



Water Security, Risk, and Growth

Simon Dadson

simon.dadson@ouce.ox.ac.uk



SCHOOL OF GEOGRAPHY
AND THE ENVIRONMENT



Role of Water Infrastructure in Economic Growth

- Dual nature of investment in water
- Productive and protective
- Infrastructure, Information, Institutions



UK Flooding and Storm Damage



- Sea wall collapse in Dawlish, Feb 2014
- >£100m subsequently announced for flood works
- “Money is no object in this relief effort. Whatever money is needed for it will be spent.” (D. Cameron, 2014)

Thai Floods, 2011



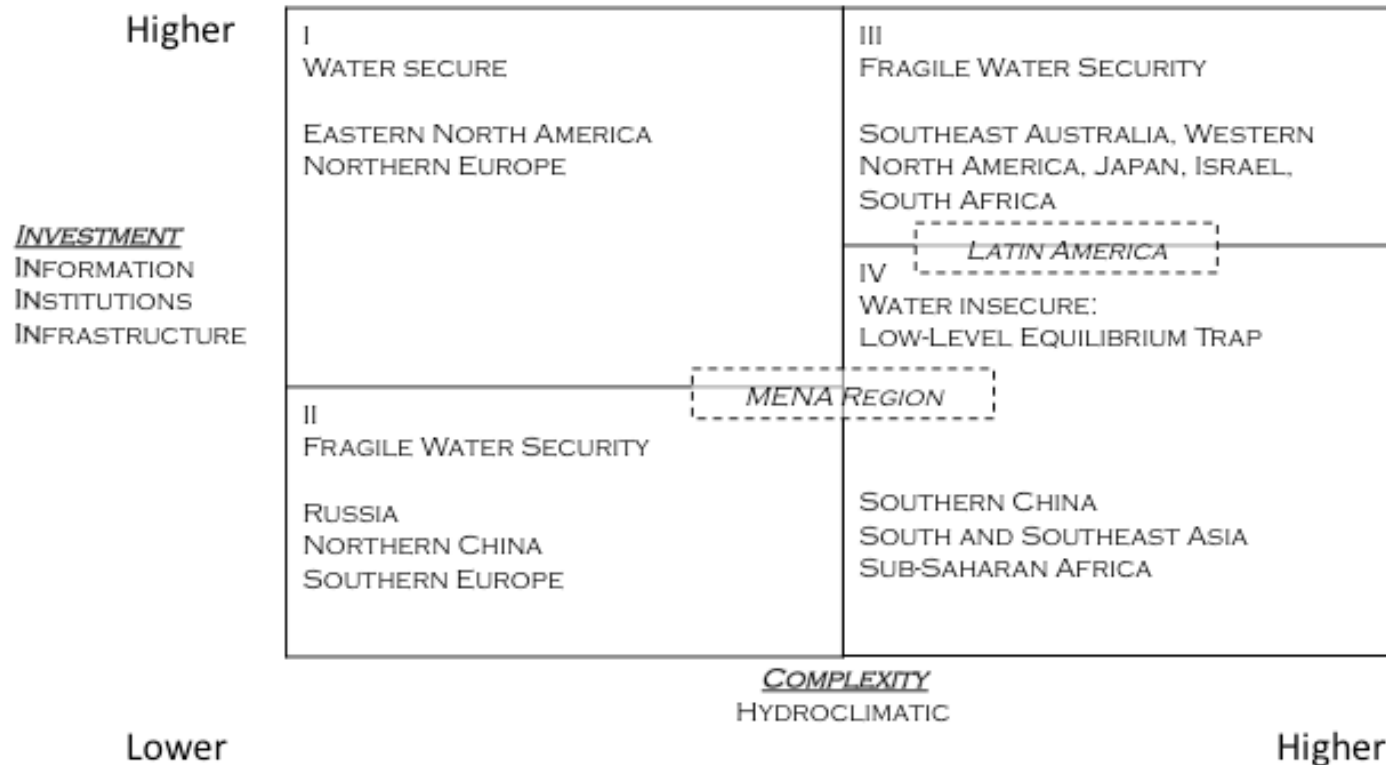
- \$43bn losses
- \$16bn insured losses; \$2.2bn loss Lloyd's of London
- Threat to subsequent foreign direct investment

