Water trade in the southern Murray-Darling Basin

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Introduction

- TERM is a regional CGE model developed by CoPS
- TERM has been used in drought analysis
- We use TERM with additional water module
- Many institutions involved in TERM-Water

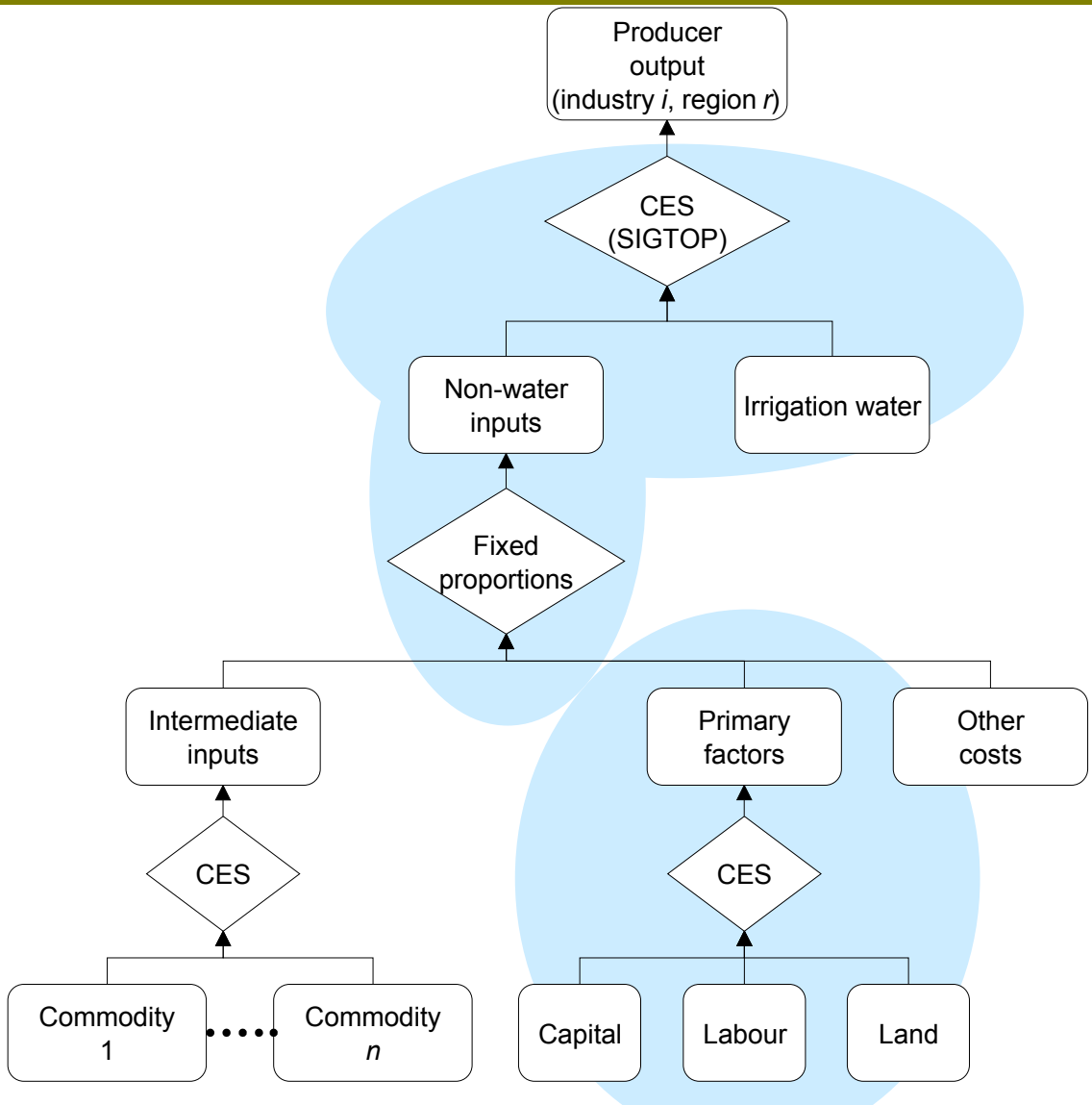
Background

- 70% of irig. water use occurs in southern MDB
  - *sMDB = NSW, Victoria and South Australia*
- This region is hydrologically linked
  - *water NOT extracted at one point, can be extracted elsewhere*
- Water trade is currently limited between states and between some regions

