Measuring Impacts

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Snowmass 2013

Vulnerable Sectors

- MARKET   NONMARKET
- Agriculture   Ecosystems
- Energy   Species Loss
- Forestry   Health
- Sea Level Rise   Aesthetics
- Water
-            Extreme Events
-            Catastrophes
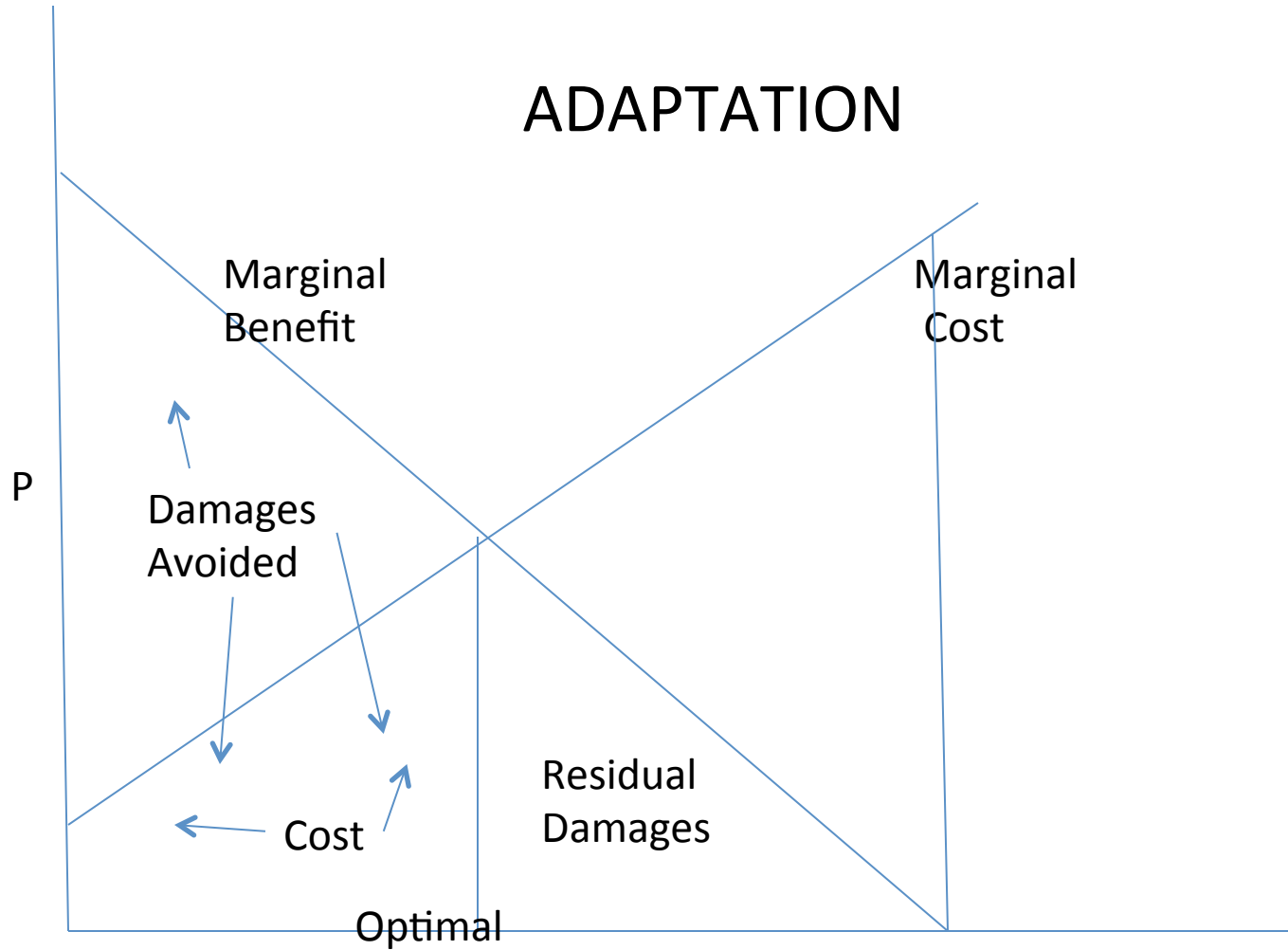
ADAPTATION

Agriculture Model

- NR/ha= P_QQ(T, Prec, Labor, Capital, Fertilizer, Irrigation)-P_LL-P_CC-P_FF-P_II
- Input Demand Functions
- Labor=f(P_Q, P_L, T, Prec)
- Capital=f(P_Q, P_I, T, Prec)
- Fertilizer=f(P_Q, P_F, T, Prec)
- Irrigation=f(P_Q, P_I, T, Prec)
-
- Net revenues are 10% to 40% of gross revenue.
- From a welfare perspective, subsidies should be subtracted from net revenue.

