The Heckscher-Ohlin Model: Features, Flaws, and Fixes

I: What's the H-O Model Like?

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Themes of the 3 Lectures

- ✍The HO Model is largely well behaved in 2 dimensions, even when you include trade costs
- In higher dimensions, it is not so well behaved, especially when you include trade costs
- Various modifications and extensions of the HO model offer some promise of making it behave better

Outline of Lecture I

- Overview of the H-O Model
- The 2×2 Model
  - Without trade costs
  - With trade costs
- The 2×2×2 Model
- Conclusions from the 2×2(×2) Model

H-O Overview

- The Heckscher-Ohlin (H-O) Model Assumptions
  - Homogeneous goods and factors
  - Perfectly competitive market equilibrium throughout (goods and factors)
  - Production functions
    - Constant returns to scale
    - Non-joint
  - Factors
    - Perfectly mobile across industries
    - Perfectly immobile across countries
  - Countries differ in factor endowments
  - Industries differ in factor intensities

H-O Overview

- The Heckscher-Ohlin (H-O) Model Implications
  - Countries export goods that use intensively their abundant factors (H-O Thm)
  - Trade draws factor prices closer together across countries, becoming equal in certain circumstances (FPE Thm)
  - Trade changes real factor prices (S-S Thm)
    - Benefiting owners of abundant factors
    - Hurting owners of scarce factors
  - Rybczynski Thm (output effects of factor accumulation)

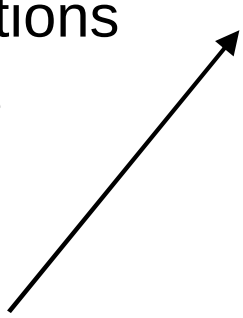
The Textbook 2×2 H-O Model

- Goods X, Y
- Factors K, L
- X is K-intensive
- Goods are final goods
- Trade is
  - Free and frictionless, or
  - Subject to simple, constant trade costs per unit (perhaps “iceberg”)

The Textbook 2×2 H-O Model

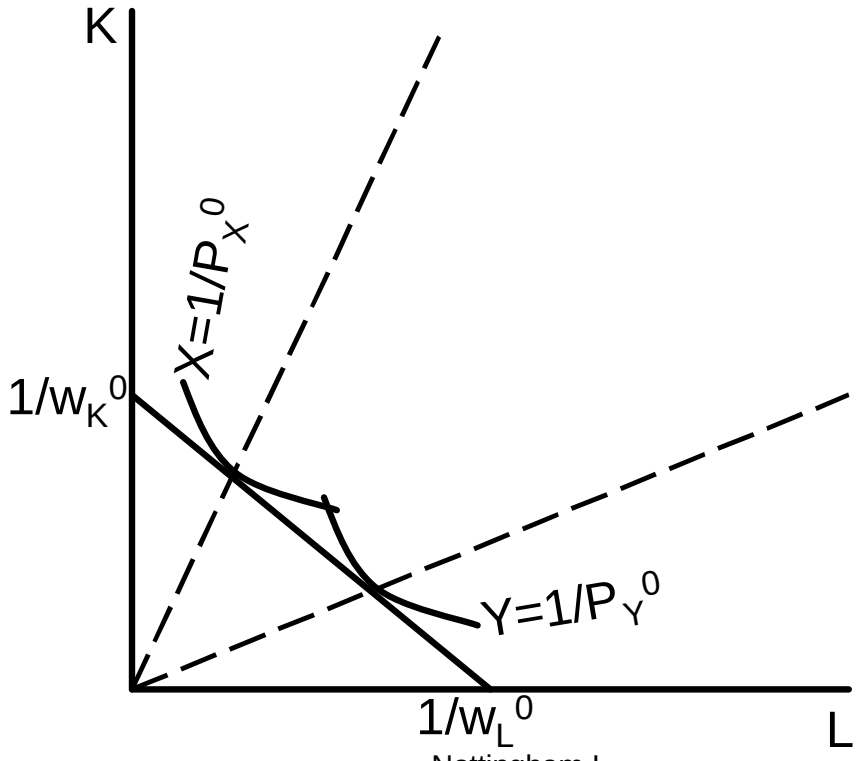
- Analysis: Expanded Lerner Diagram shows
  - Production
  - Factor allocations
  - Factor Prices
  - Trade

