POLICY INSTRUMENTS FOR ADDRESSING EXTERNALITY IN AGRICULTURE

G Cornelis van Kooten
Department of Economics

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Background

Production externalities occur when the agricultural producer making a decision does not recognize the external or spillover effects of that decision.

Externalities include agricultural practices that have a negative impact on the environment, reduce the quality of life of others, and/or add costs to other production activities (e.g., fish production in a lake is reduced due to eutrophication). It might also include positive externalities related to visual amenities, provision of certain types of bird habitat, etc.

Outline

- Evidence of externality
- Policy instruments for addressing externality
- Potential pitfalls

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Externalities in Agriculture: Policy Instruments for Addressing Externality

- United Kingdom (Pretty et al. 2000, 2001, 2005; O'Neill 2007)
  - Total externality costs £429 million (US$549 million)
  - 89% of average net farm income in 1996
  - less than three percent of 1996 agricultural value added
- United States (Tegtmeier and Duffy 2004)
  - annual external costs of agricultural activities: $7.7 to $22.8 billion ($2018)
  - 5.0 to 15.0 percent of value added
  - Based on 168.8 million ha, external costs varied from $39.74 to $129.17 per ha

Externalities in Agriculture: Policy Instruments for Addressing Externality (cont)

- United Kingdom (Fitzpatrick et al. 2017)
  - compared externality costs against gross expenditures on food
  - £120 billion ($153.6 billion) in negative spillovers in 2017; consumer expenditures of £120 billion in 2016
  - Total externality costs £429 million (US$549 million)
- How are costs attributed:
  - heart disease, cancer & obesity from food consumption : £44.9 billion
  - externality cost of food production: £16.1 billion
  - costs of food poisoning: £1.7 billion
  - costs related to organophosphate pesticides: £12.0 billion
  - farm support payments: £6.4 billion
  - loss of biodiversity: £12.8 billion
  - degradation of natural capital: £30.9 billion
    - GHG and emissions of pollutants constitute £12.2 billion.

Externalities in Agriculture: Policy Instruments for Addressing Externality (cont)

- The Netherlands (Jongeneel et al. 2016)
  - annual externality costs averaged €1,868 million ($US 2,111 million) over 2005-2012
  - gross annual externality benefits (related to provision of bird habitat, mental health benefits of on-farm clinics, etc.) averaged €263 million ($297 million)
  - Agriculture value added = €10,604 million ($11,983 million)
  - Total average annual net benefit from agriculture = €8,736 million ($9,872 million)
  - On an area basis, net externality costs average €849/ha ($959/ha) of arable, horticultural and pasture land

