Modelling greenhouse gas emissions abatement strategies at the farm level

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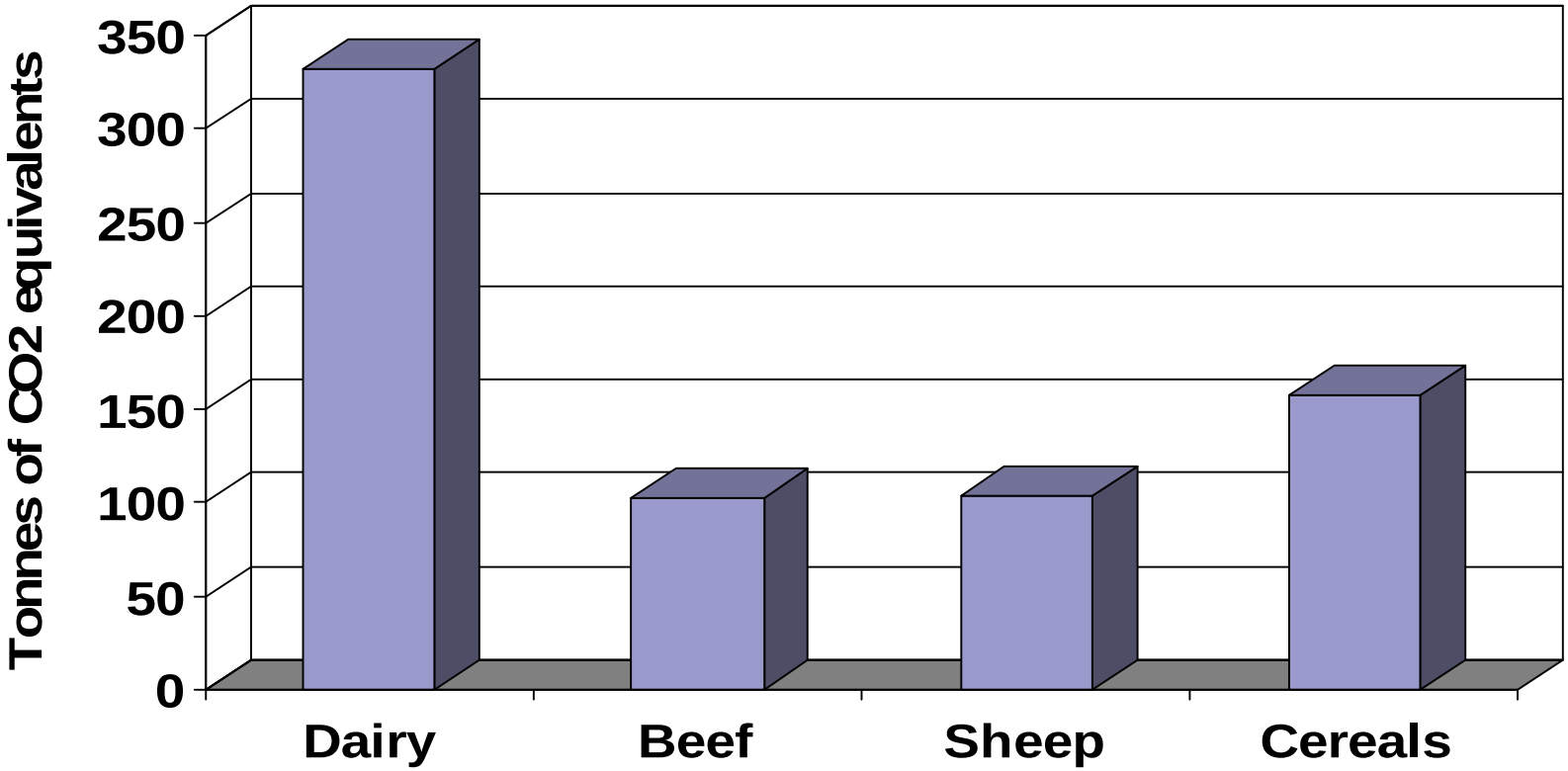
Overview of Presentation

- **Background**
- **Research Question**
- **Materials and Methods**
- **Results**
- **Conclusions and Future Research**