East African Drought, 2011-12



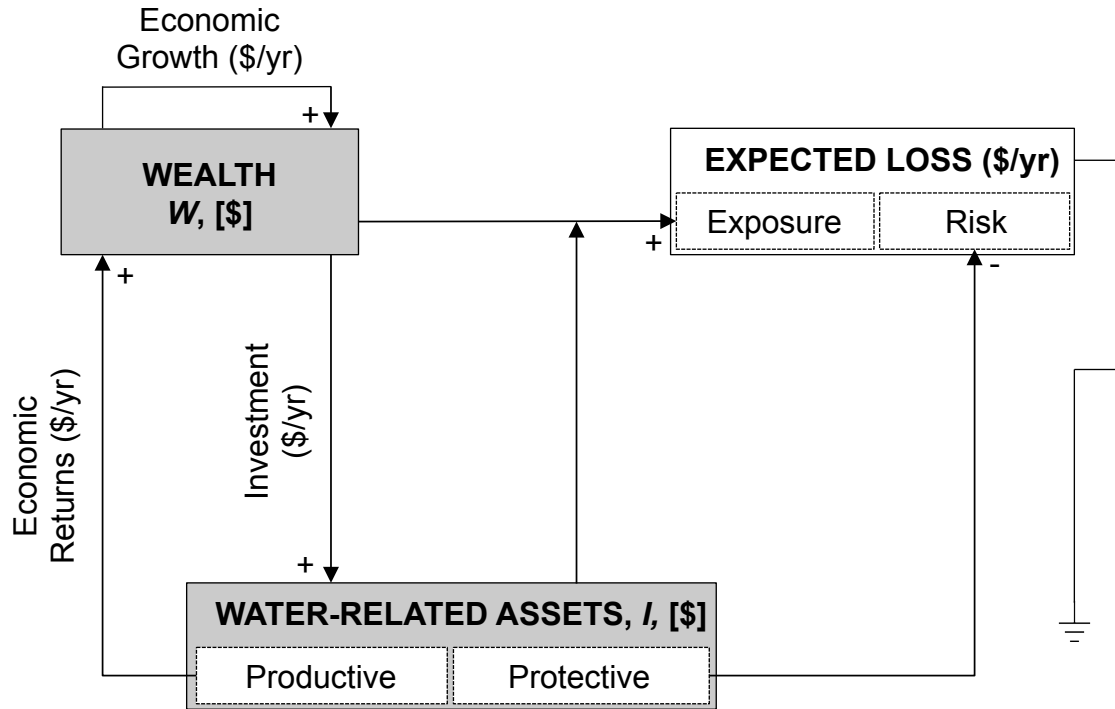
- Up to 260,000 deaths
- ~1m refugees;
- Humanitarian, health and security crises

Water Security



- “tolerable water-related risk to society”
- What are the effects of external shocks?
- What is the best way out of the water insecurity trap?
- What controls the dynamics of the system?

Model



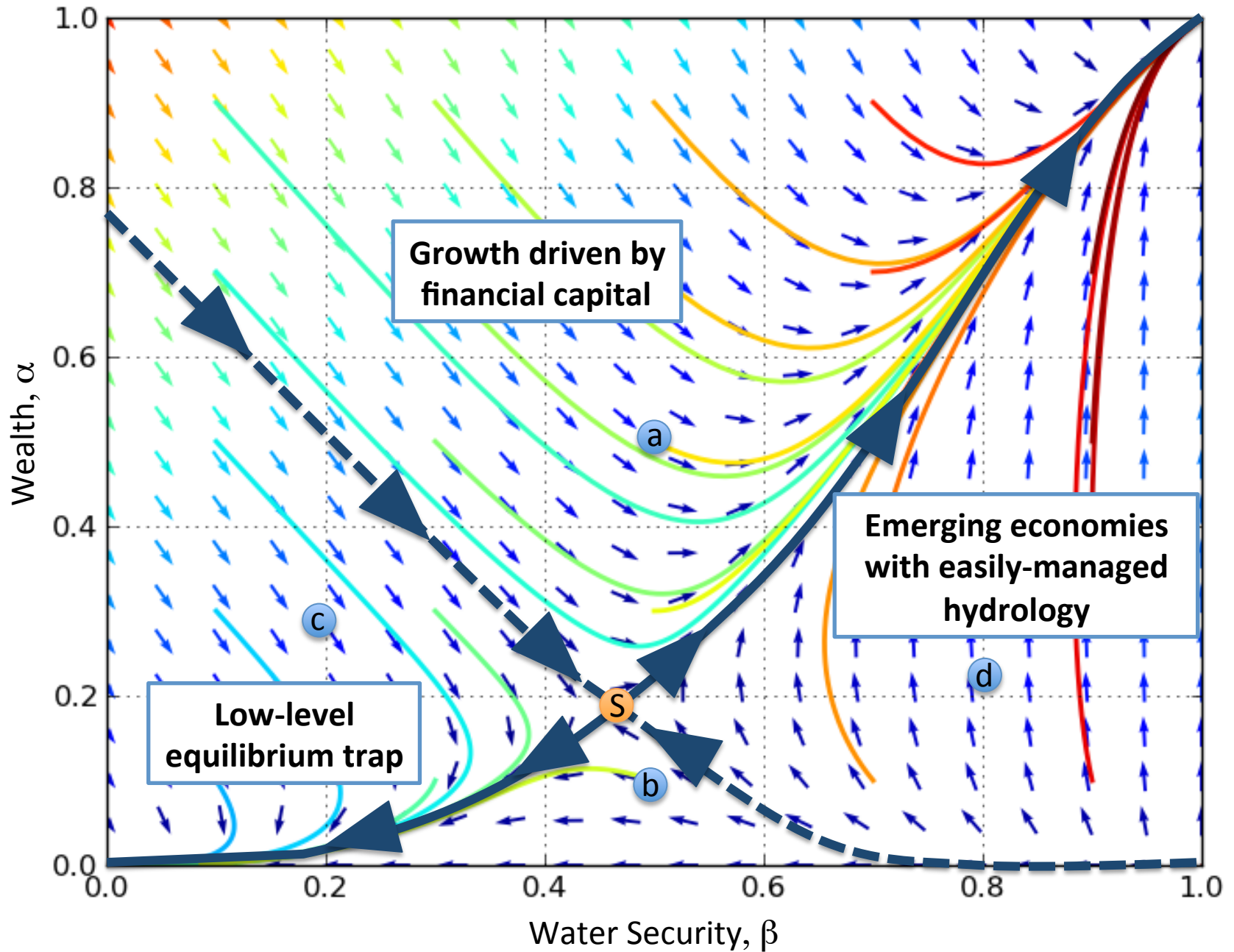
W_0 = wealth in the absence of water-related constraints

