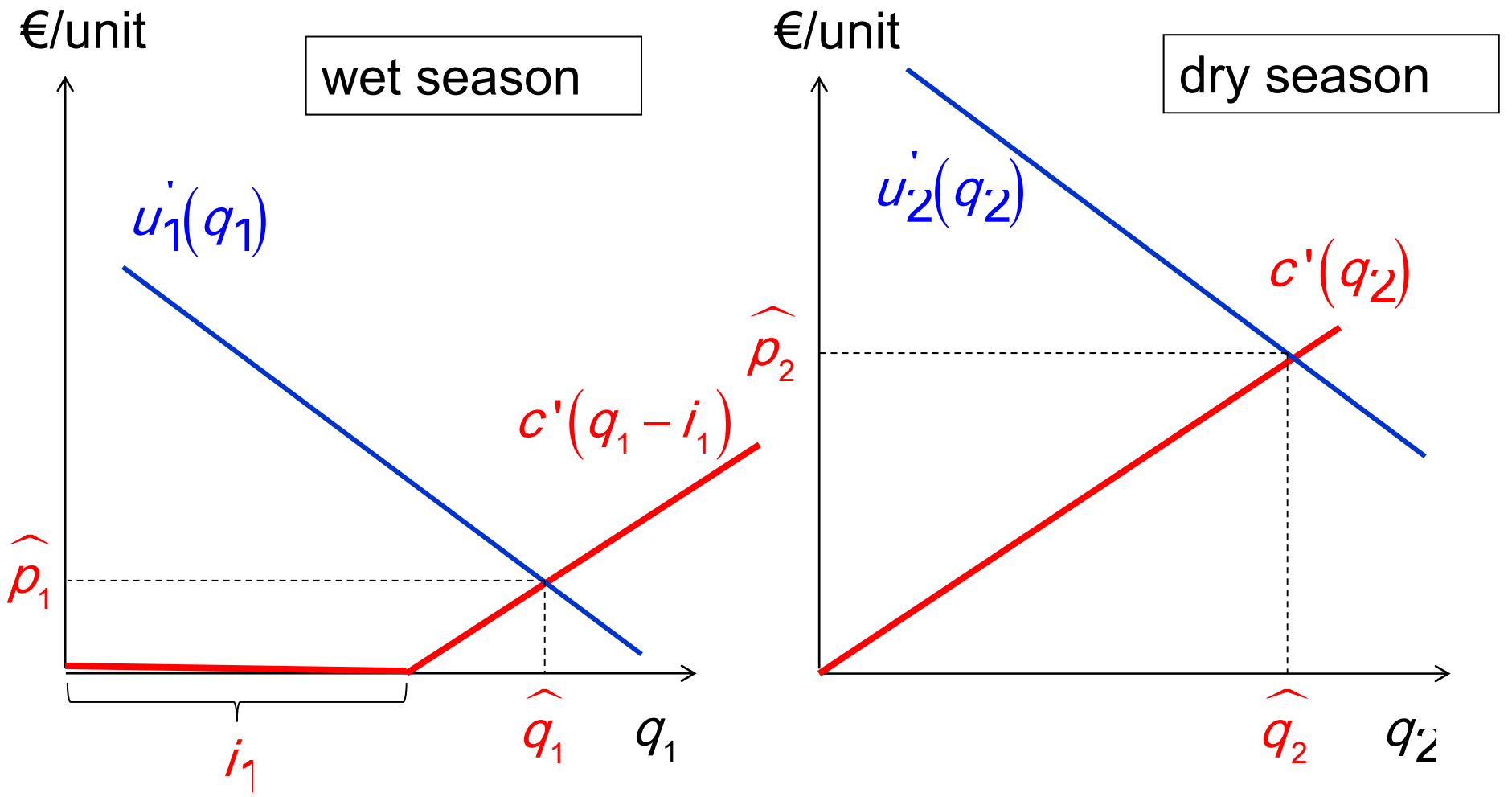
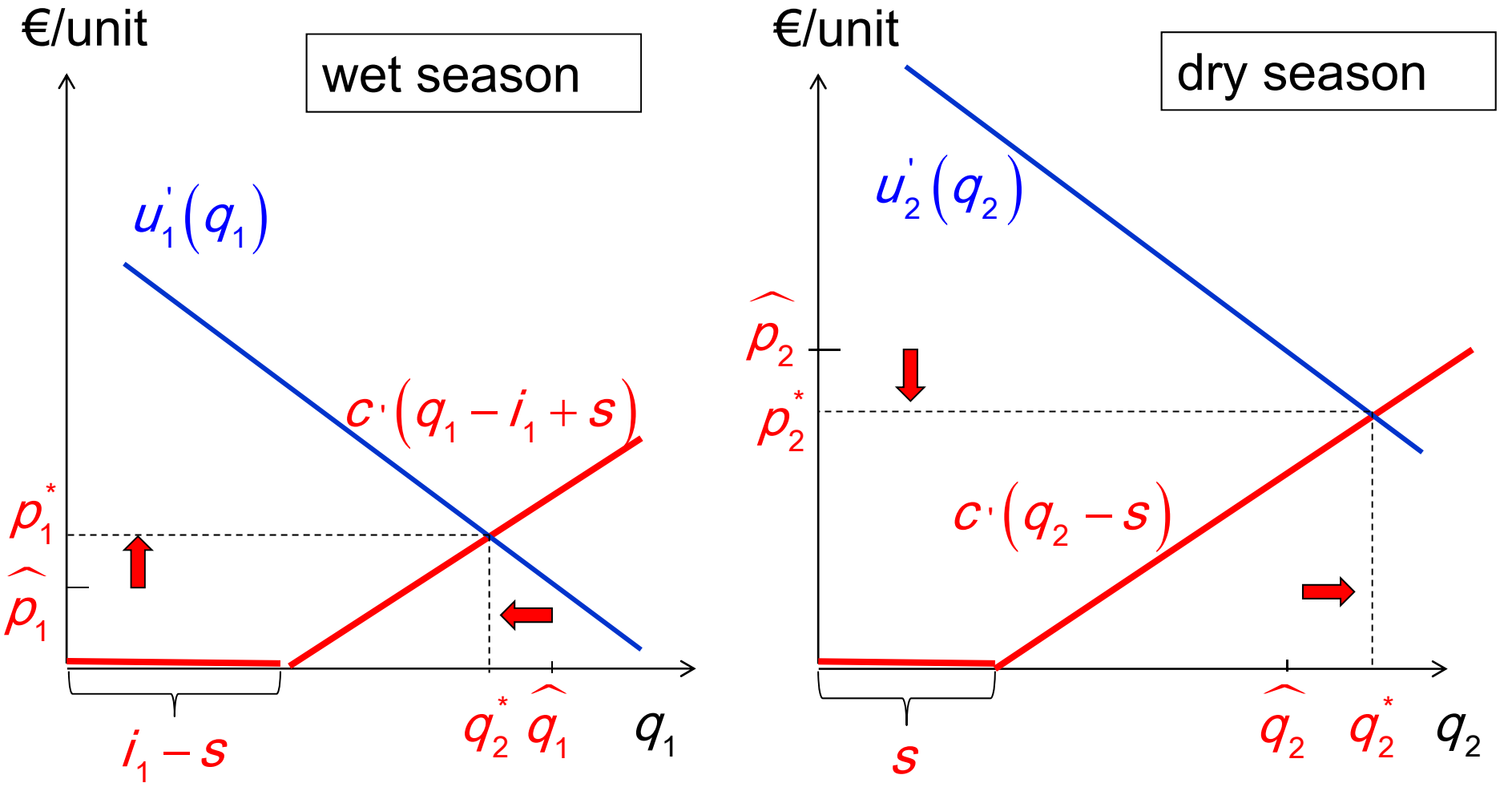
Comments on "*The role of storage in a competitive electricity market and the effects of climate change*" by L. Evans, G. Guthrie, A. Lu