Background

- **EU**
  - have proposed to cut emissions by 20% by 2020
  - approximately 10% of GHG emissions come from agriculture
- **Ireland**
  - Agriculture currently accounts for over 25% of GHG emissions.
- **New Zealand**
  - Agriculture currently accounts for over 40% of GHG emissions
- **Irish Agriculture's share of the emissions reductions is not yet decided**

Average GHG Emission level by Farm Type



Research Question

- **Technical Abatement Strategies**
  - Considerable volume of research into the impact on emissions from changing farm practices in Ireland.
  - These strategies will help to reduce emissions but could they achieve a reduction of 20%?
- **Policy Abatement Strategies**
  - Can also be used to reduce emissions
  - Baumol and Oates (1988) argued that permit trading may be the most cost efficient means
  - Compare the cost of achieving a targeted reduction in emissions by allowing farmers to trade permits with a command and control approach

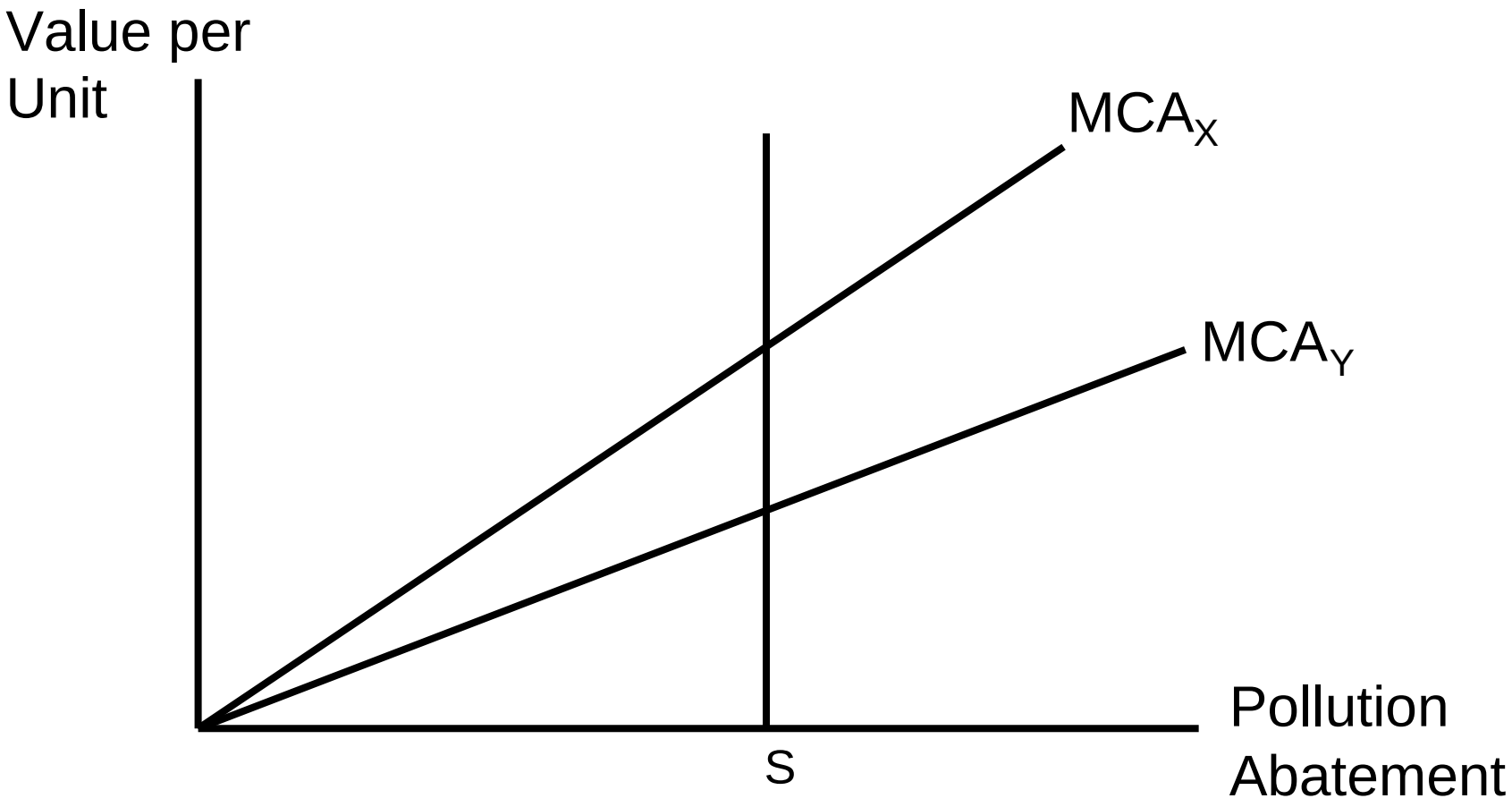
Policy Based Abatement Strategies

- **What are Policy Based Abatement Strategies?**
- **These are mechanisms used by regulators to achieve desired reductions in pollution**
  - Emissions Standards (Command and Control)
  - Emissions Tax
  - Emissions Standards and Charges
  - Emissions Trading
  - Input Restrictions or Input Tax
  - Consumption Tax