Getting water into TERM

- Water as a production input
- Substitutability between water and other inputs
- Property rights over water allocations given to (farmers in) each industry in each region
- Total water supply fixed exogenously

Production structure



Substitutability of water

- SIGTOP = input substitutability

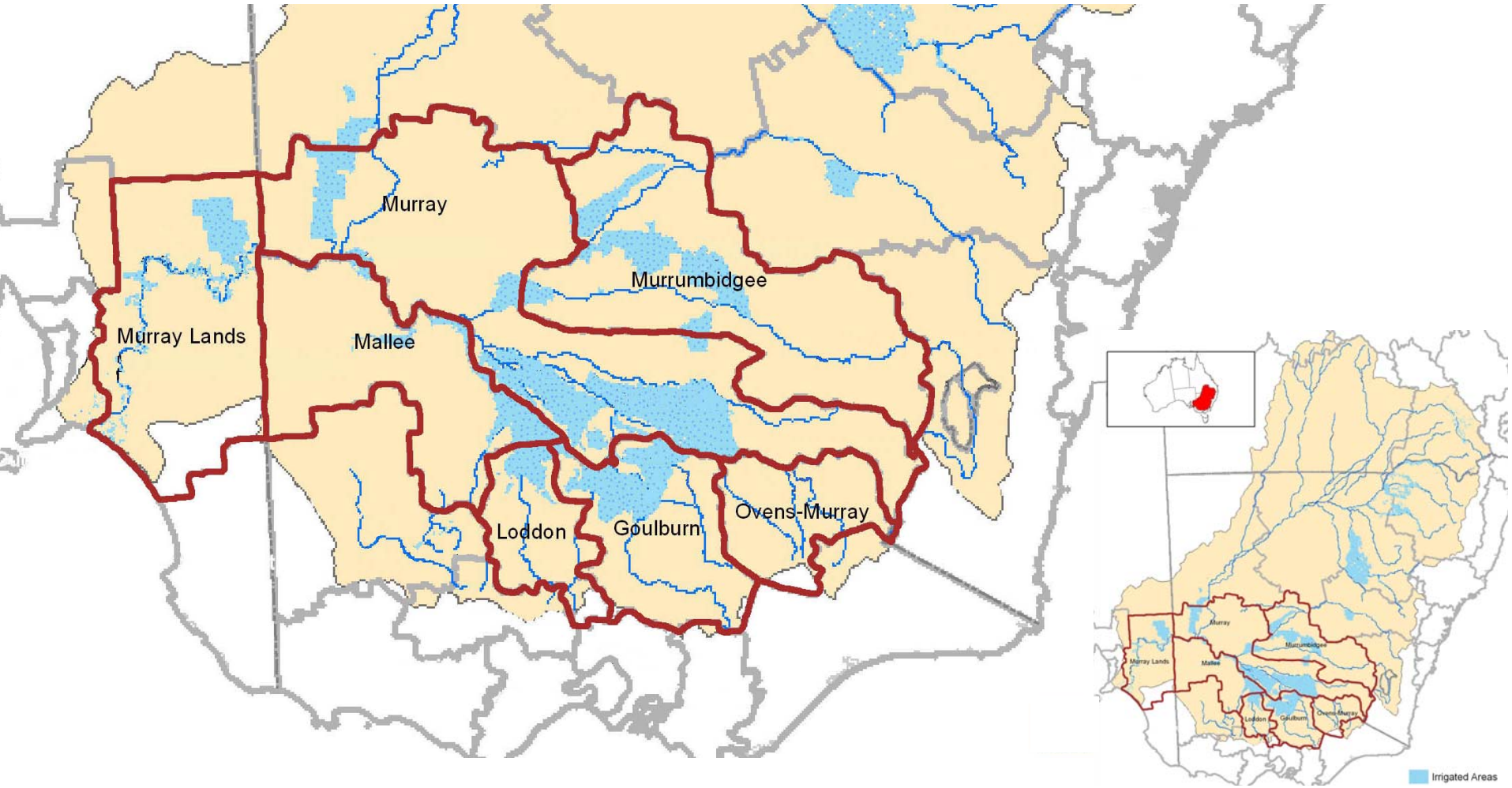
  (between water and a bundle of all other inputs)

xwat(i,r) - xtot(i,r) = - SIGTOP(i,r)*[pwat(i,r) - ptot(i,r)]