I_0 = investment required to achieve water security (the point at which the next \$ invested goes elsewhere)

Hereafter, consider α = wealth as a fraction of W_0

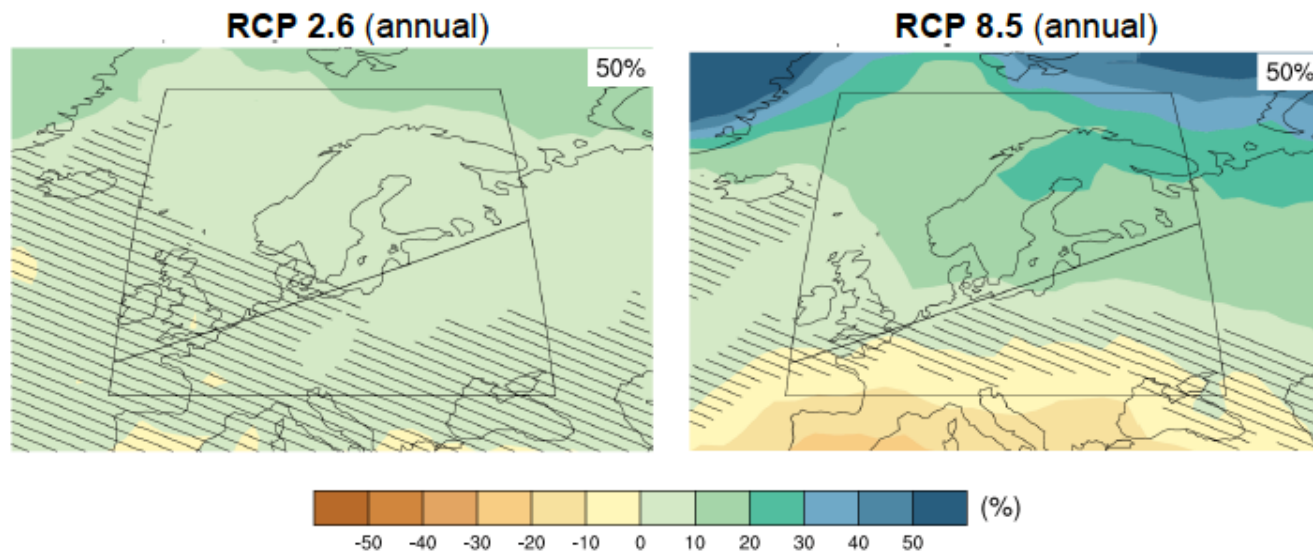
And β = investment in water security to date relative to I_0

