Climate variability, climate risk and irrigated agriculture
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John Quiggin
Federation Fellow
Risk and Sustainable Management Group, Schools of Economics and Political Science, University of Queensland
Web Sites

Quiggin http://www.uq.edu.au/economics/johnquiggin
Blog http://johnquiggin.com
Climate variability

A perennial problem for agriculture
Australia: ‘droughts and flooding rains’
Responses

Irrigation: ‘droughtproofing’
Production flexibility and diversification
Financial measures for consumption smoothing
Responses

Irrigation: ‘droughtproofing’
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Modelling

State-contingent production
Introduced in GE modelling, Arrow-Debreu, Chambers & Quiggin, modern production theory
Natural integration with finance theory
Climate Change

Driven by greenhouse gas emissions
Change in stochastic distribution of climate
Attribution problem
Projections

Warming of at least 2 degrees even with stabilization at 450 ppm
This, and not status quo, should be baseline for comparison

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Business as usual

Implies high risk of catastrophic damage by 2100

Assumes discovery of ‘magic bullet’ which will remove CO2 and/or reverse cumulative processes
Figure 7.1 Temperature increase into the 22nd century

Projections from the Garnaut Review

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Rainfall impacts

More spatial and temporal variability
- The wet get wetter and the dry get drier

More extreme events
- Flood events exacerbated by sea level rise
Agricultural production

Mixed impact for warming up to 2 degrees by 2100

Negative net impacts 2-3.5 degrees

Serious to catastrophic losses at higher rates of warming
Cereal price impacts of climate change (IPCC FAR)
Impact on Murray–Darling Basin

Decline in average inflows
Increase in drought frequency
A state-contingent model

Farmers plan production for Wet, Normal and Dry states

Increase in drought frequency causes large reductions in profitability
Baseline for Murray-Darling Basin simulations
Median climate, business as usual, 2100
Median climate, 450 ppm mitigation, 2100
Policy implications

Under business as usual, irrigation ceases to be viable

Combination of mitigation, adjustment, innovation can achieve sustainable outcome
Concluding comments

Risk and variability are central in agricultural production

Climate change creates new risks, changes old ones

Markets are a crucial part of the response
Climate variability, climate risk and irrigated agriculture