- SIGTOP depends on industry characteristics

  $SIGTOP_{Dairy} > SIGTOP_{General} > SIGTOP_{Rice}$

Southern MDB



Aim

- Magnitude and distribution of effects of expanding water trade
  - *National, state and regional level*
  - *Impact on industries*
  - *How irrigating activities adjust*
- Effect of trade in different contexts
  - *Long term changes in available water volumes*
  - *Short term (seasonal) variations in water availability*

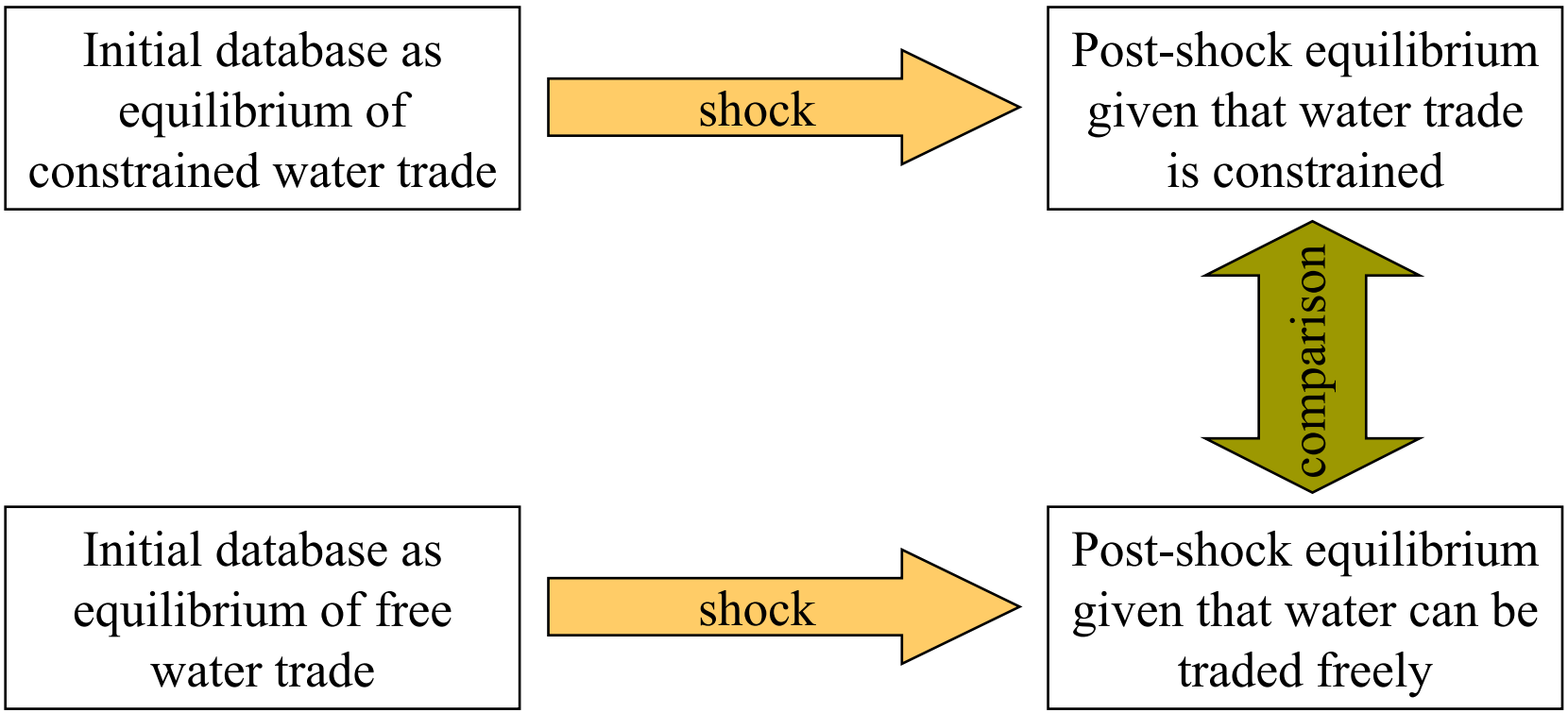
Strategies

- The direct impact of allowing trading opportunities
  - *The economic changes resulting from freeing up currently constrained trade*
- The indirect benefits of trading water freely
  - *Increased flexibility*
  - *Can better cope with shocks to available water supply*

Assessing direct benefits

- Need to shock the 'freeness' of water trade