Trajectories for water security and growth



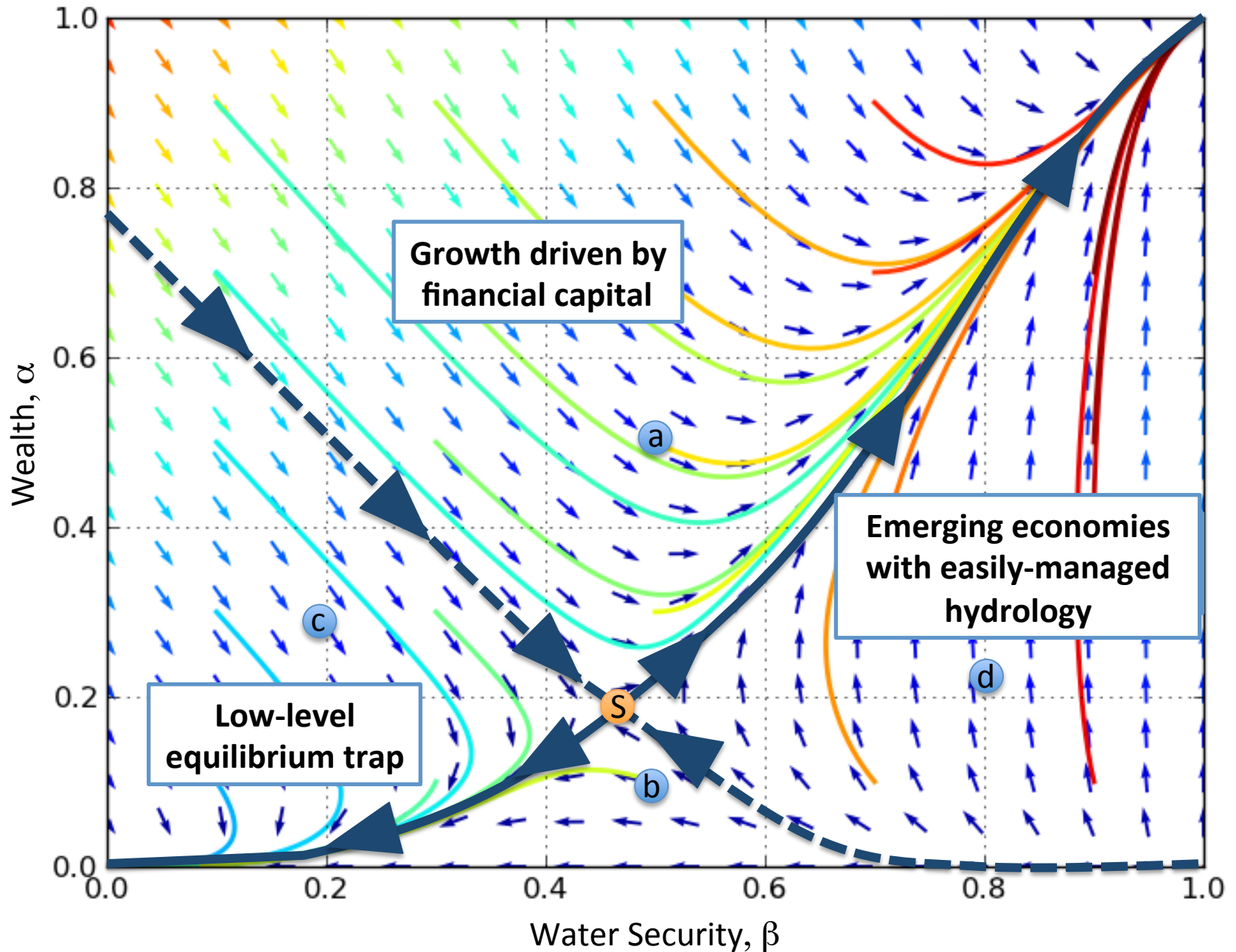
Research questions

- What are the effects of external shocks?
- What is the best way out of the water insecurity trap?
- What controls the dynamics of the system?

