

Policy Responses to Climate Change: Implications for Land Use Management

Brent Sohngen

***Department of Agricultural, Environmental &
Development Economics***

Sohngen.1@osu.edu



Outline

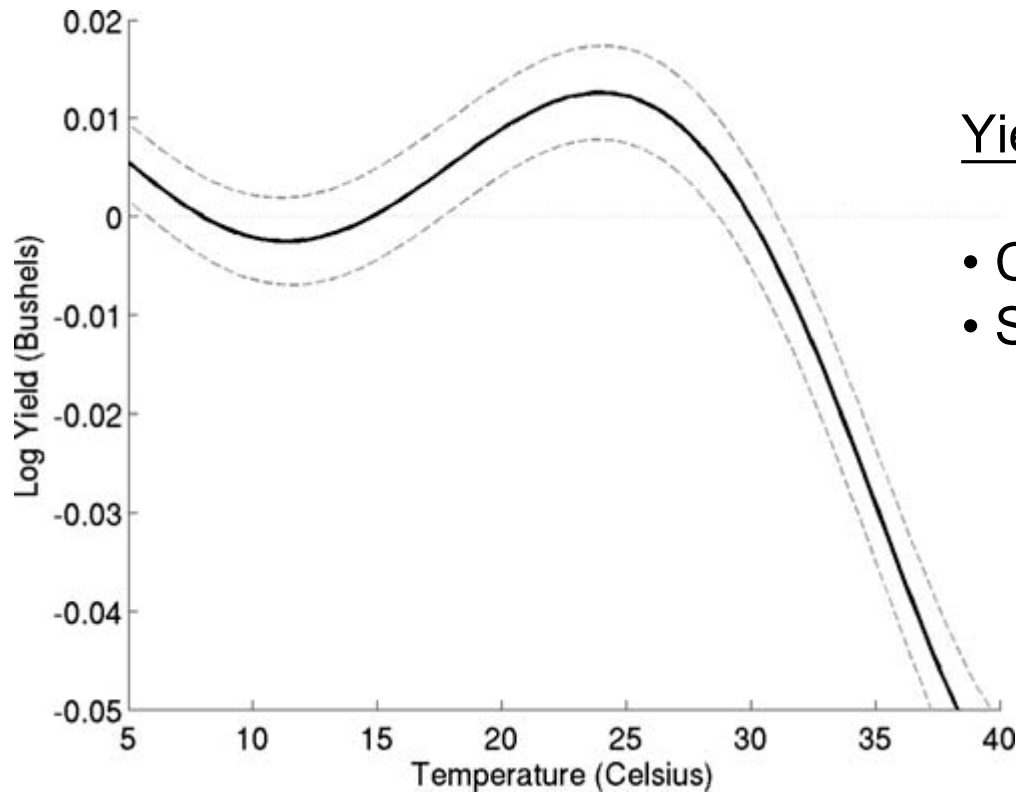
- ◆ **What do we know about the economics of climate change & agriculture?**
- ◆ **What is the status of climate policy in the U.S.?**
- ◆ **How could biofuel policy affect land use in the U.S. and Ohio?**

Note: References provided upon request

\$\$ Impacts on US Agriculture (US Effects Only)

- ◇ **Current Net Cash Income: \$85-\$95 bill. per year**
- ◇ **Adams et al. (1990): -\$10 to + \$10 bill.**
- ◇ **Mendelsohn et al., (1994): -5.7% to + 1.2 %**
- ◇ **Darwin et al. (1995): - \$4.8 to + \$5.8 bill.**
- ◇ **Mendelsohn et al. (1998): -\$39.8 to + \$28.4 bill.**
- ◇ **Reilly et al. (2003): -\$0.1 to -\$5.0 bill.**
 - **Production actually increases. Loss is caused by price declines due to greater production. Southern US more susceptible.**
- ◇ **Schlenker et al. (2006): -11% to -21% per hectare (LV)**
- ◇ **Deschenes and Greenstone (2007): +\$1.3 bill.**

Temperature and Corn Yield



Yield impacts (2020-2050)

- Corn: 22-30% reductions
- Soybean: 16-21% reductions

Do not account for C fertilization

Figure 2 from Schlenker and Roberts. 2006. Nonlinear Effects of Weather on Corn Yields. *Review of Agricultural Economics*. 28(3): 391-398.