- Use of trade quotas
  - *Permits limited trade between regions*
  - *Degree of trade can be 'shocked'*
  - *Maintains price differentials between regions*
- Code developed
  - *However, no experiments conducted*

Assessing indirect benefits



Implementation

- Trade expanding from:
  - *No trade → intraregional trade only*
  - *Intraregional trade → inter- and intraregional trade*
- Change of closure
  - *Altering the aggregation level at which water supply = water demand*

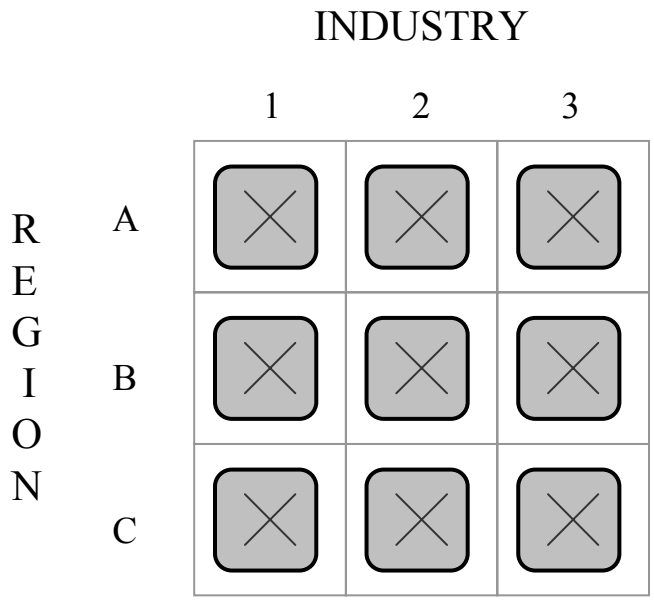
No water trade regime

- Restricting water use to within each industry of each region

Exogenously force the condition:

water allocations = water use

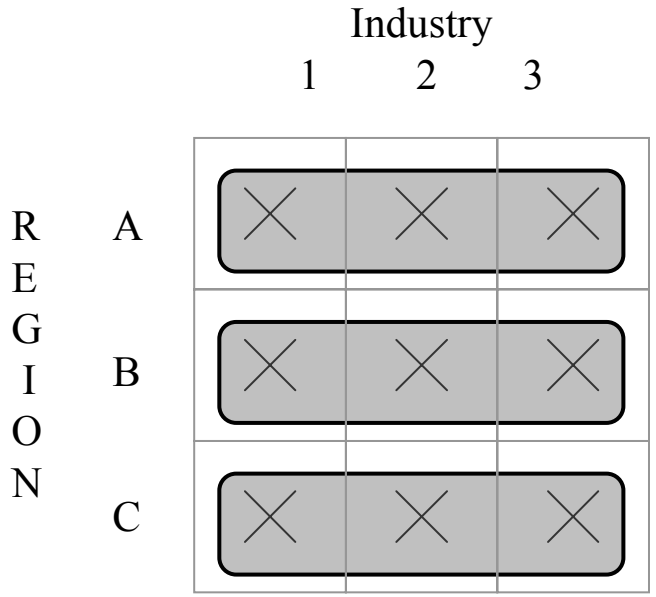
(x_right = xwat)



Intraregional water trade only

- Restricting water use to within each region
- Water can reallocate between industries