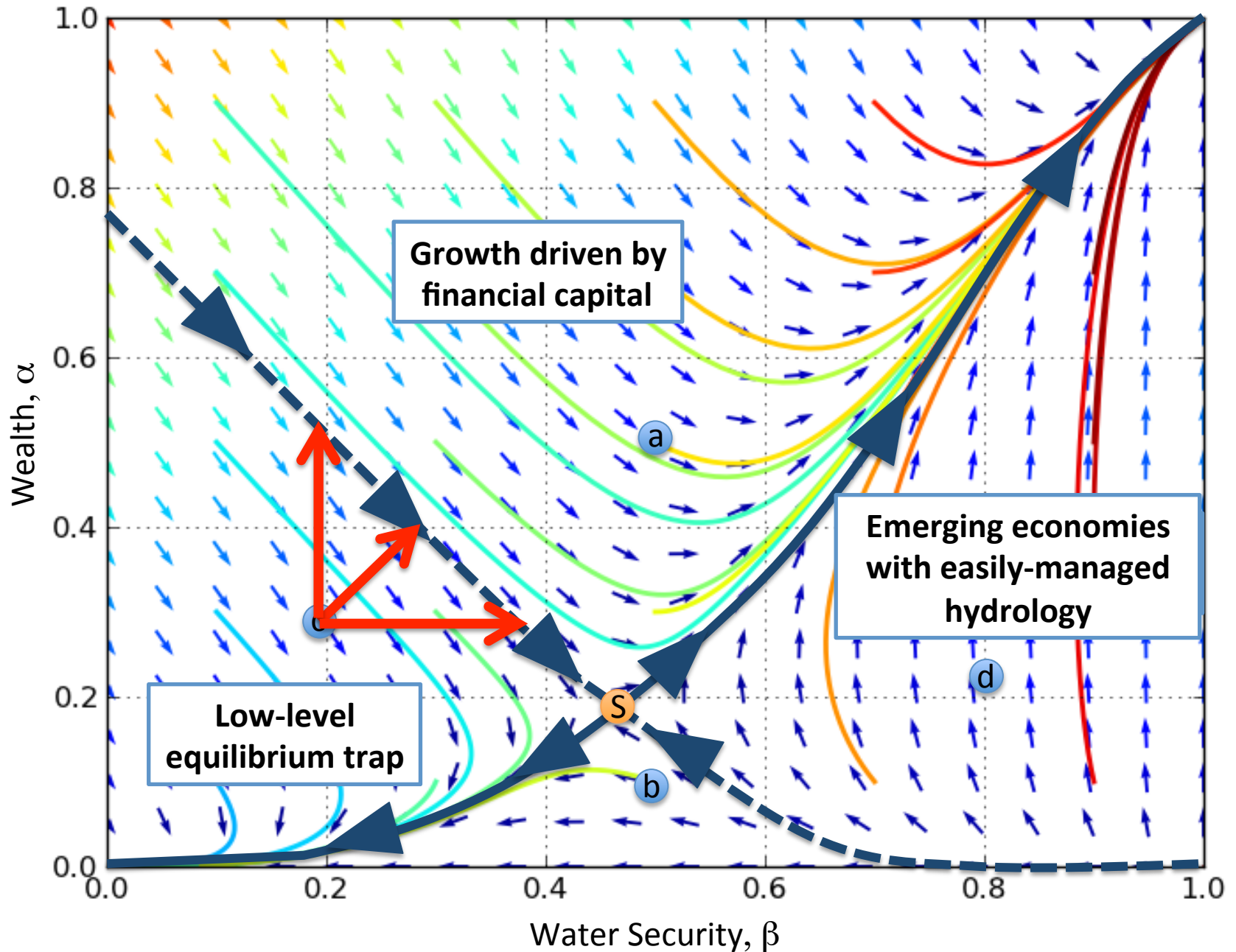


IPCC 2013, Fig. A1.SM2.6.73,8.5.73

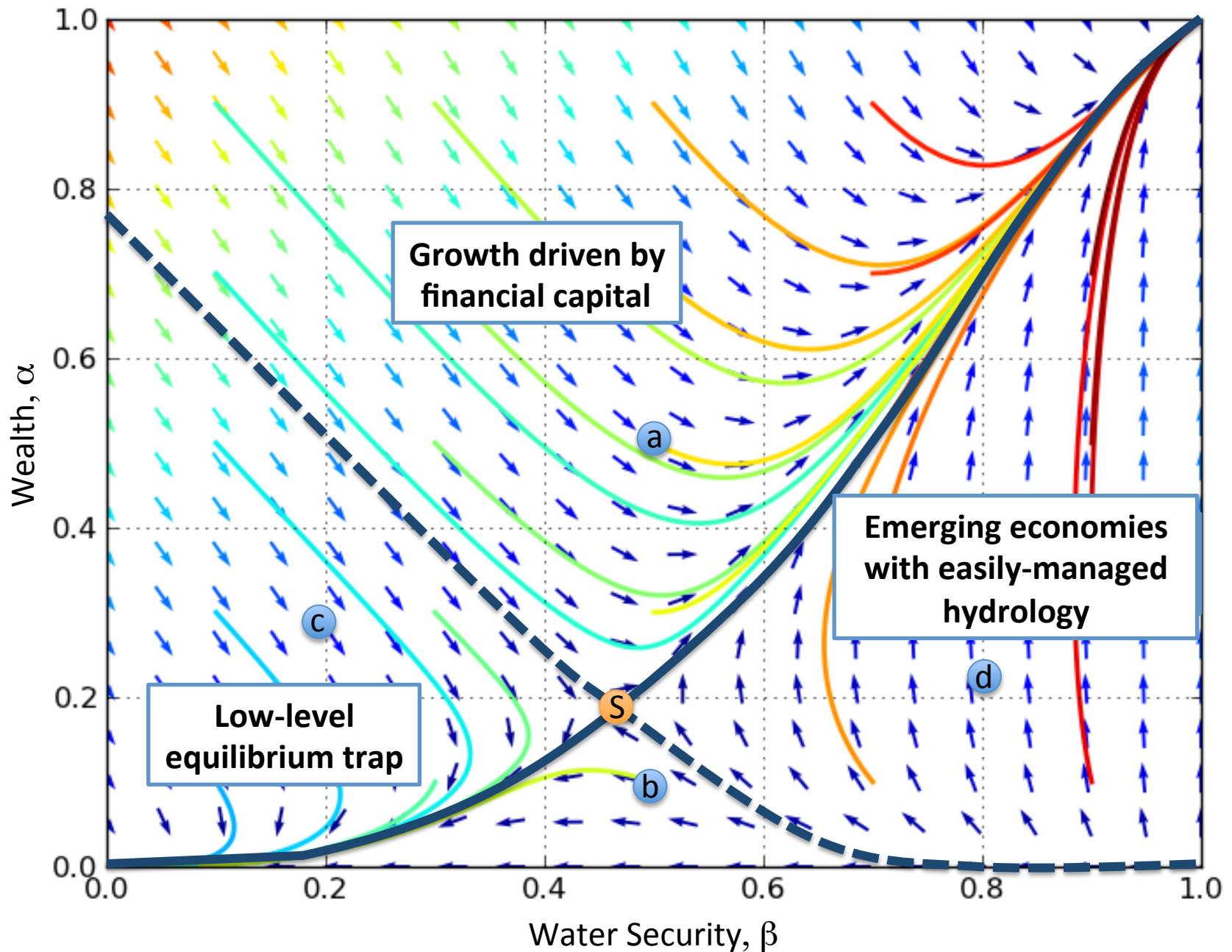
What is the effect of external shocks?



