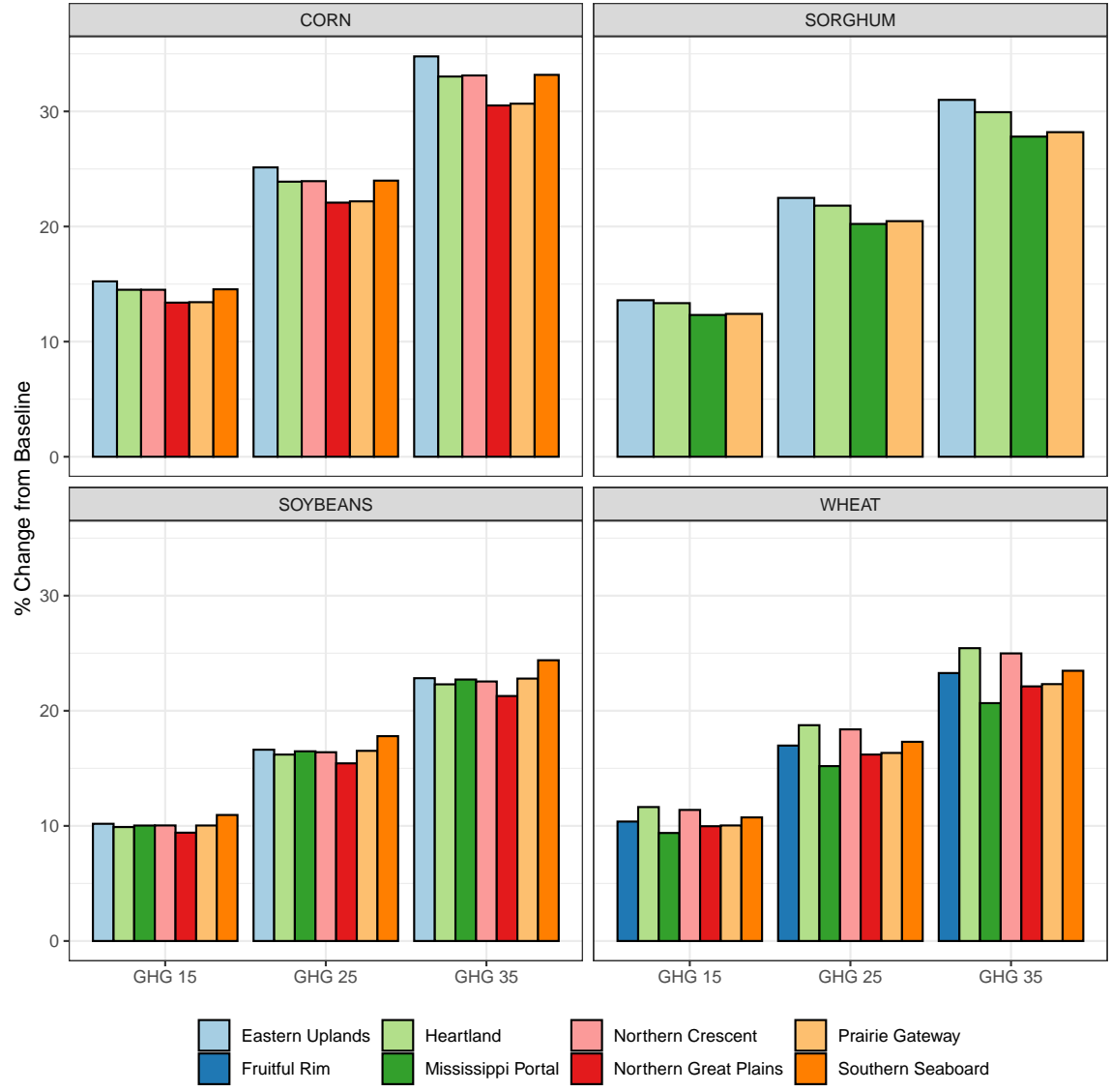
Crops covered:

- Corn, soybeans, sorghum, and wheat

# Evolution of Prices in the 2020 AEO



# Cost of Production Increase



# Area Change (GHG 35)

## Corn

- Small decreases in Illinois, Iowa, and Dakotas: 1.4%-1.7%
- Decreases of over 6.9% in Indiana, Ohio, Wisconsin

## Soybeans

- Small decreases up to 4.1% (except Kansas: 7.5%)

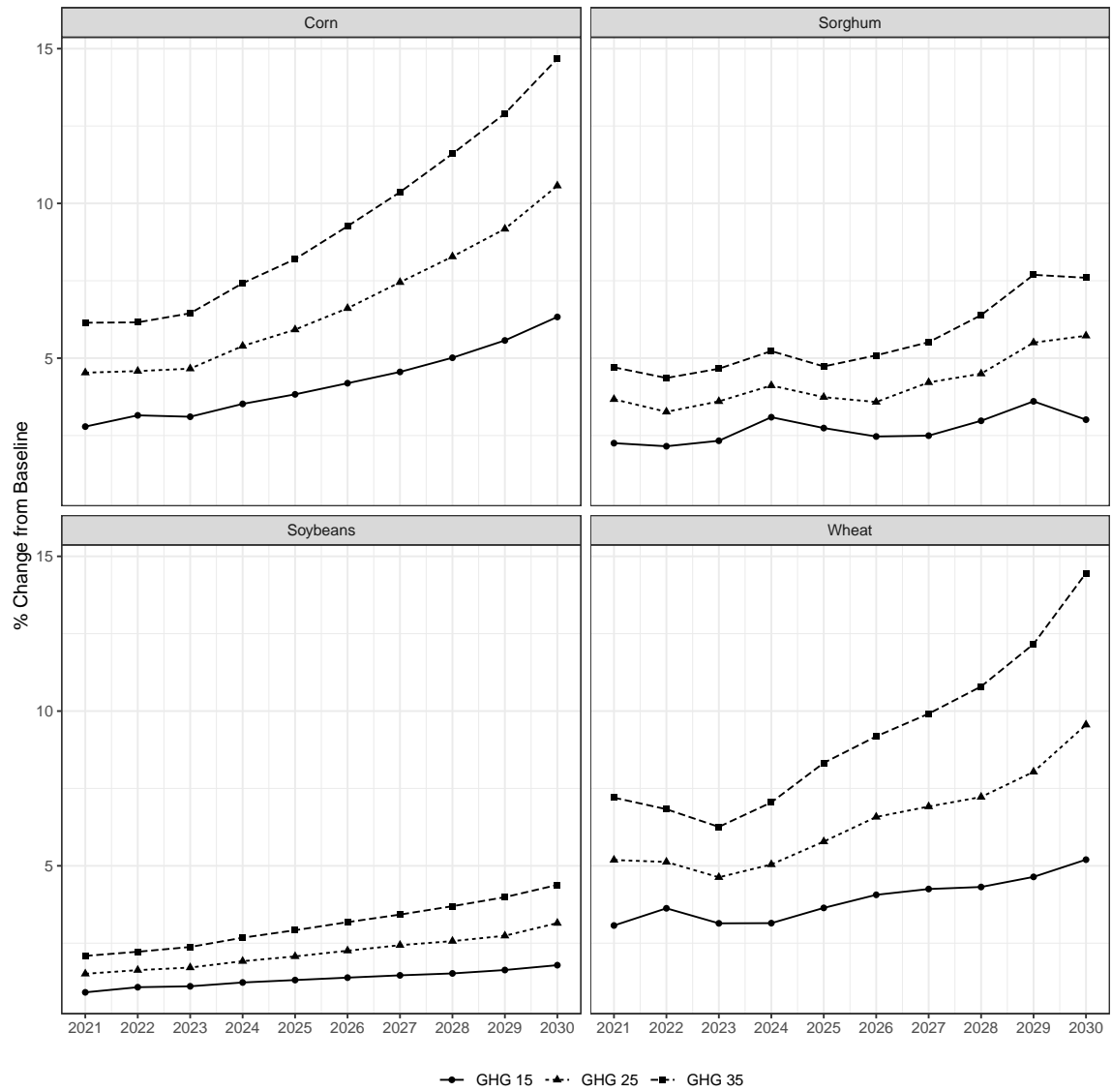
## Wheat

- Decreases of 5.4%, 5.6%, and 8.7% in Kansas, North Dakota, and Montana

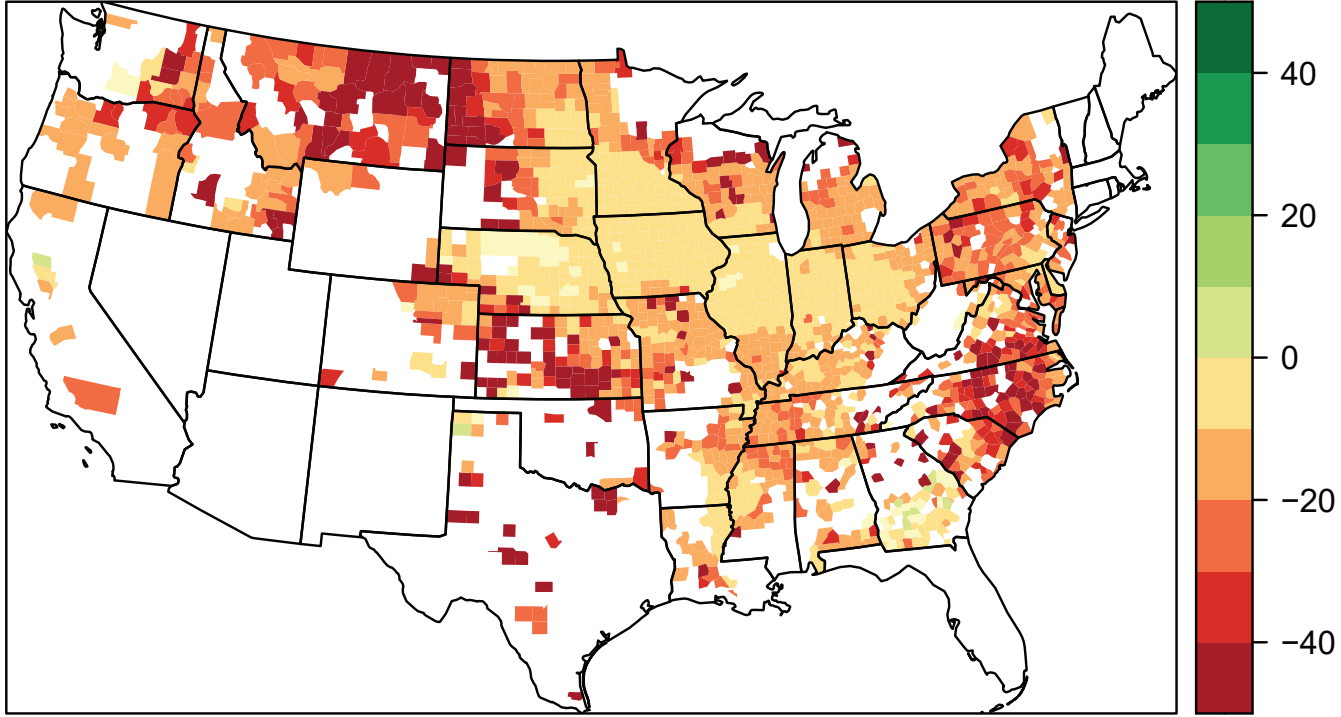
Interactions with area in the Conservation Reserve Program (CRP)