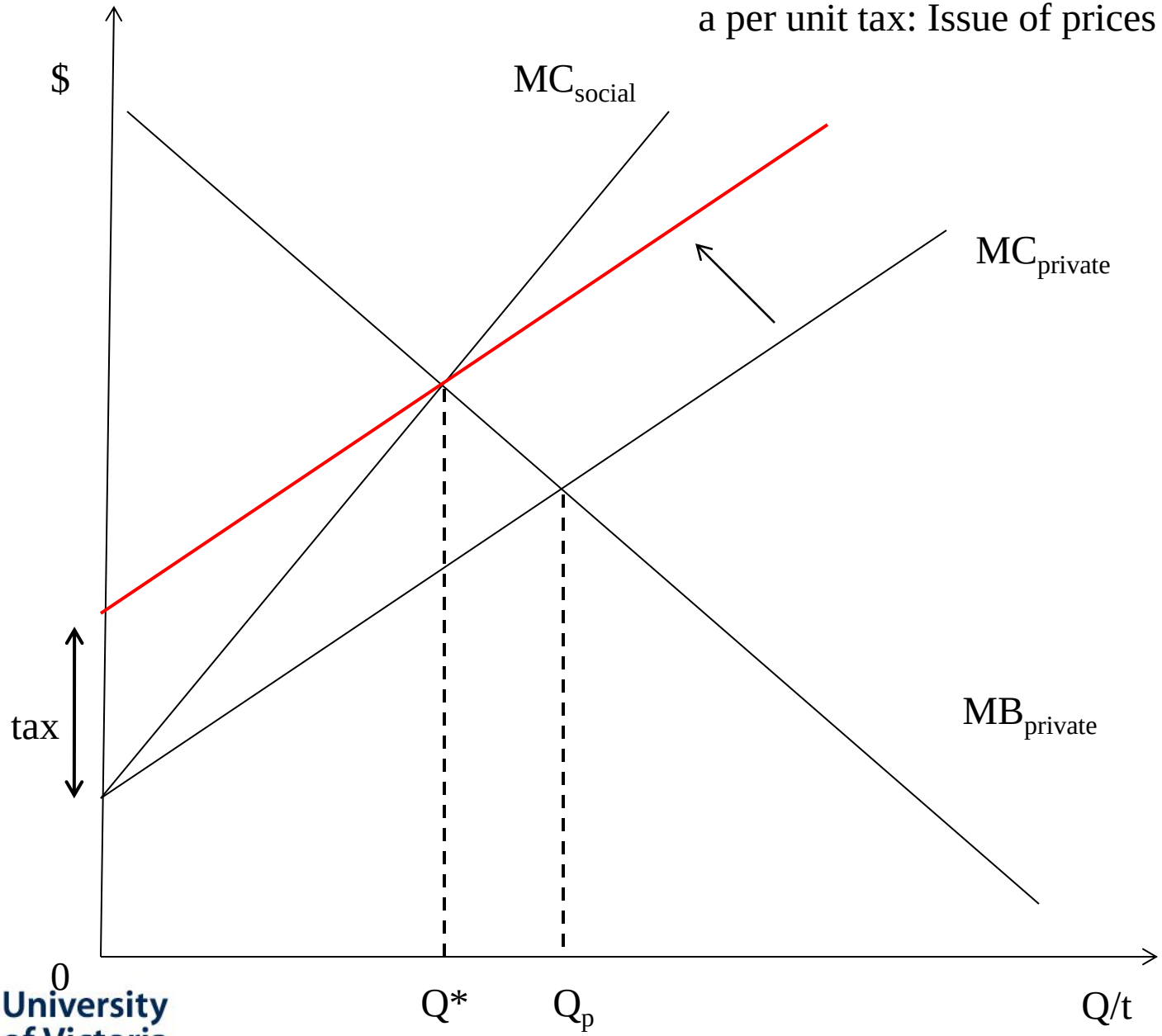
Externalities in Agriculture: CO_2 Emissions

- Example: The Netherlands
  - 3.4 megatons (Mt) of CO_2 emissions are estimated to come from peat soils, with another 26.0 Mt of CO_2 and CO_2-equivalent (CH_4 & N_2O emissions converted to CO_2 equivalence)
  - Using a shadow price of carbon of €16/tCO_2 ($20.80/t$CO_2$), CO2 externality cost equals €470.4 million ($531.6 million)
    - 25% of the total externality cost of Dutch agriculture.
  - If social (marginal) cost of carbon (SCC) of $30.70 (approximately €27) per tCO_2 is used, average externality cost = €793.8 million, or 36% of revised annual externality costs of €2,191.4 million.

Reasons for intervention in agricultural markets:

1. Externality: An economic agent makes decisions on the basis of private costs and benefits without taking into account the costs (or benefits) imposed on others
   - Nitrogen runoff into waterways: Eutrophication
   - Nitrogen leaching into groundwater: blue baby syndrome
   - Divergence between social and private costs
   - Should anything be done? Is there a problem? Not necessarily as it depends on the costs of taking action and the benefits of so doing.

Government can correct the externality with a per unit tax: Issue of prices vs quantities



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Reasons for state intervention (cont)

2. Public goods in agriculture
   - Open space; visual amenities; wildlife habitat; ecological services (e.g., wetlands provide various services – absorb pollution, flood control, waterfowl habitat)
   - Once provided it is impossible to exclude anyone from 'consuming' the good, service or amenity
   - Private provider cannot capture the benefits of providing the good or service.
   - Public incentives may be needed to encourage farmers to provide these goods

Economic Instruments for Addressing Externalities in Agriculture

1. Economic incentives
   - Taxes and subsidies (flip side of tax)
   - Cap and trade
2. Cross compliance
3. Zoning and purchase of development rights
4. Contracting
5. Best management practices