  for given
  - Goods prices
  - Factor endowments

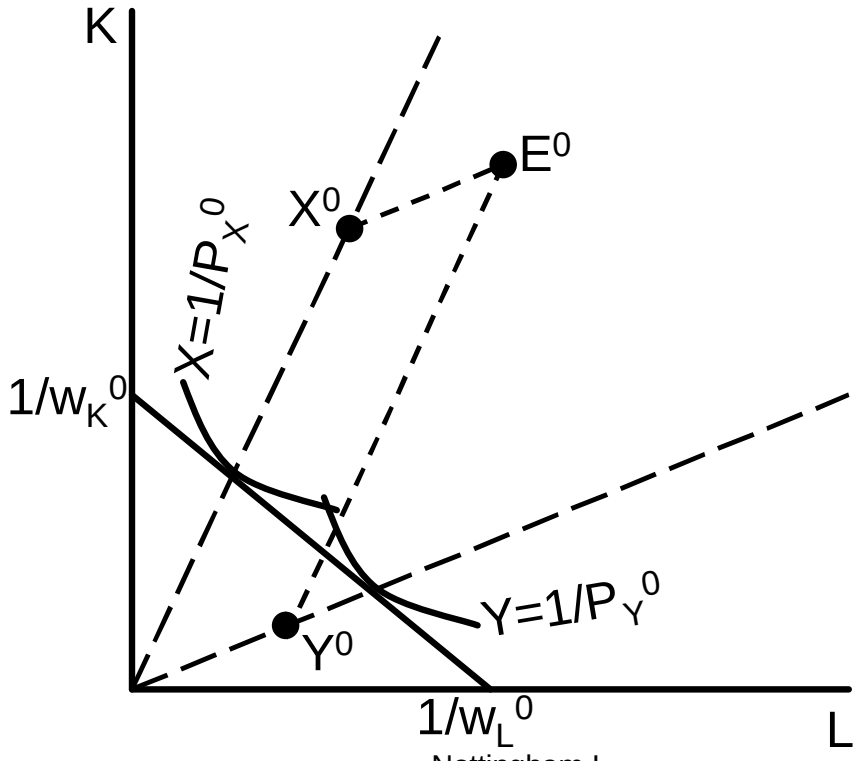


- Thus
  - Full solution for small open economy
  - Dependence on prices for large economy

Lerner Diagram



Lerner Diagram



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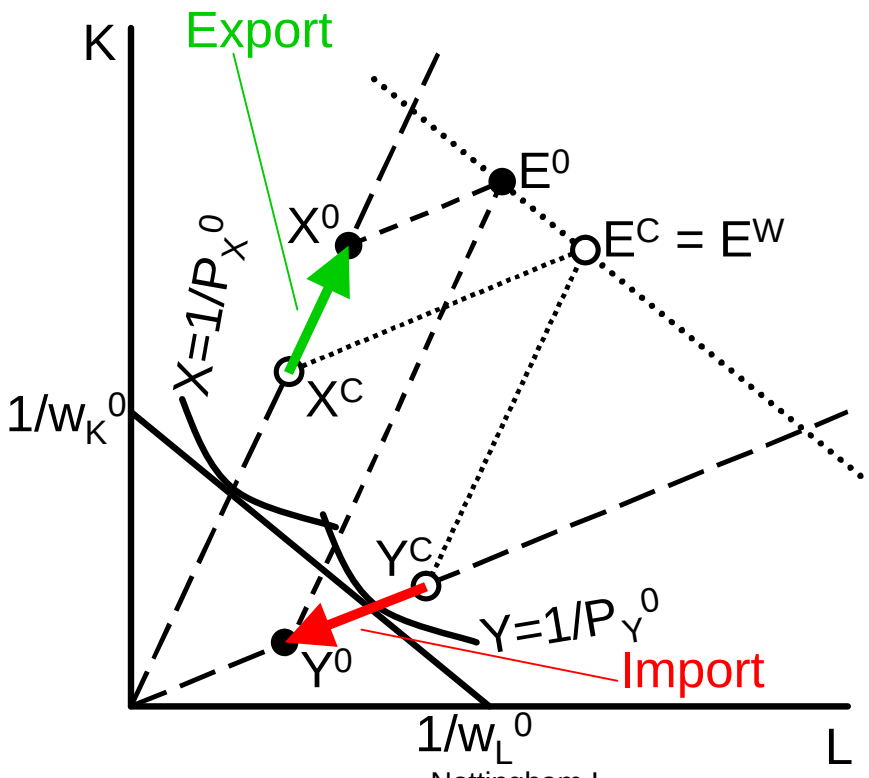