Claude Crampes
(claude.crampes@tse-fr.eu)

basic idea


€/unit
wet season
$u_1'(q_1)$
$c'(q_1 - i_1)$
$\widehat{p}_1$
i_1
$\widehat{q}_1$
q_1
€/unit
dry season
$u_2'(q_2)$
$c'(q_2)$
$\widehat{p}_2$
$\widehat{q}_2$
q_2

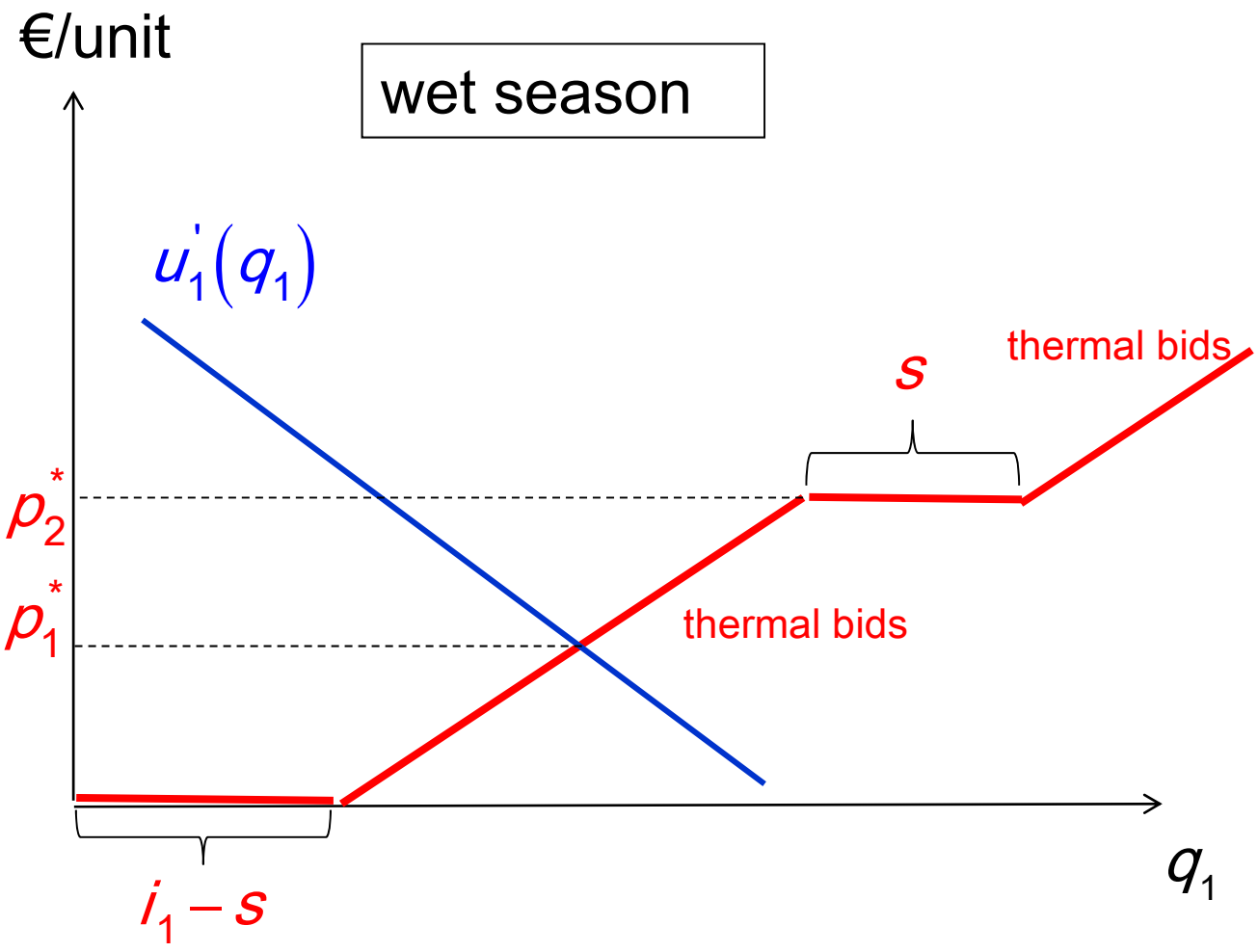
time transport



results

- water storage facilities for hydroelectric plants allow
  - to increase total surplus;
  - to increase consumers' surplus;
  - to increase hydro-electricity producers ' profit;
  - to decrease gas-fired plants' profit.
- the paper provides a numerical confirmation calibrated with data from the New Zealand electricity market in a dynamic context with stochastic inflows
- the paper also considers climate changes
  - increase in rainfalls, both average and volatility;
  - carbon tax on gas-fired plants.

implementation on a wholesale market



- entering the today merit order necessitates a correct valuation of p_2^*, the opportunity cost of today water ≡ the shadow price of stored water.
- the paper links the shadow price of water to inflow conditions, lake levels, and seasonal cycle.

quantitative results

- All the results from the calibrated model fit theoretical predictions
- Then the question is to know whether calibration is well suited.

some short questions

- Demand is cyclical but certain;
  - how to justify that demand functions all have the same slope *b*?
- The cost of gas-fired plants is a cubic function of the output, with a scale factor calibrated at one average point;
  - why that? did you simulate other functional forms? do thermal plants always bid the same?
- There are transmission but no congestion;
  - is it the case or just a simplification?

some potential extensions

- Water is both a public and a private good;
  - could the model take the alternative uses of water into account?
- Water can be pumped upstream for future use;
  - are there pumped storage plants in NZ?
  - how would they decrease the shadow price of stored water?