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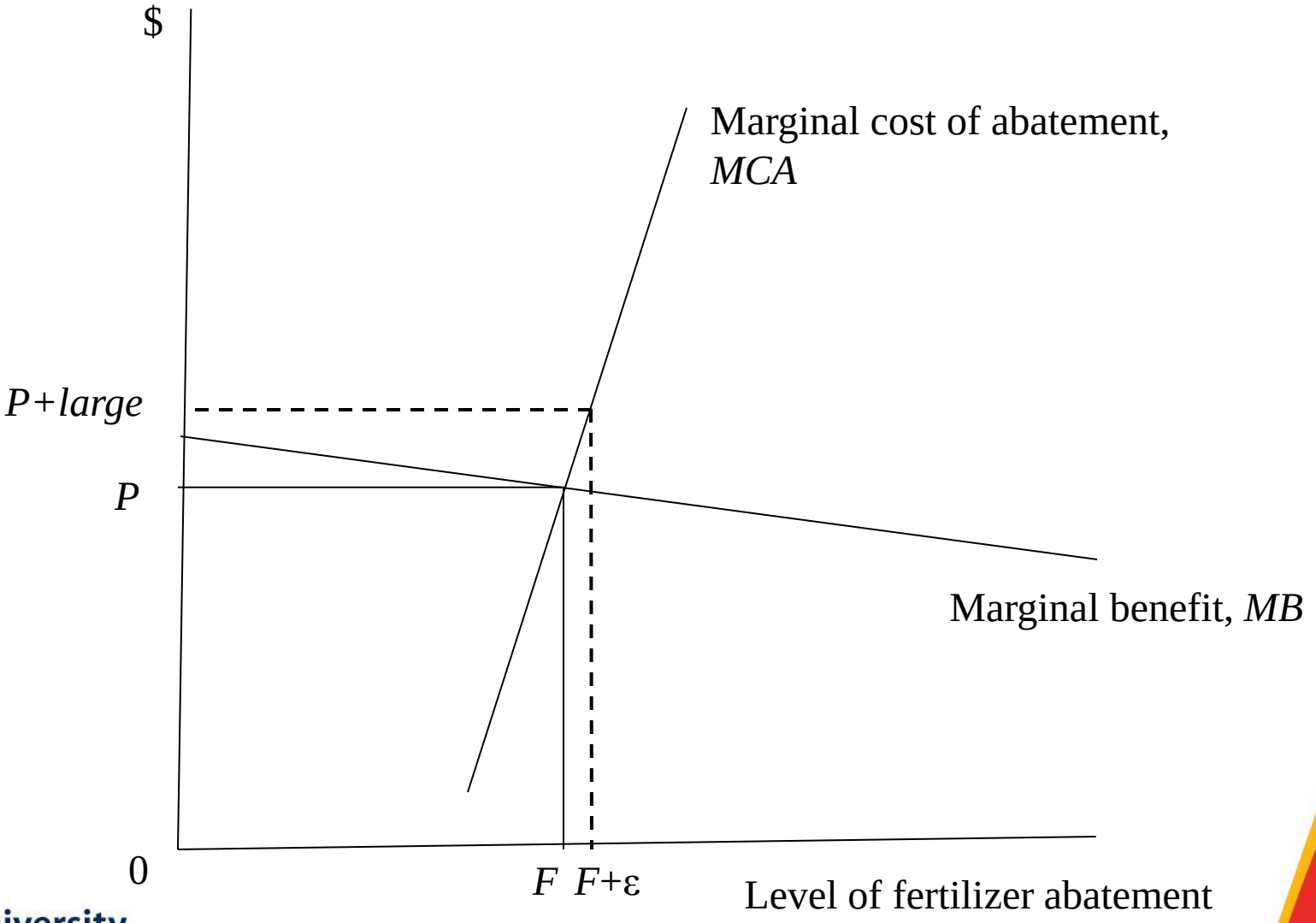
Economic Incentives

- Regulation versus economic incentives
- Prices (taxes) vs quantities (cap-and-trade)
  - Weitzman (1974), Pizer (1997)
- Example: Consider a watershed and the authority wishes to limit fertilizer use
  - Regulate: each farmer in the watershed is allowed to buy a fixed amount of fertilizer (perhaps based on farmland area)
  - Cap-and-trade: Farmers can trade their fertilizer allocation
  - Tax: charge on fertilizer use so as to get right quantity

Cap-and-Trade vs Tax

- It should not matter whether one uses a price (tax) or quantity (cap and trade) instrument – they are two sides of the same coin
- The problem occurs when there is uncertainty about supply and demand. With uncertainty there are costs of choosing the wrong instrument
- Consider the following diagrams.