The Textbook 2×2 H-O Model

- Behavior
  - If Endowments inside Diversification Cone
    - Both goods produced
    - Factor prices independent of endowments
  - If Endowments outside Diversification Cone
    - One good produced
    - Factor prices depend on endowments

The Textbook 2×2 H-O Model

- Sensitivity
  - All variables (outputs, trade, factor prices) are uniquely determined and depend smoothly on
    - Endowments
    - Prices
  - Adding trade costs vis a vis a single other country
    - Creates range of world prices for which country does not trade
    - Outside that range, all variables depend smoothly on trade costs

The Textbook 2×2 H-O Model

- Summary
  - With free and frictionless trade:

$$S_I \; ? \; S_I(E_K, E_L, P_X / P_Y), \qquad I \; ? \; X, Y$$

$$D_I \; ? \; D_I(E_K, E_L, P_X / P_Y), \qquad I \; ? \; X, Y$$

$$T_I(? \; S_I \; ? \; D_I) \; ? \; T_I(E_K, E_L, P_X / P_Y), \qquad I \; ? \; X, Y$$

$$w_J \; ? \; w_j(E_K, E_L, P_X, P_Y), \qquad J \; ? \; K, L$$

The Textbook 2×2 H-O Model

- Summary
  - With iceberg trade costs, *t*:

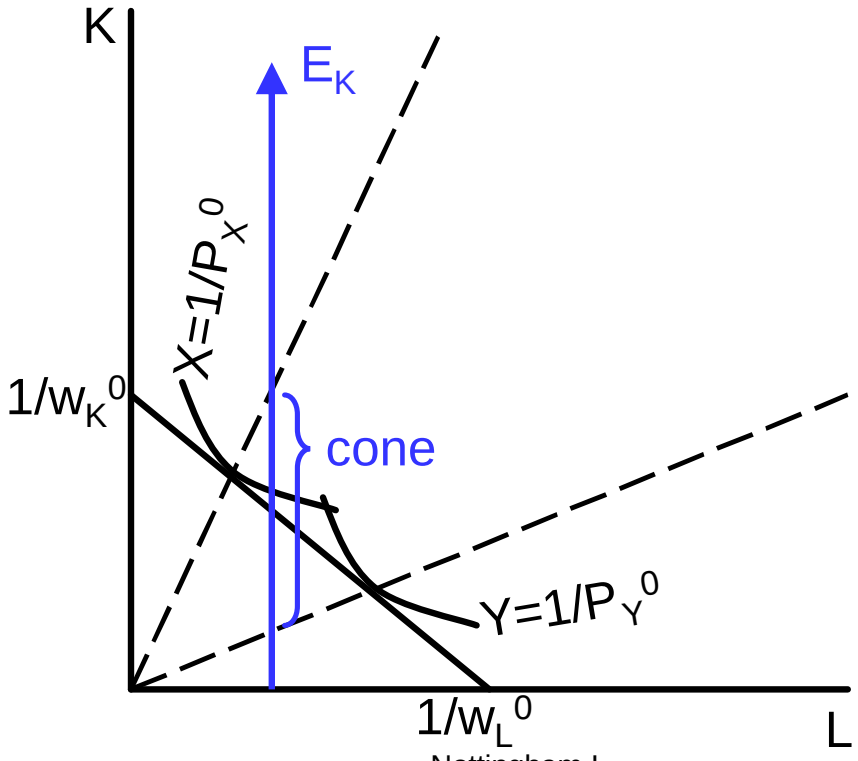
$$S_I \;?\; S_I(E_K, E_L, P_X / P_Y, t_X, t_Y), \qquad I \;?\; X, Y$$