Places that are more (less) productive invest more (less) inputs and have higher (lower) outputs.
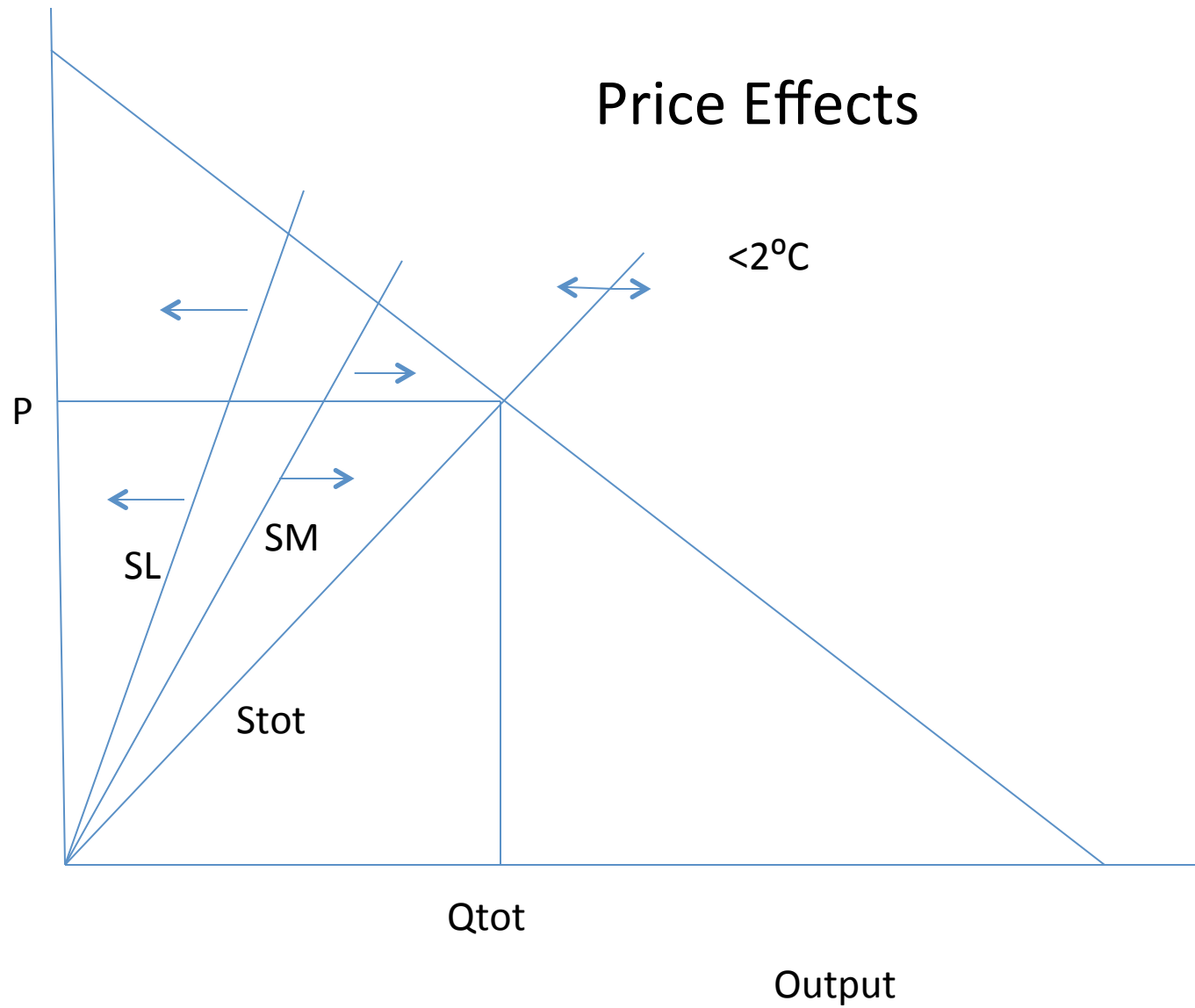
As climate changes, farmers will change how much land is farmed, whether it is used for crops or livestock, which crops or livestock are chosen, and how much inputs to apply.