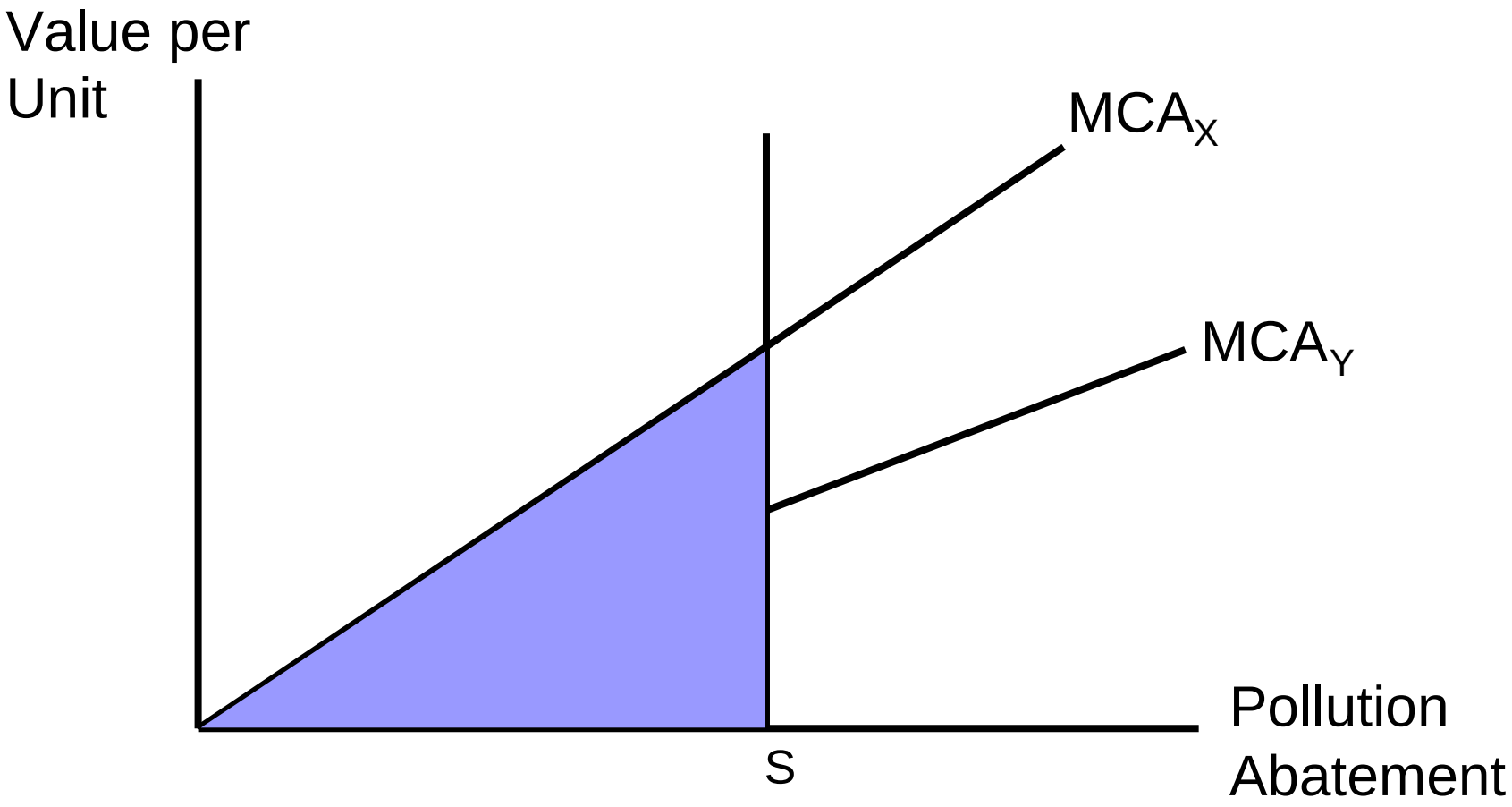
Emissions Standard

- **Requires regulatory authority to set an acceptable environmental level**
- **Often called "command and control approach"**
- **Adv:**
  1) Guarantee that emissions don't exceed a certain level
- **Disadv:**
  1) Inefficient because standards are usually based on general requirements
  2) Individual relative marginal abatement costs are not considered