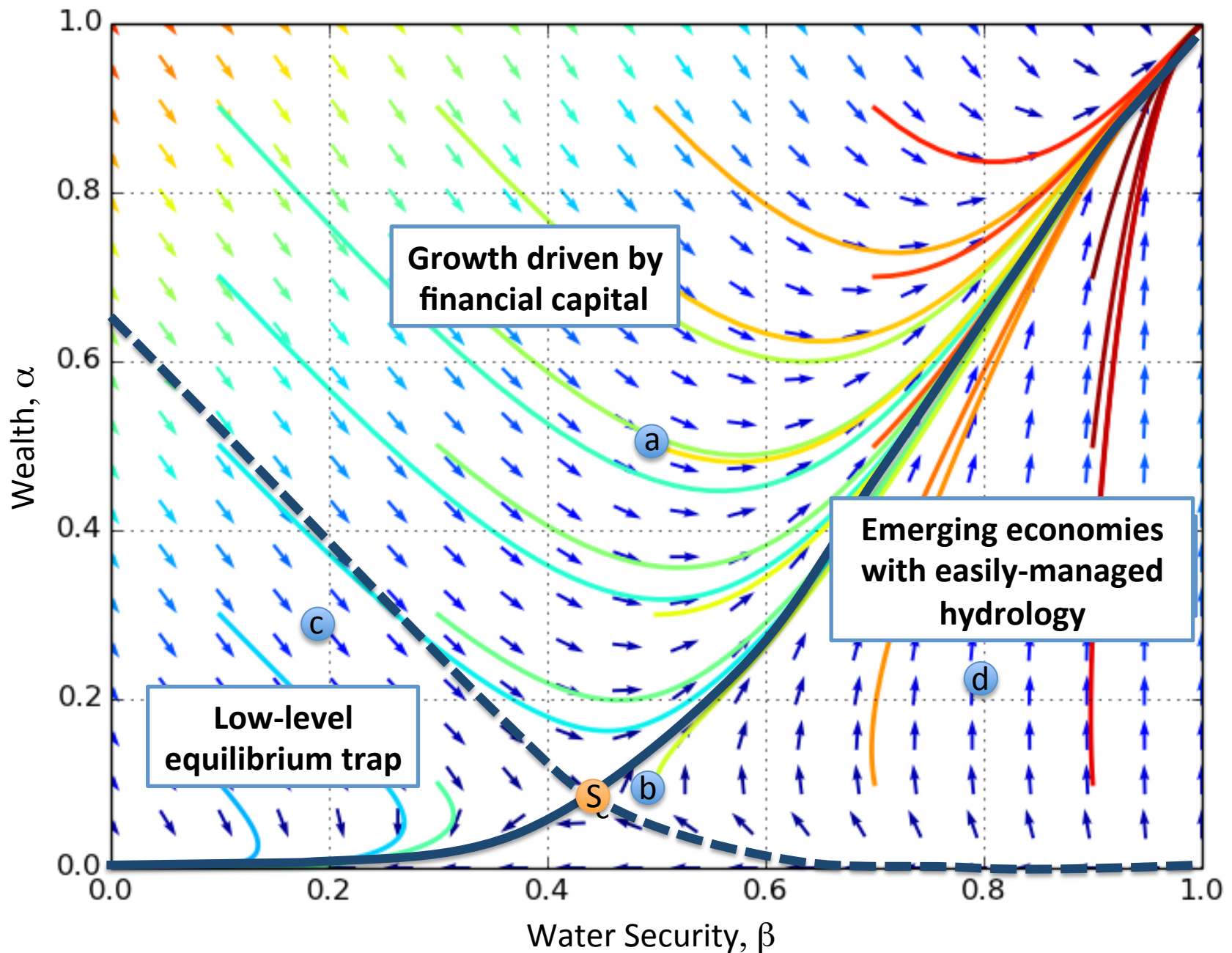
What is the best way out of the water insecurity trap?