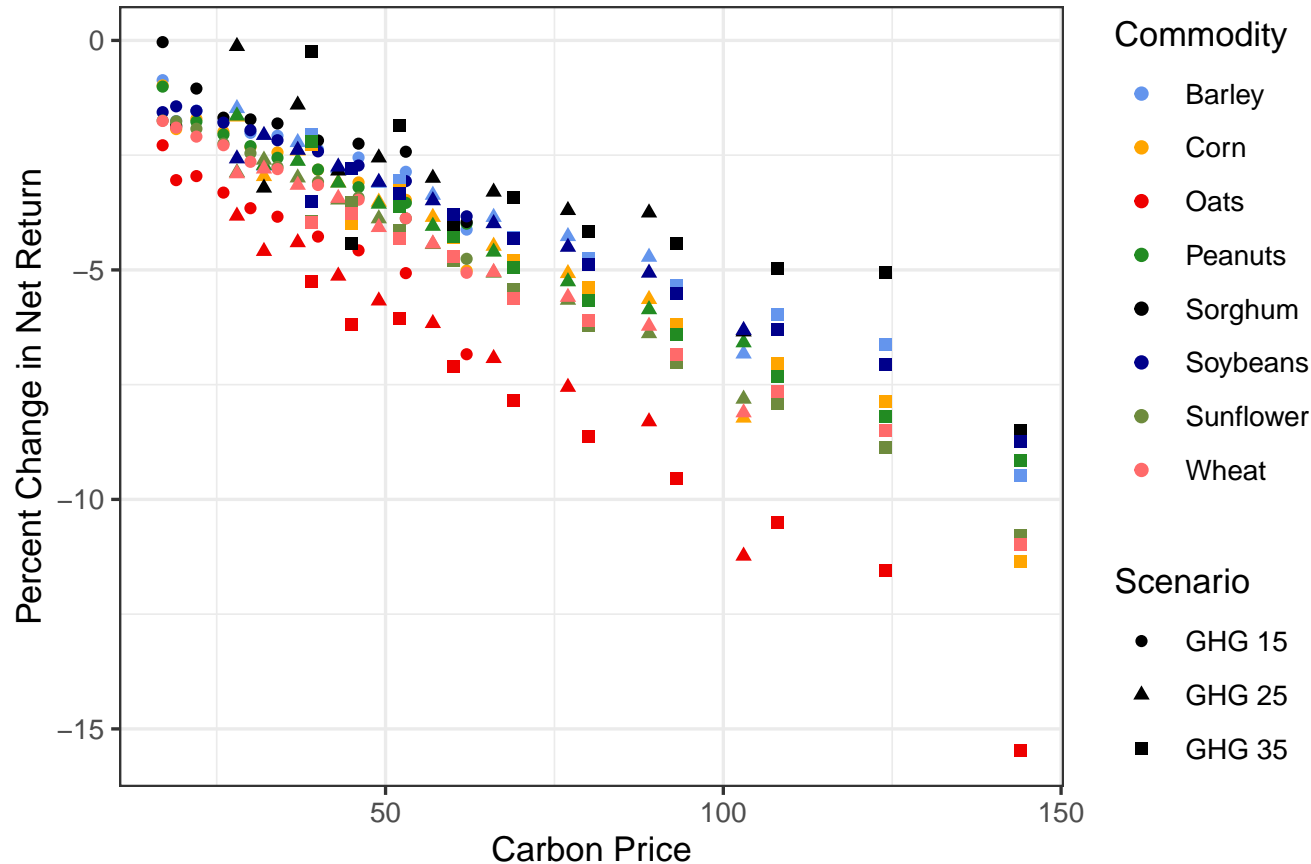
# Price Changes



# Percent Change in Farm Income (GHG 35)



# Farm Income Change from Global Analysis



Determination of farm income by prices, area change, and cost of production:

- Carbon tax and its translation into cost of production
- Changes in terms of area allocation and commodity prices as well

Interaction with Conservation Reserve Program (CRP)

- Rental rate and cap

Regional differences in effect of farm income

- Midwest less affected than “fringe” regions