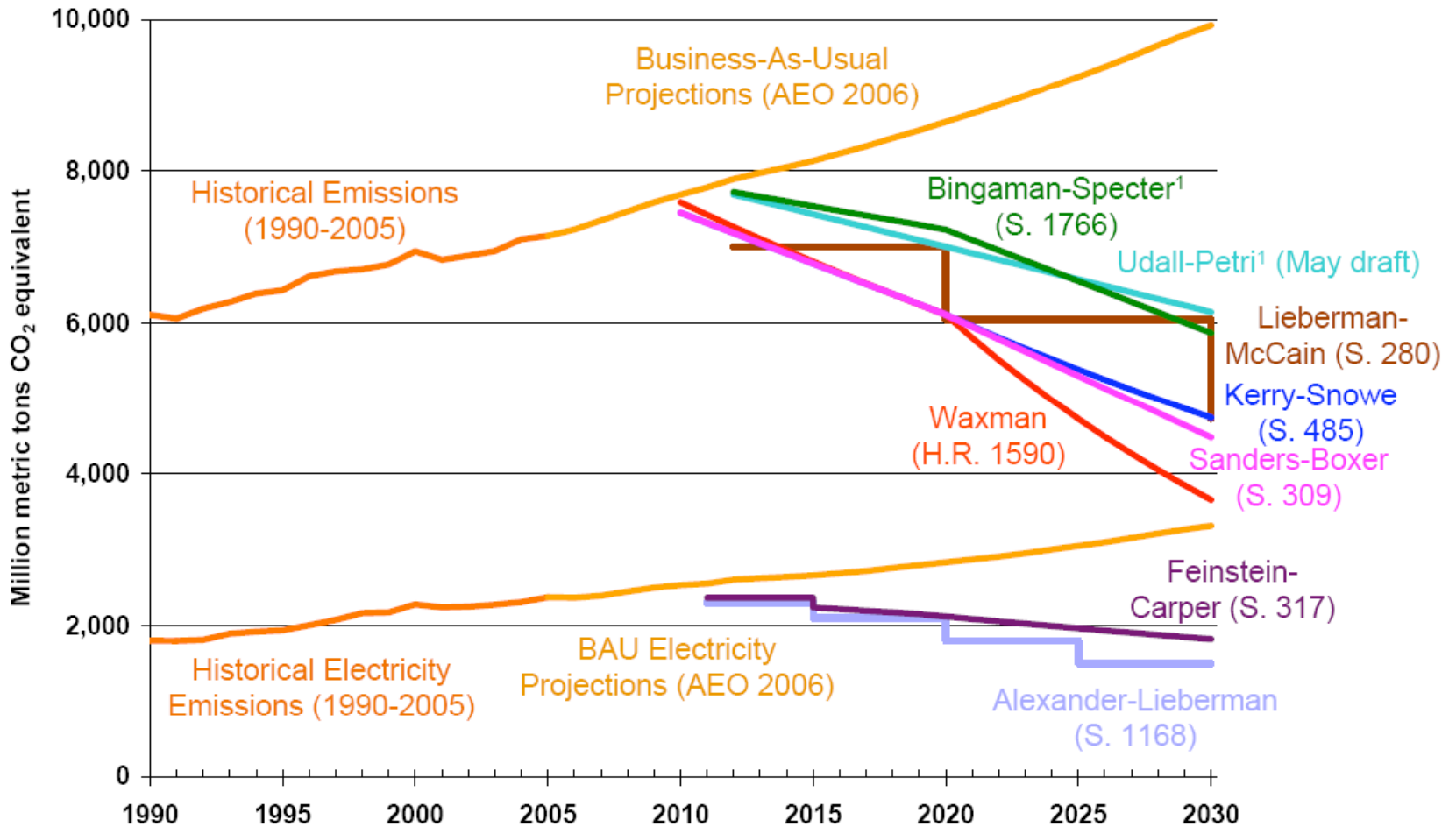
Impacts/Adaptation

- ◆ **Large potential changes in productivity of corn/soybeans due to climate change**
 - ➔ **Will need to adapt new varieties, new crops, new practices, etc.**
- ◆ **Economic impacts projected to be relatively modest, although the debate keeps growing...**