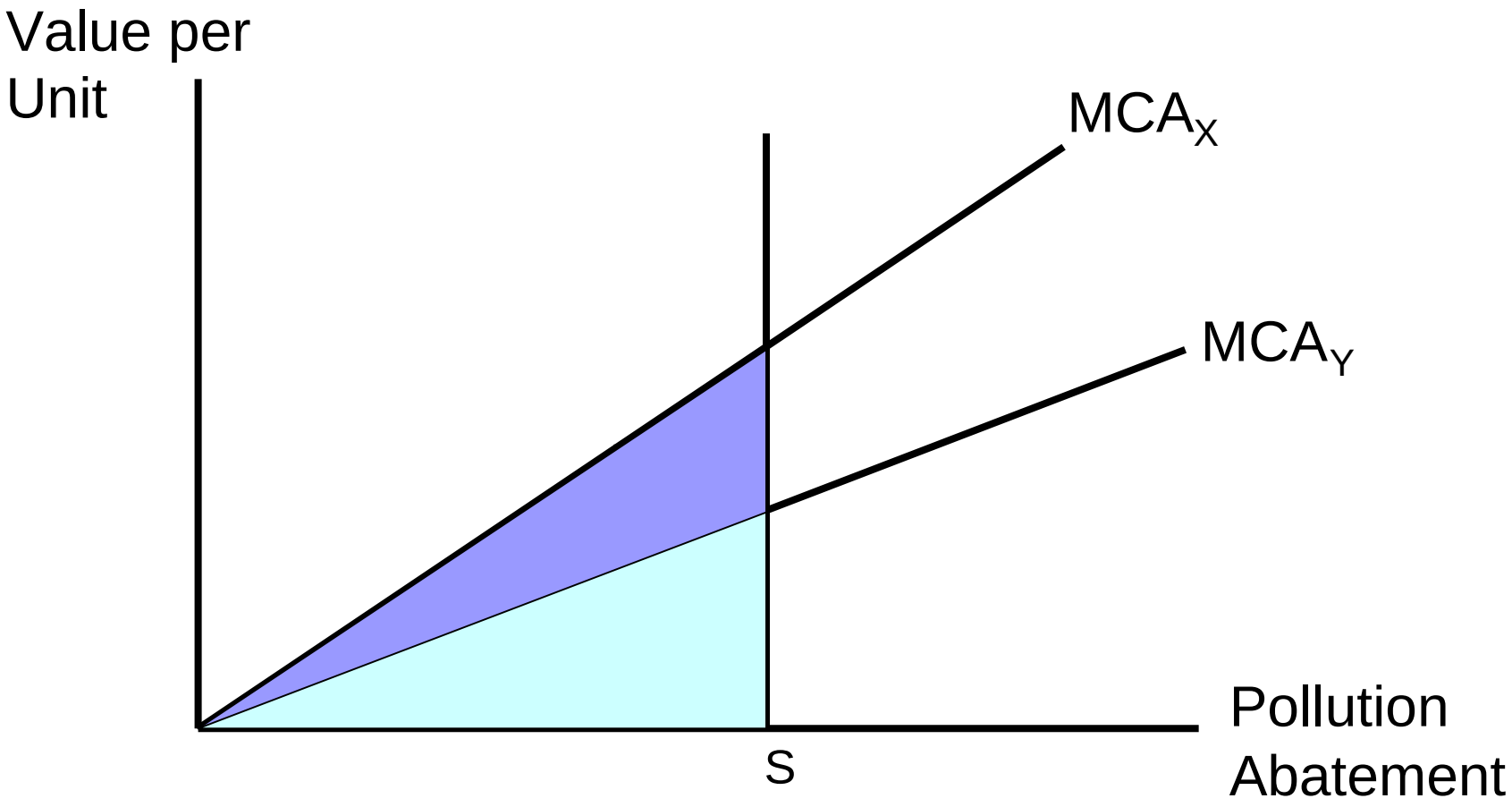
Emissions Standard



Emissions Standard



Emissions Standard



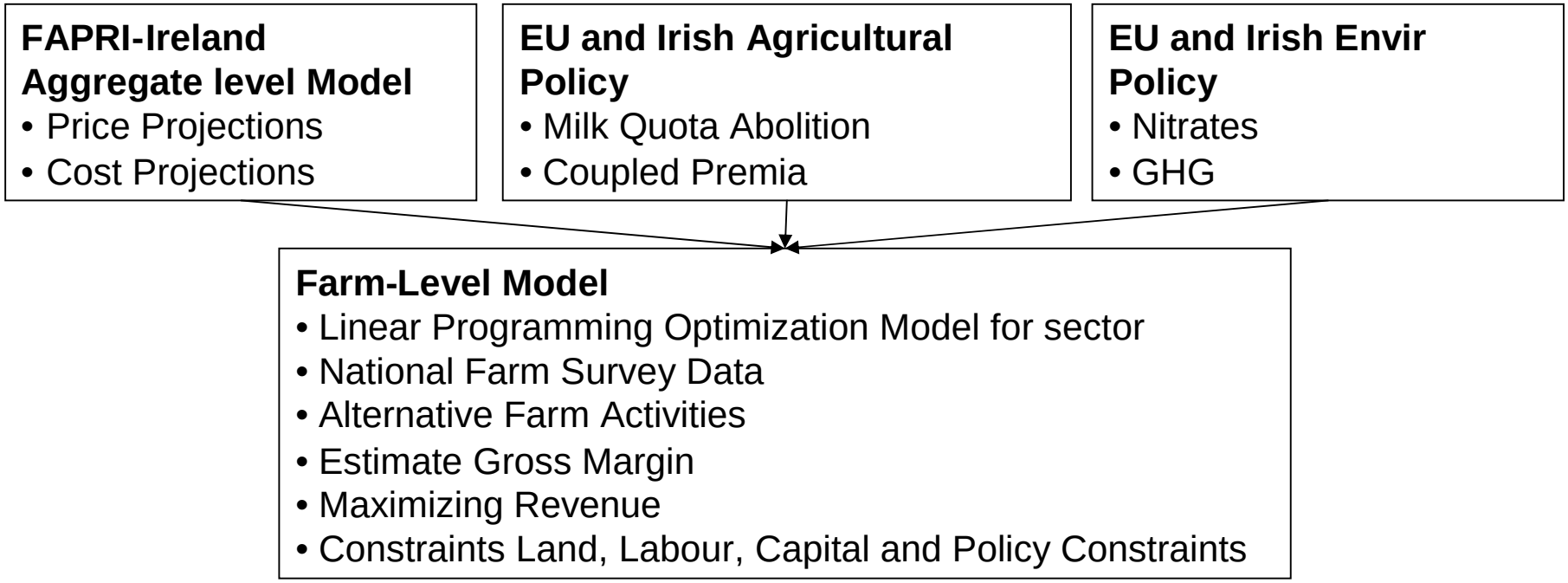
Emissions Trading

- **Permits to pollute are issued**
- **Participants in the market trade permits**
- **Permits can initially be issued based on historical levels or auctioned off**
- **Adv:**
  1) Emissions permits are cost effective in achieving required environmental standards
  2) Often politically more acceptable than a tax or charge
  3) Permit market is self correcting as agricultural returns change the permit price will change also
- **Disadv:**
  1) If initial allocation is by auction there is a danger that permit prices can be bid up