Note: A small error in setting quantity leads to a large increase in cost in this case.



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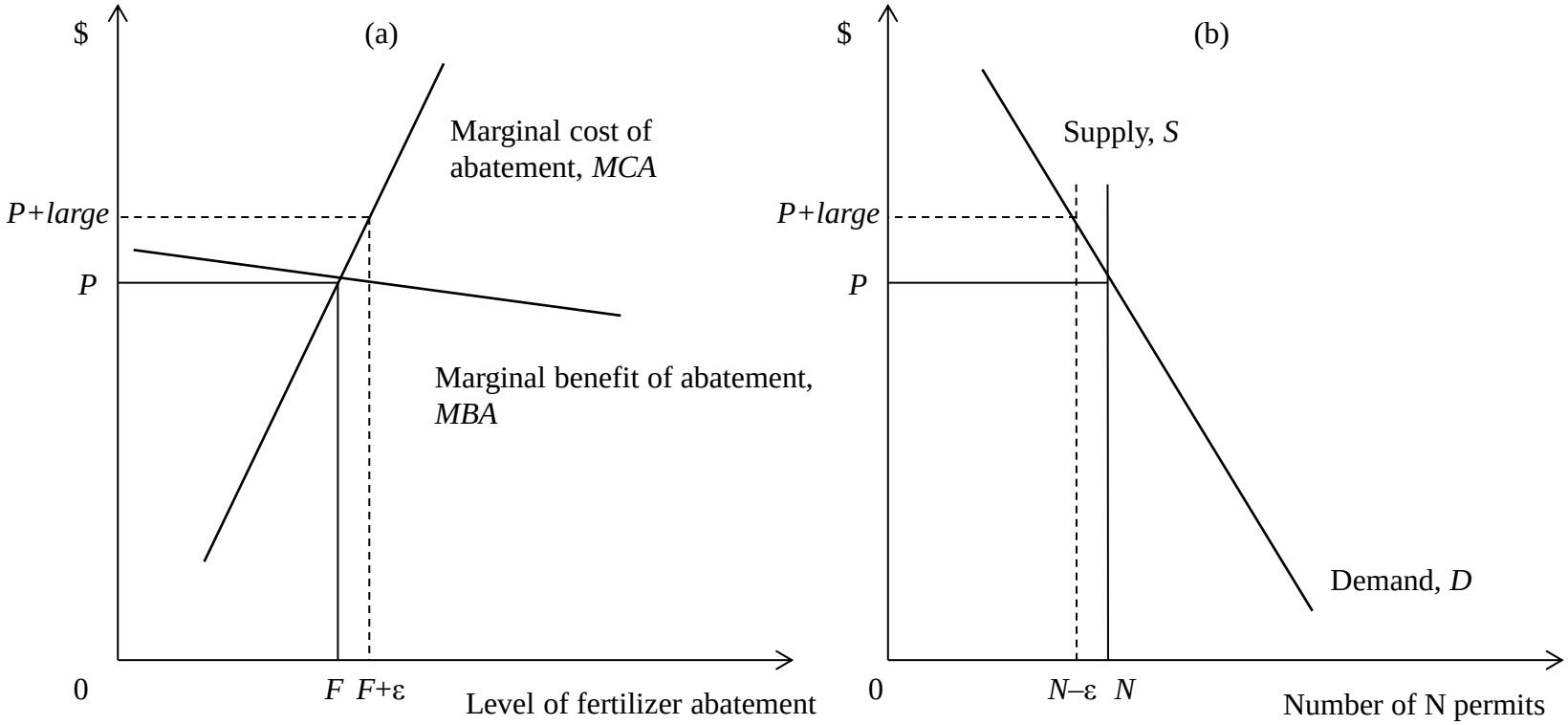
Consider the intertwined markets – fertilizer abatement and tradable permits. If abatement is characterized by the relations in panel (a), the demand for permits is flat. Then, if the number of permits made available is reduced even slightly (panel b), their price will rise a lot.