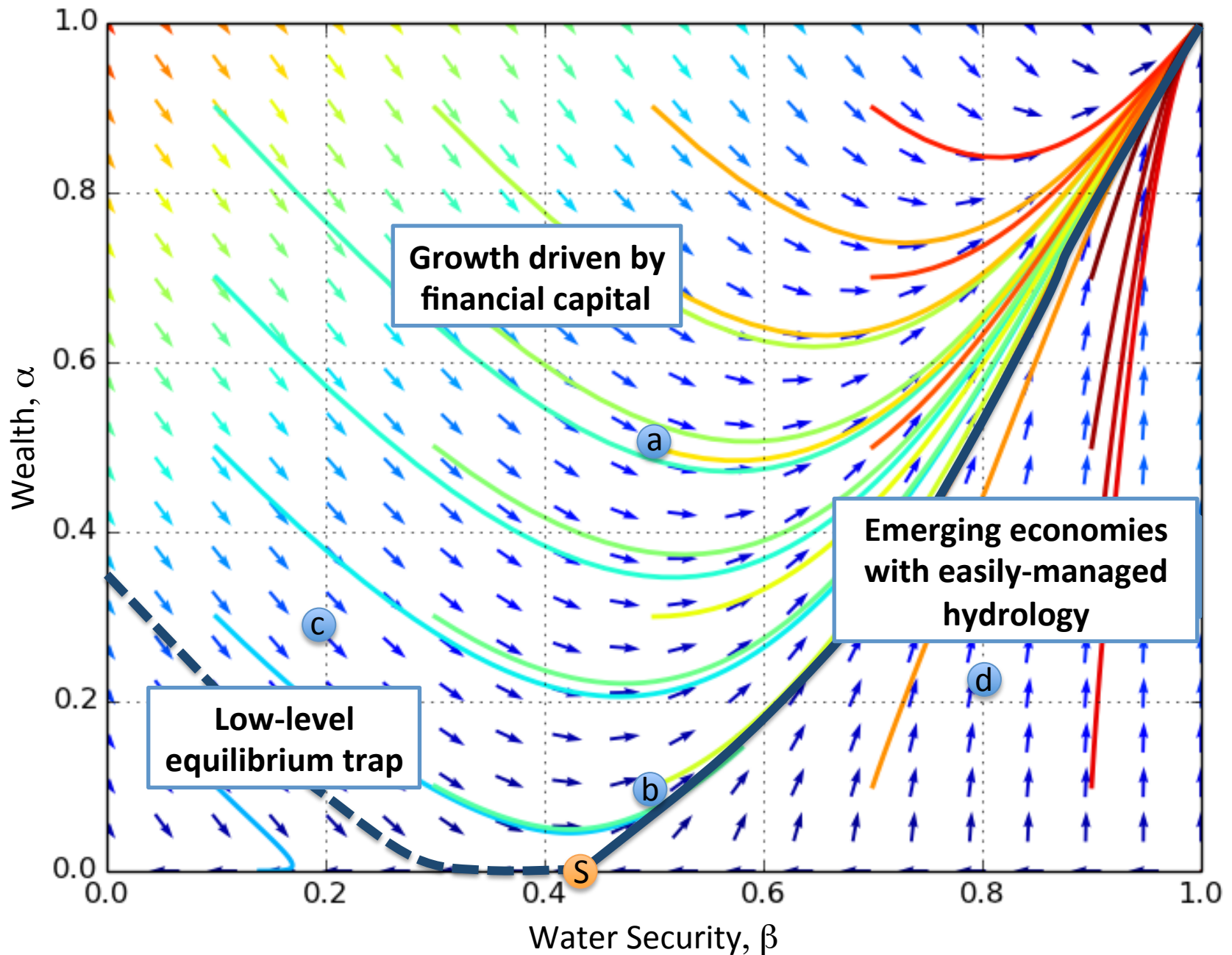
What controls the dynamics of the poverty trap? $\rho_w/\rho_e = 1$



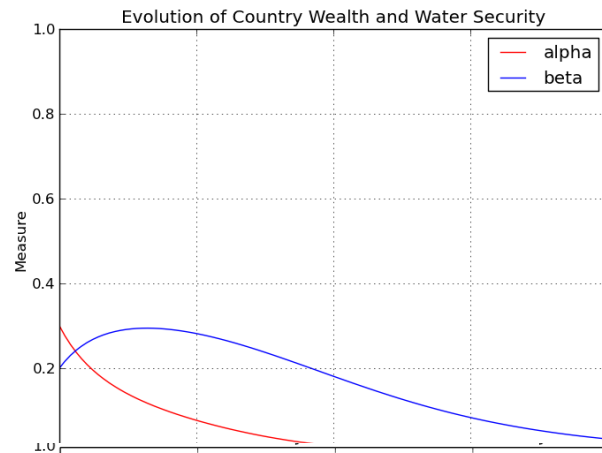
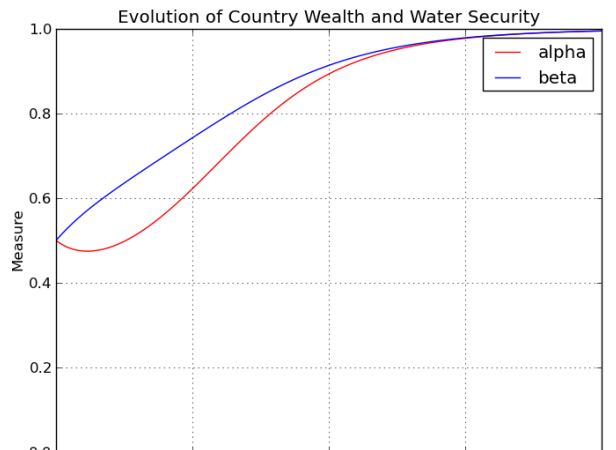
What controls the dynamics of the poverty trap? $\rho_w/\rho_e = 0.5$