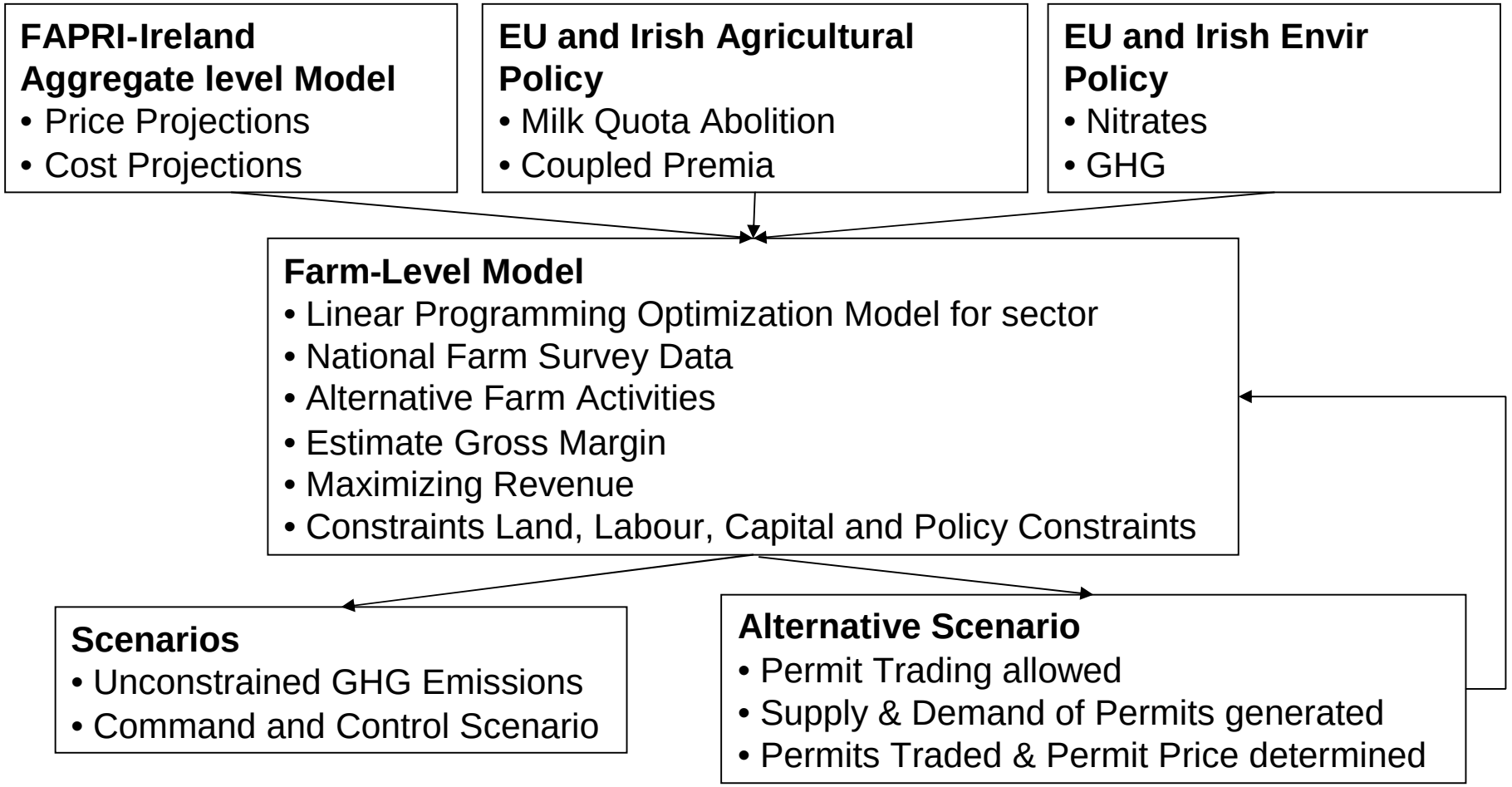
Conceptual Framework

Farm-Level Model
- Linear Programming Optimization Model for sector
- National Farm Survey Data
- Alternative Farm Activities
- Estimate Gross Margin
- Maximizing Revenue
- Constraints Land, Labour, Capital and Policy Constraints