All of these adjustments to climate are adaptation. Technically, the "cost of adaptation" is the change in the costs of production. The benefit is the change in the gross revenue.
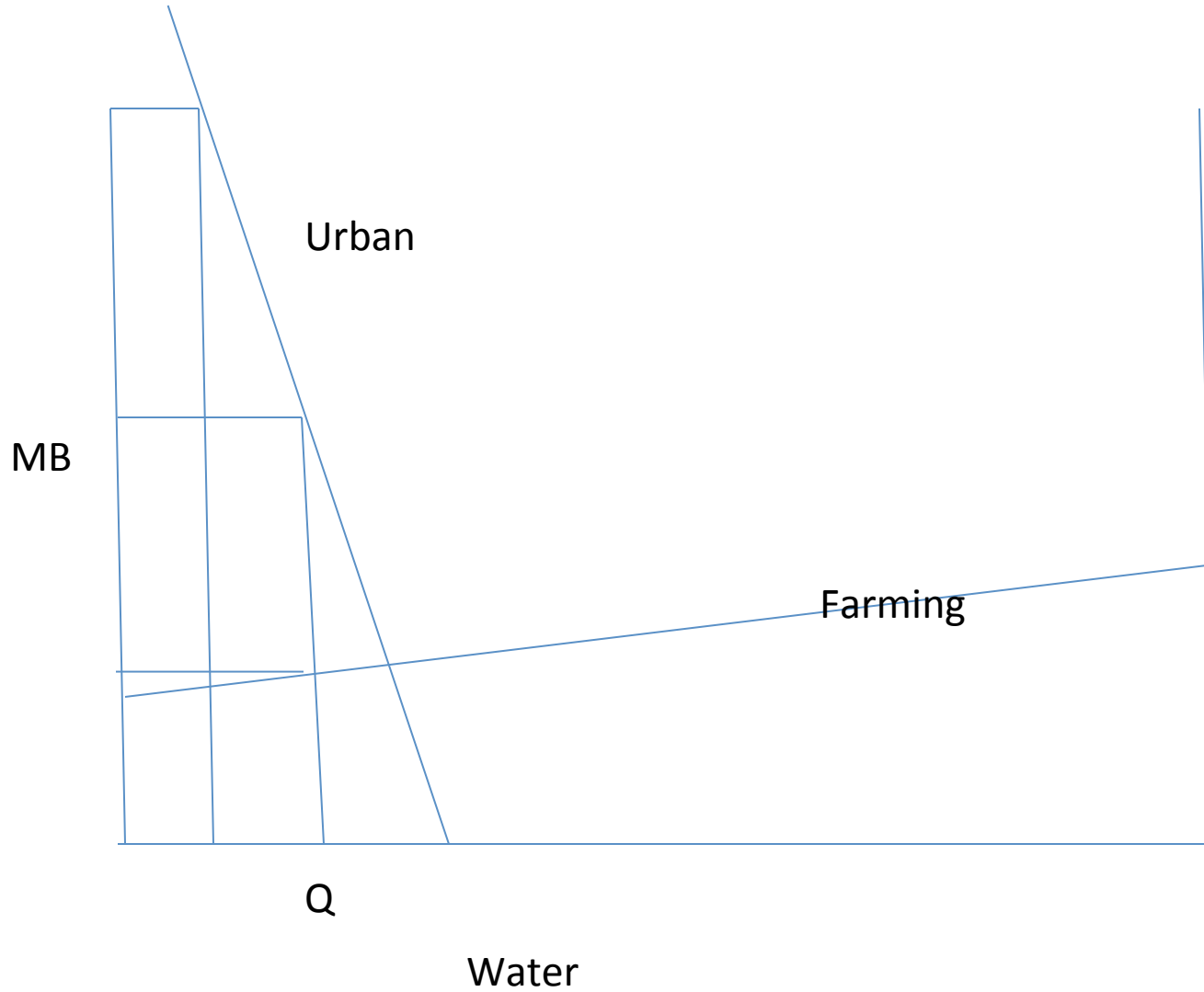
Farmers will adopt the adaptations that maximize net revenue. The private farm sector will adapt efficiently.
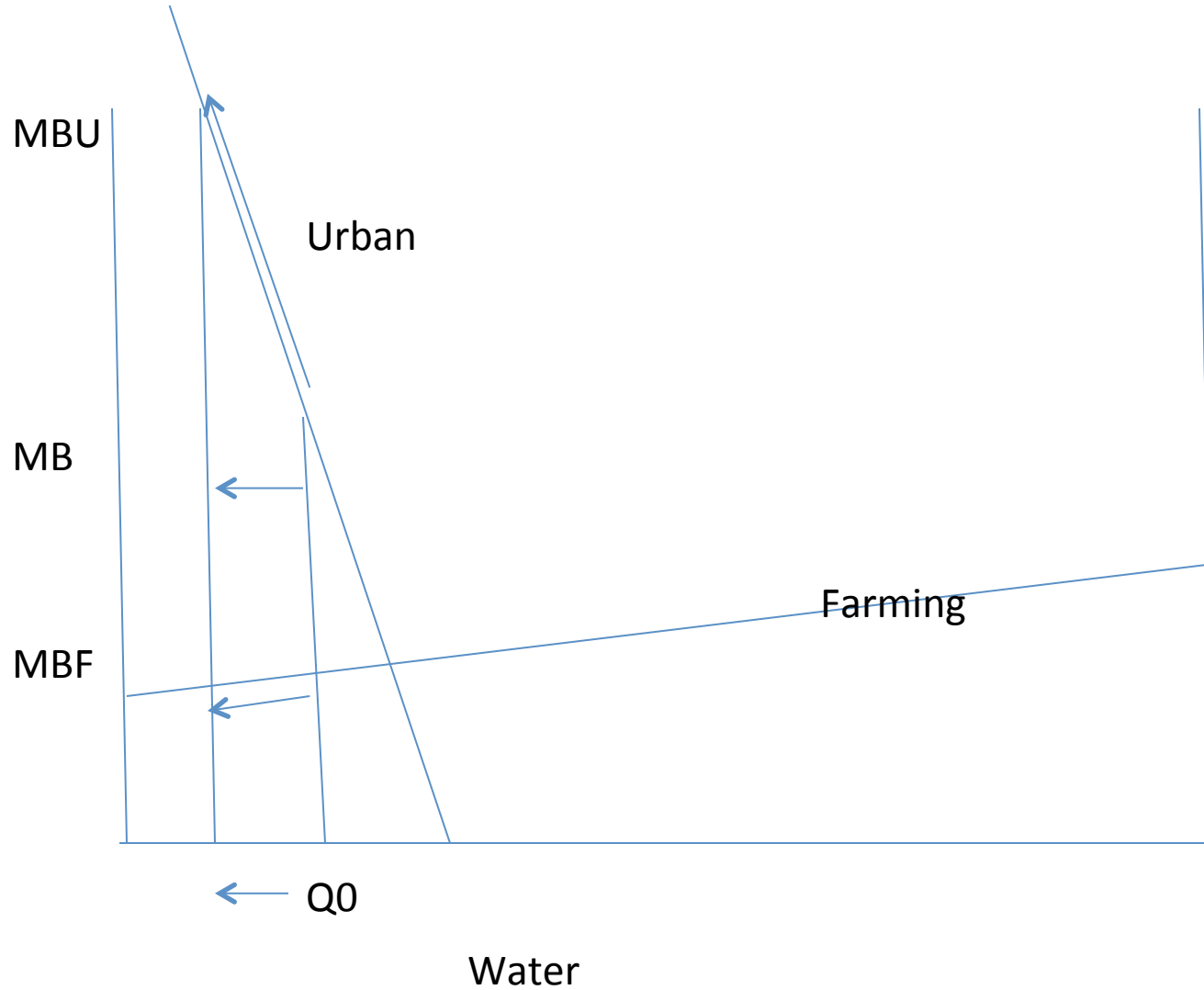
What could go wrong?

- Ignore externalities- air pollution damage of farms is 25% of value added in US.

- Will underinvest in long term adaptations if lack property rights. Serious problem in developing countries.

Price Effects

P

<2°C

SL

SM

Stot

Qtot

Output

Water Allocation

Urban

MB

Farming

Q

Water

Water Allocation

MBU

MB

MBF

Urban

Farming

Q0

Water

Water Adaptation

- Water is not allocated efficiently now
- If climate change reduces supply, how the remaining water is allocated is important
- If take water away from inelastic demand user (urban), then large welfare losses.
- If take water away from elastic demand user (farmer), welfare loss much smaller
- Institutional change critical (towards market exchange)

Dam Adaptation

- Suppose net benefits of dam without climate change are 100 for 100 years.

- Suppose climate change causes benefits to fall to 50 in 50 years

- How does that change the present value of benefits?

- Without climate change, PV=2405

- With climate change, PV=2262, reduction of 6%.

COSTS
AND
DAMAGES

PV Costs

PV Benefits

<1.0

1   2   3   4   5

TEMPERATURE in 2100