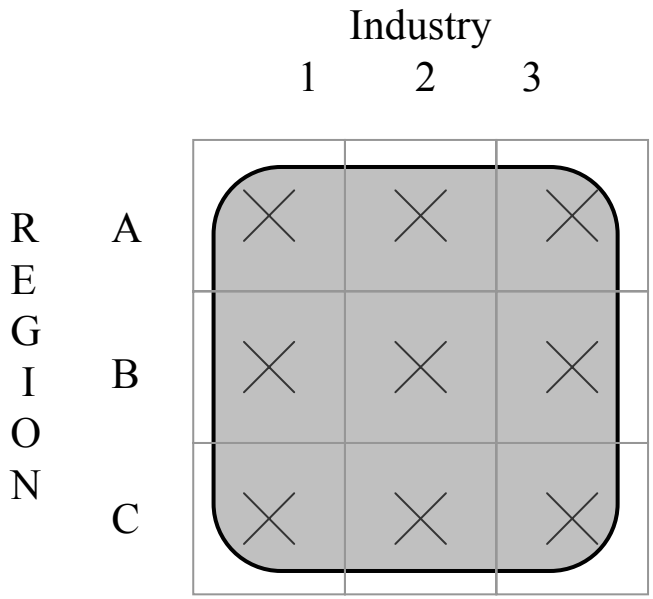
swap pwat_i(REG) = xwat_i(REG);



Inter- and intraregional trade

- Water can reallocate between industries in all regions

swap pwat_ir = xwat_ir;



Types of shocks

- All shocks were to volume of water allocated
- Long term shocks
  - *Policy changes*
  - *Changing climatic trend*
- Short term shocks
  - *Seasonal variation*

Long term shocks

- 10%, 20% & 30% water reductions to industries in southern MDB
- Capital adjustment possible
- Labour migration is relatively fluid
- Land fixed within each region

Short term shocks

- Water reductions based on observed seasonal variation – for years 1997-98 to 2001-02
  - *–17.7% in 1997-98*
  - *–17.4% in 1998-99*
  - *–33.2% in 1999-2000*
  - *–14.0% in 2000-01*
  - *–17.4% in 2001-02*
- Capital fixed
- Labour has lower propensity to migrate for a given wage differential

Long run results

- A 10% reduction in water availability reduces GRP of the southern MDB by:
  - *1.04% without trade in water*
  - *0.67% with trade permitted in each region*
  - *0.52% with trade in and between regions.*
- No trade → intra- and interregional trade halves the impact on GRP
- Similar proportional change under 10%, 20% and 30% cuts

GDP and GRP effects

	Relative effects of moving from no trade to allowing intra-regional trade only				*Relative effects of moving from intra-regional trade only to allowing interregional trade*		
reduction	10%	20%	30%		10%	20%	30%
	%	%	%		%	%	%
New South Wales							
Murrumbidgee	49	52	52	Export water	–32	–32	–32
Murray	41	43	43	Export water	–35	–34	–34
Victoria							
Mallee	49	57	61	Import water	42	38	31
Goulburn	16	21	22	Import water	56	55	52
Loddon Campaspe	25	30	34	Import water	42	36	26
Ovens Murray	22	30	36	Import water	70	72	71
South Australia							
Murray Lands	21	29	33		75	76	75
Southern MDB	**35**	**40**	**42**		**23**	**24**	**22**
Australia	31	36	39		22	30	32

Short run results

- Moving from no trade to intra- and interregional trade together approximately halves the impact on GRP
  - *between 47 and 55 per cent*
- The potential increases in GRP of the southern MDB from water trade are:
  - *greater in drier years such as 1999–2000 ($555 million in 1999–2000 dollars)*
  - *compared with years when water is more abundant, as in 2000–2001 ($201 million in 2000–01 dollars)*

Key Conclusions

- Trading enables water to be re-allocated to more productive uses
- No trade → intra- and interregional trade more than halves the impact of water reductions on GRP
- Reduced water availability leads to an output decline in most industries
- In years with low water availability, water reductions would have a larger effect on GRP than if the cut had occurred in years with higher water availability

The End

Water trade regimes