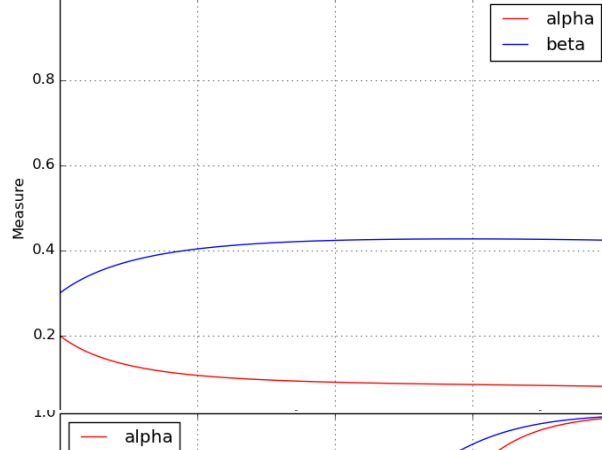
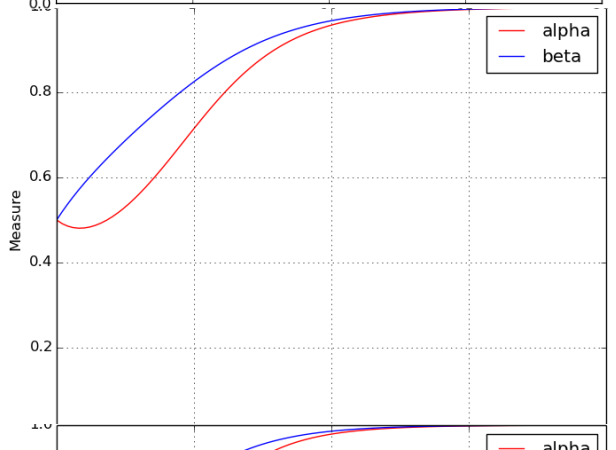
What controls the dynamics of the poverty trap? $\rho_w/\rho_e = 0.1$



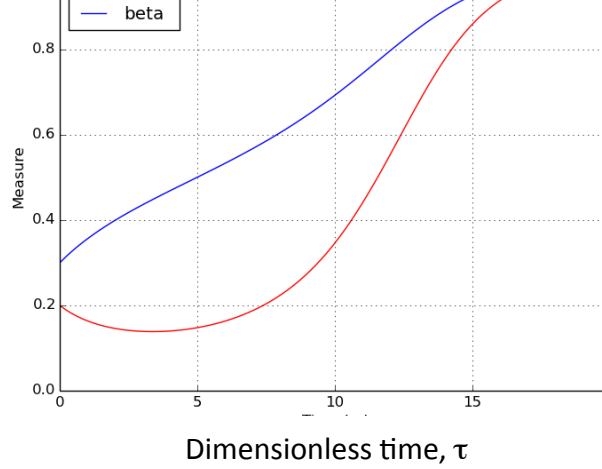
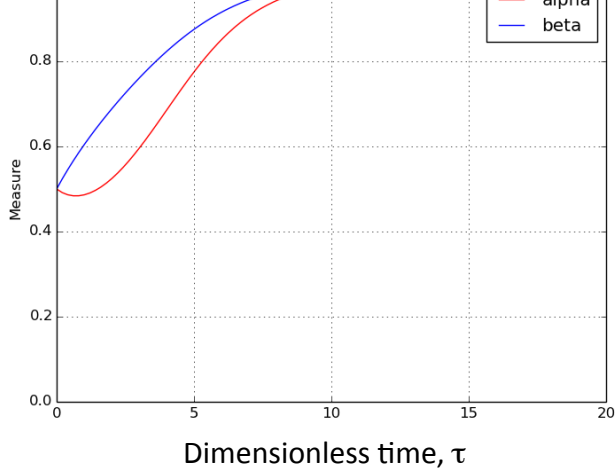
$$\rho_w/\rho_e = 1$$



$$\rho_w/\rho_e = 0.5$$



$$\rho_w/\rho_e = 0.1$$



Conclusions

- What is the effect of external shocks?
Highly context-dependent and non-linear
Situations close to poverty trap more susceptible to shocks and more responsive to intervention
- What is the best way out of the water insecurity trap?
The most efficient interventions combine water security **and** investment in the wider economy
- What controls the dynamics of the system?
The relative resilience of water-related investment is a key control on the presence and location of the poverty trap