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Economic Incentives (cont)

- Regulations/standards are inefficient, but, from a practical standpoint, the informational requirements for determining appropriate charges maybe more onerous than what is required under a more **nuanced regulatory approach**
- Consider CO_2 emissions and sequestration
  - How do we track carbon in soils?
  - Unlikely that we can ever use a subsidy/tax scheme to tackle agricultural (and forestry) externalities related to carbon fluxes
    - How do we measure fluxes?
    - How do we weight fluxes as to when they occur? What weight do we use when sequestering carbon over a period of time and we pay today?

Cross Compliance

- Requires farmers to comply with certain environmental standards to be eligible for farm subsidies – deemed a red-ticket policy
  - Describes practices that agricultural producers must implement to be eligible for government support payments
  - offsets externalities associated with agricultural output incentivized by support payments
  - U.S. example: land set-asides
    - In conjunction with Conservation Reserve Program
- EU farmers compensated for providing environmentally-friendly farming practices – *greening component*
  - Payment **added** to SFP farmers receive – a type of green-ticket policy
  - referred to as the Ecological Focus Area
  - EFA is costly as the set aside reduces subsidy payments by a minimum 5%, which amounts to $200,000 annually for some farms

Land-use Restrictions

- Zoning leads to social surplus if it is efficient
  - Assigns development rights and arbitrarily distributes surplus
  - Three major impacts on agriculture:
    - Does not fairly distribute the surplus – there are definite winners and losers
    - Invites speculation and encourages rent seeking to gain variances to the zoning ordinance – to the blueprint.
    - Planning not a dynamic process capable of reflecting the changing demographics of a growing farm community and the nearby urban developments
- Major objection to zoning is that it creates inequities, with a farmer's ability to earn income affected by the zoning ordinance.
- Examples: BC's ALR and greenbelts → open space

Purchase of Development Rights

- Government buys land and leases it to farmers with restrictions
- Government can buy land and sell it back with restrictions
- Government can purchase certain development rights to land to ensure that a particular land use remains in effect indefinitely
  - Restrictive covenants: bind current and future landowners to specific land uses by restricting certain crop practices or other uses of land
  - Conservation easements: restricts what can be done with a specific portion of a field; e.g., easement prevents ploughing within 10 meters of a wetland area to protect waterfowl habitat
- Benefits of restrictive covenants and easements: Their purchase provides revenue for farmers

Payments for Environmental Services (PES) and Contracting

- Government or private agents contract with landowners so that the latter provide environmental / ecological goods or service that are desired
  - Contracts range from one year to 5-year, 10-year and longer
  - Initial payment to change land use, annual payments thereafter
- Examples: U.S. Conservation Reserve Program and Canada's Prairie Pothole Project under NAWMP (1986)

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Payments for Environmental Services (PES) and Contracting (cont)

- Carbon aggregators pay landowners to grow trees providing a one-time payment to convert land and then follow-up payments (annual, end of contract period, or some combination)
- Problem #1: Landowners have little incentive to keep land in forestry if subsequent payments are less than opportunity cost of land in an alternative use
- Problem #2: Chain of certification and final sale of carbon offset credits is questionable. Landowners may not be actual farmers, aggregated carbon needs to be certified, certifiers have no incentive to monitor, etc.*
- Lesson: Contracting only works if the incentive scheme is carefully thought out and there exist institutions (e.g., 'rule of law' and courts) to ensure contracts are upheld.

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*van Kooten, 2017. Forest Carbon Offsets and Carbon Emissions Trading: Problems of Contracting, *Forest Policy and Economics* 75: 83-88