US Climate Policy

- ◇ **Consensus emerging.**
- ◇ **Regional efforts underway**
 - **Cap emissions**
 - **NE States (RGGI); California (AB 32); Other states heading in that direction.**
 - **Renewable portfolio standards/Demand side management**
 - **NE states; Upper MW; TX, CA, etc.**
 - **But clear recognition that these are not enough (ex: Why would CA cap emissions?)**
- ◇ **Climate legislation under consideration**
 - **A number of bills under consideration.**
 - **Democratic nominee would sign...**
 - **Republicans agree in principle, but recommend different approaches**

Comparison of Emission Reduction Goals in Legislative Proposals in the 110th Congress (as of August 13, 2007)



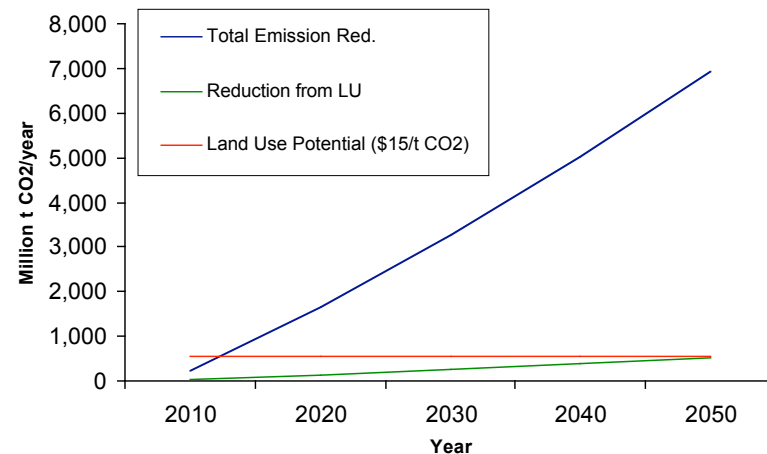
This graph depicts emissions targets from some of the major climate change bills in Congress. Targets are based on comparison with historical year emissions. Kerry-Snowe, Sanders-Boxer, and Waxman specify future emissions as a percentage of 1990 emissions. For Lieberman-McCain, Udall-Petri, and Bingaman-Specter, emission targets for covered sectors are related to historical emissions for those sectors, and total emissions are assumed to match those in the corresponding historical year.

¹ Bill contains flexibility mechanisms which allow actual emissions to rise above the target.

US Climate Proposals & Biological Sequestration.

- ◇ **Most legislative proposals limit the use of biological sources of sequestration, at least initially.**
- ◇ **Lieberman-Warner Proposal**
 - **Limit biological sequestration to 7.5% of total reduction.**
- ◇ **Limiting the cap raises costs for everyone.**
- ◇ **Important for agri. interests to get involved.**

Lieberman-Warner total Reduction
Price capped at \$12/t CO₂.



Land Use Potential from
Murray et al. (2006)

Biofuels & Land Use

◇ CRP Land?

- **Most short-term discussion is about changes in crop patterns and movement from CRP back to crops.**
- **Should this force us to take a much closer look at the environmental benefits of the land we enroll?**

◇ Forest-Ag-Urban Interface

- **Long-term adjustments in relative land values could have large implications for land-use.**

Example: Land-use implications of biofuels in the Midwest (OH-IL-IN)

- ◆ **Econometric model of land use for 3 midwestern states (Choi, 2004; Choi et al. 2007)**
- ◆ **Project agr, for., and urban land uses as a function of rents, population growth, etc.**

<i>Baseline Scenario</i>			
	2005	2045	Changes
Forest (+1%/yr)	14,055	12,767	-1288
Agriculture (+2%/yr)	47,979	44,965	-3014
Urban (Census)	6,344	10,647	4303
<i>Bioenergy Scenario</i>			
	2005	2045	Changes
Forest (+2%/yr)	14,055	9,287	-4768
Agriculture (+4%/yr)	47,979	48,463	484
Urban (Census)	6,344	10,628	4284