Conceptual Framework



Conceptual Framework

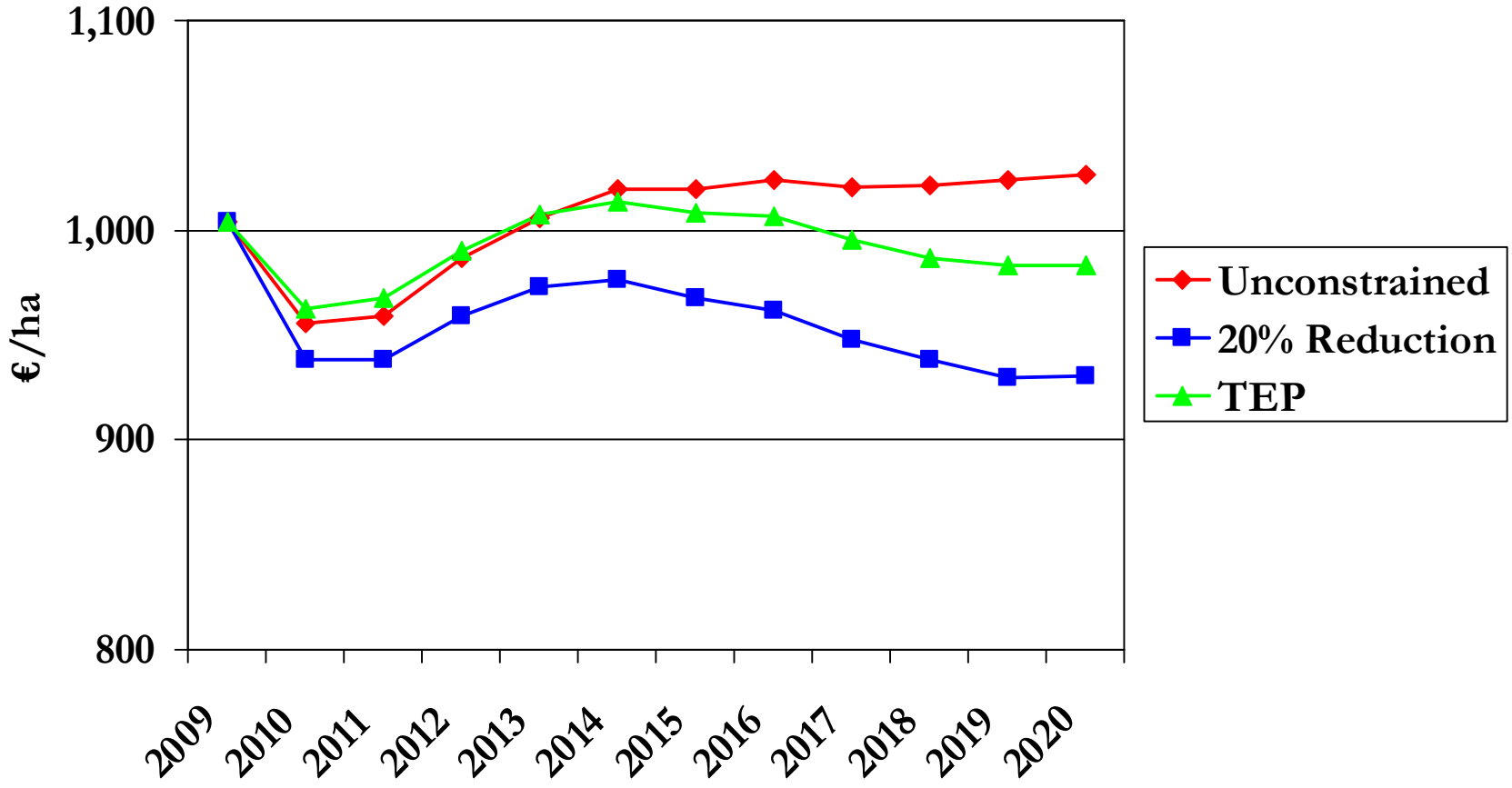


Scenarios to be Analyzed

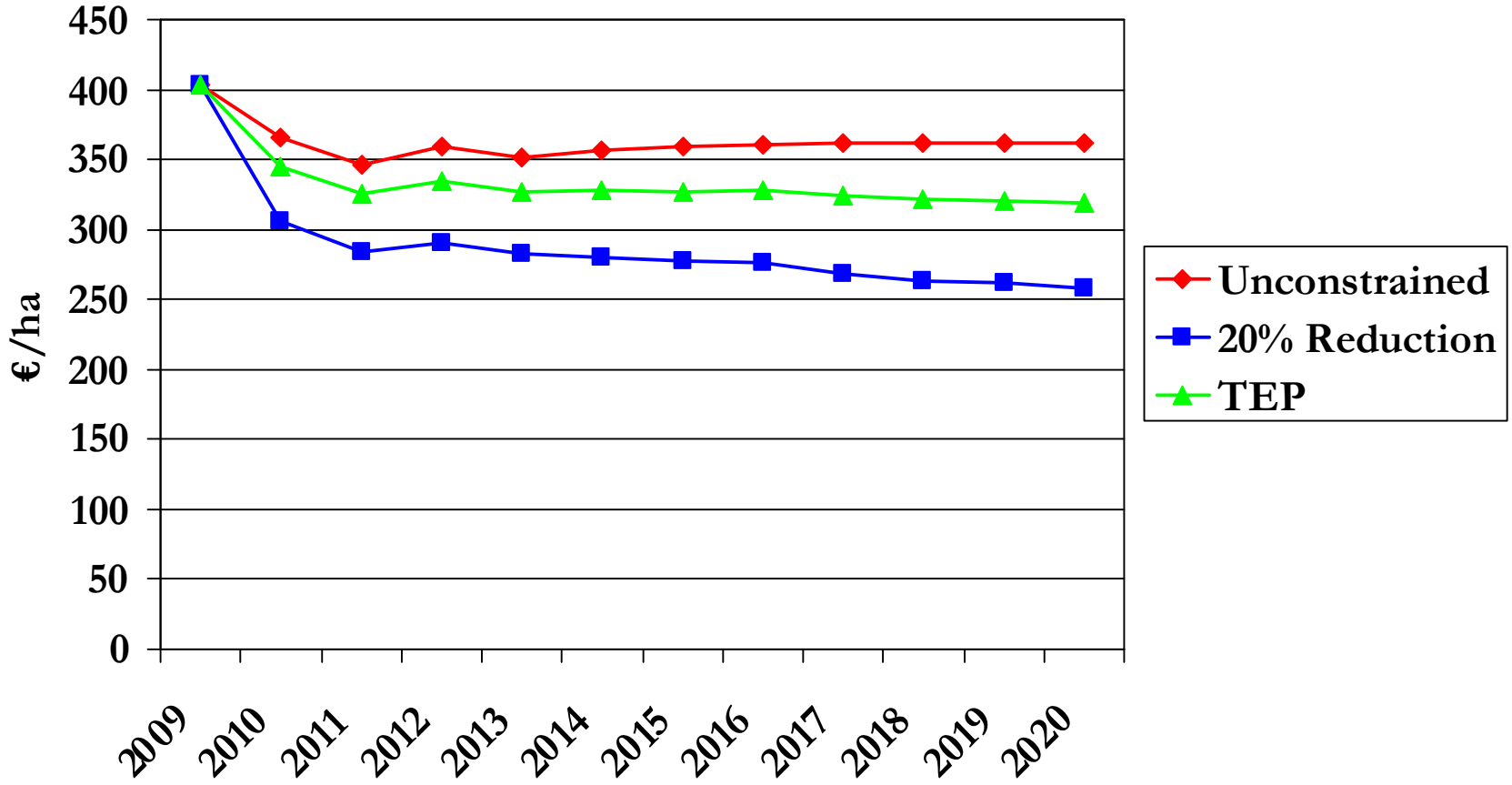
- **Unconstrained GHG Scenario**
  - Baseline scenario includes no agricultural reform and no restriction on GHG emissions
- **20% GHG Reduction Scenario**
  - Assumes a 20% reduction in GHG emissions is enforced across all farms "command and control" approach
- **TEP Scenario**
  - Assumes a 20% reduction in GHG emissions is enforced across all farms however farmers can trade emission permits

Preliminary Results

Impact on Ave Dairy Farm Gross Margin of GHG Emissions Scenarios



Impact on Ave Beef Farm Gross Margin of GHG Emissions Scenarios



Conclusions

- **Command and Control approach would have a significant impact on average dairy and beef gross margins.**
- **Impact on cereal and sheep gross margins is much smaller**
- **Indications are that tradable emissions permits can help to reduce the impact of a cut in GHG emissions on farm income**

Future Research

- **Inclusion of**
  - Technical abatement strategies
  - Forestry and Biomass crops
  - Alternative market-based or policy-based emissions abatement strategies
- **To examine the impact of alternative emissions abatement strategies on the wider economy**
  - Using BMW SAM
- **To include transaction costs in the analysis**
- **To look at alternative emissions allocations**

Thank You

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