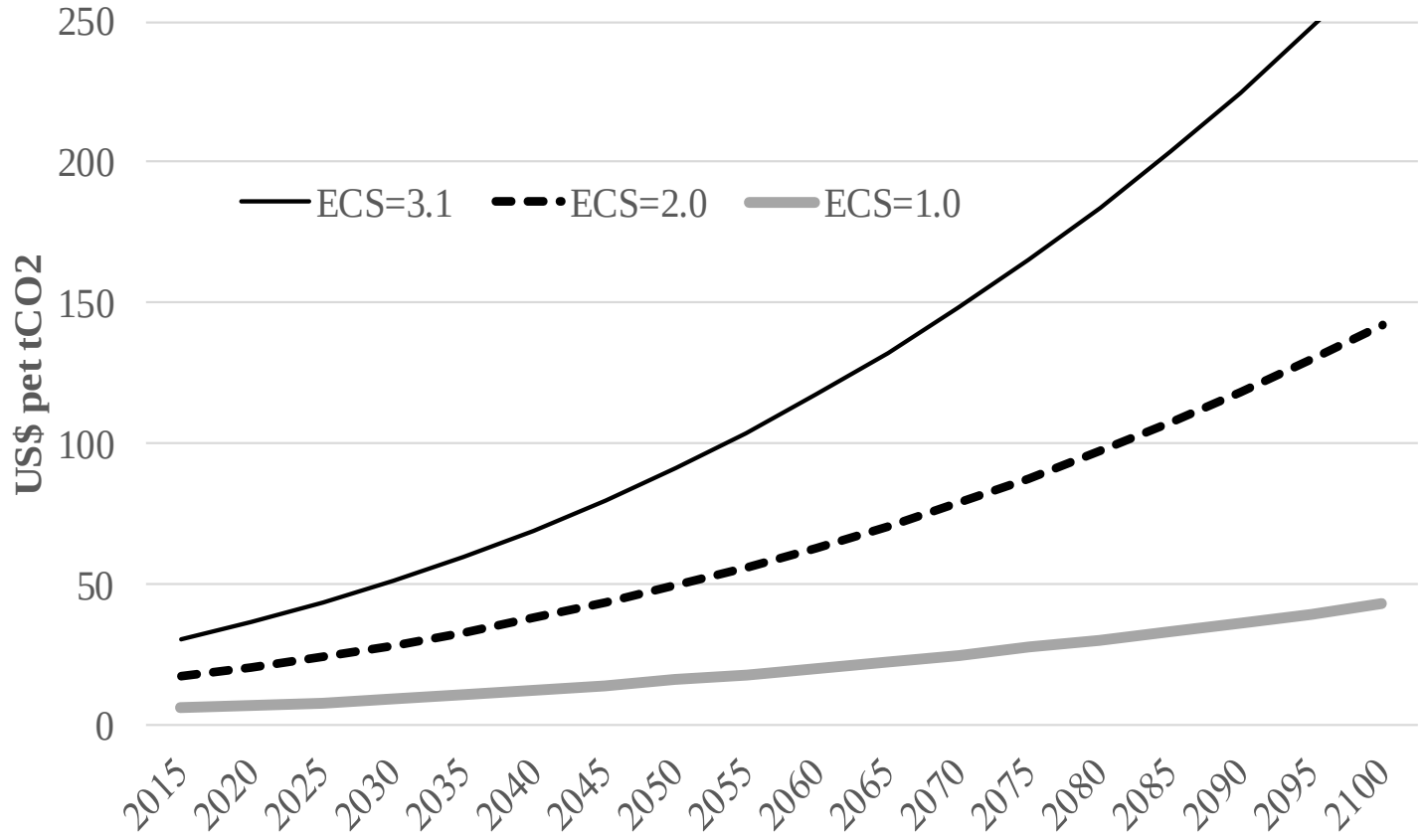
Best Management Practices

- Difficult to track carbon fluxes in soils, sources of eutrophication in a watershed (which individual farms are responsible), etc.
  - How do you calculate carbon credits from land use?
  - How can we determine a tax on N runoff?
- Practical alternative to tax or subsidy: provide incentives for farmers to adopt best management practices (BMPs)
- Forest Stewardship Program of Can Ag Partnership
  - Permanent tame forage BMP: 50% of establishment and certified seed costs up to max of $10,000
  - Permanent native forage BMP: 90% of establishment and certified seed costs up to max of $10,000
  - Manitoba: perennials in crop rotations, perennial planting on sensitive lands, etc. 25%-50% of establishment costs

Pitfalls

- When calculating externality costs, shadow prices for various externalities are required.
  - Use of benefit transfer techniques. How reliable are shadow prices from the U.S. or Europe for western Canada, say?
- An extreme example of this is shown in the next slide

The Effect of the Equilibrium Climate Sensitivity on the Social Cost of Carbon



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Conclusions

- Not simple task to identify externalities. What constitutes an externality? How do we measure it?
- Determination of action: Should society correct the externality? Does the ‘fix’ result in problems elsewhere? (Notion of leakage.)
- Uncertainty is a huge problem
- Transaction costs related to monitoring, contracting, etc. is a problem (e.g., require ‘rule of law’)
- Having thought about this, I like the direction Canada has chosen regarding its business risk management suite of programs and its use of BMPs to deal with externality in agriculture.

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