$$D_I \;?\; D_I(E_K, E_L, P_X / P_Y, t_X, t_Y), \qquad I \;?\; X, Y$$

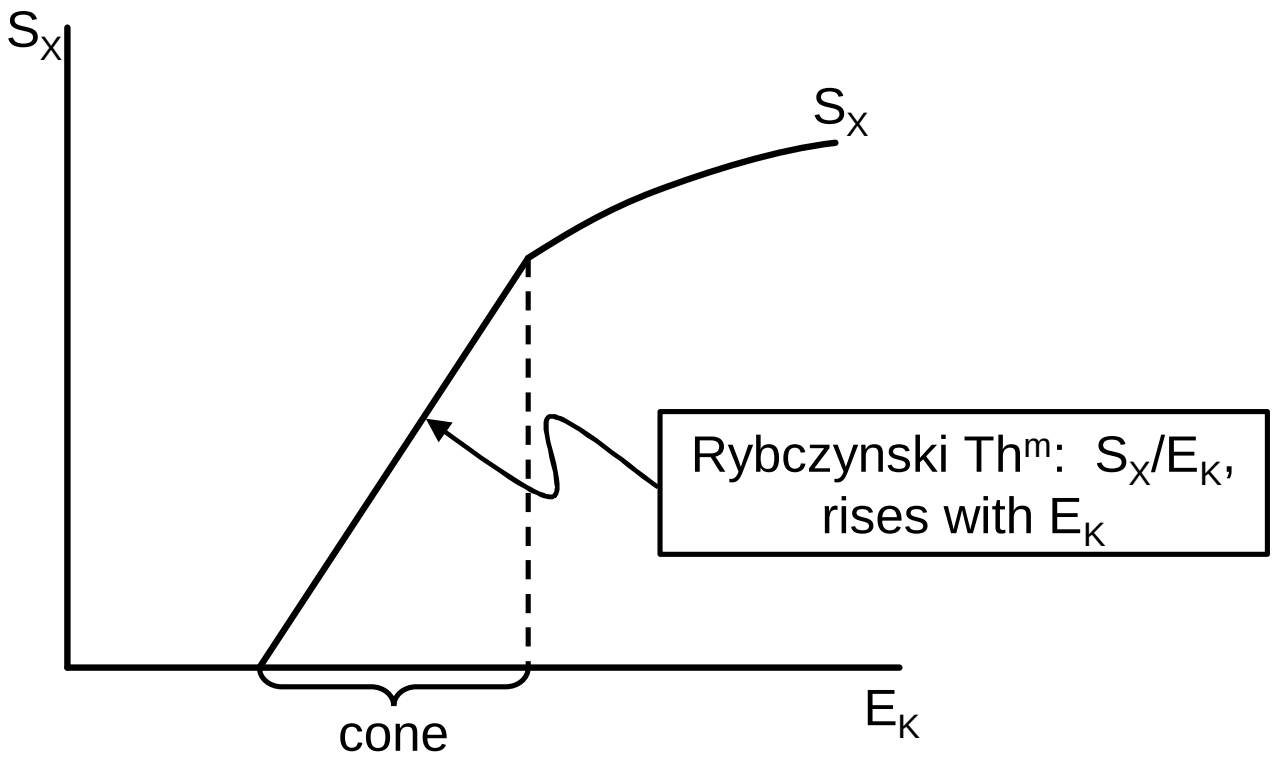
$$T_I(?\; S_I \;?\; D_I) \;?\; T_I(E_K, E_L, P_X / P_Y, t_X, t_Y), \qquad I \;?\; X, Y$$

$$w_J \;?\; w_j(E_K, E_L, P_X, P_Y, t_X, t_Y), \qquad J \;?\; K, L$$

Effects of Increasing Capital Endowment, E_K



Effects of Increasing E_K



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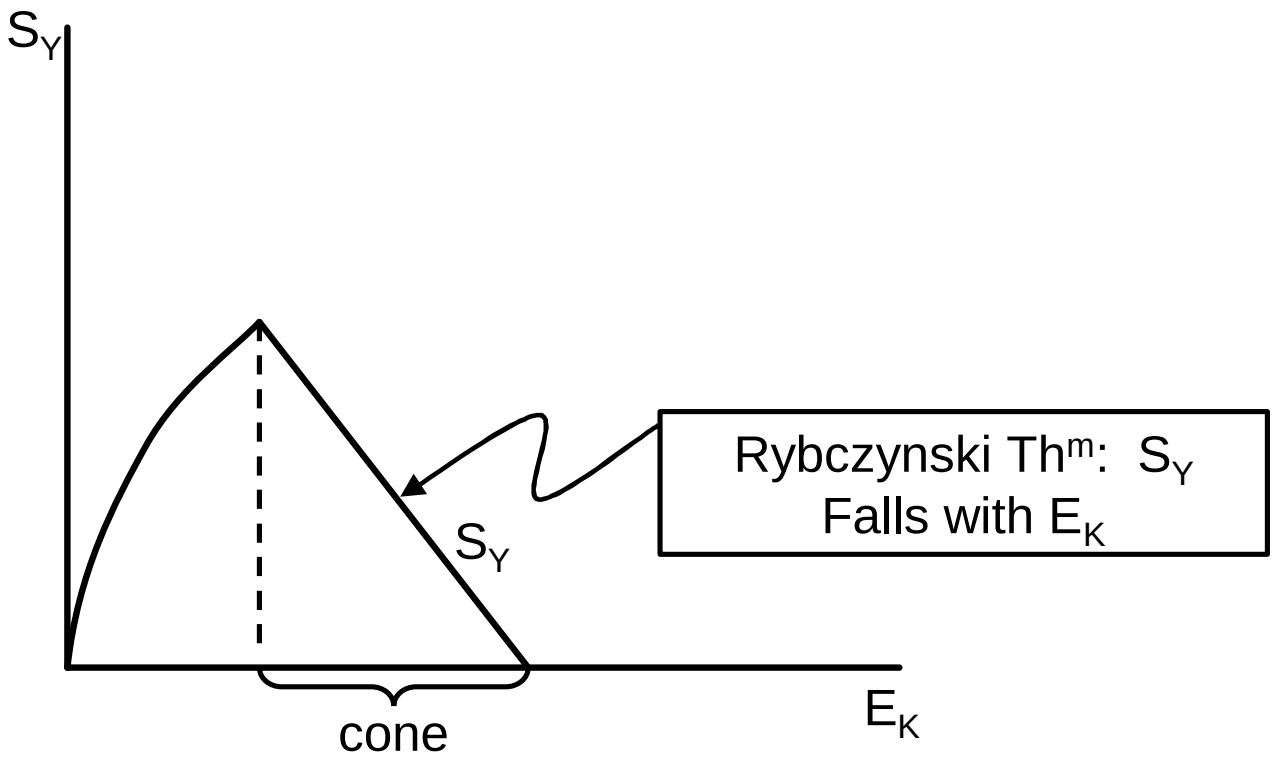

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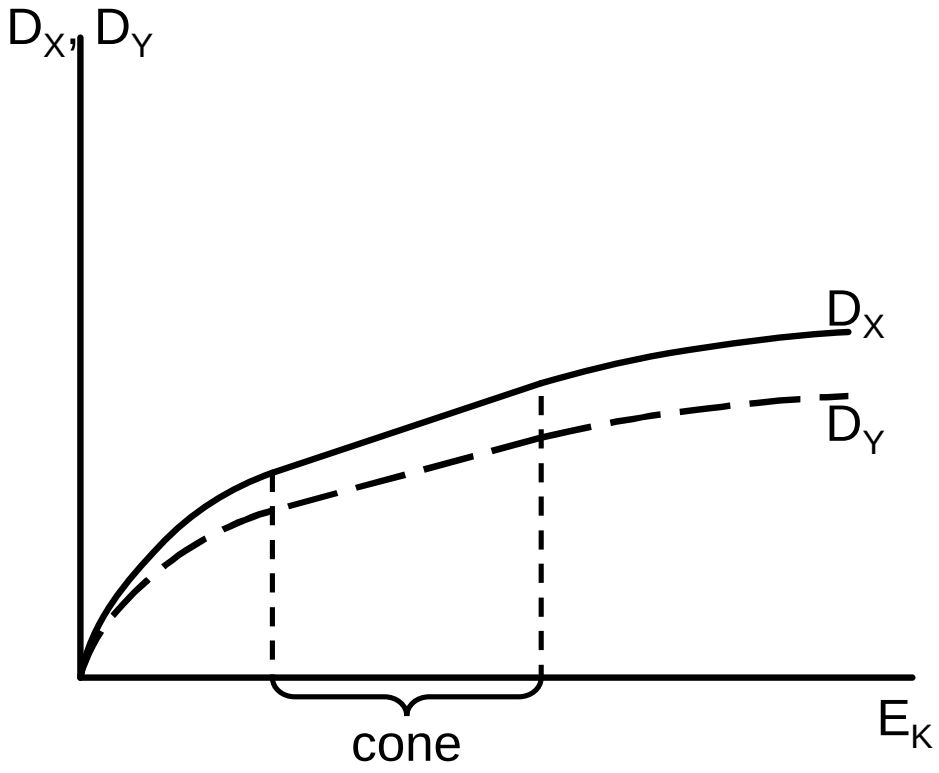

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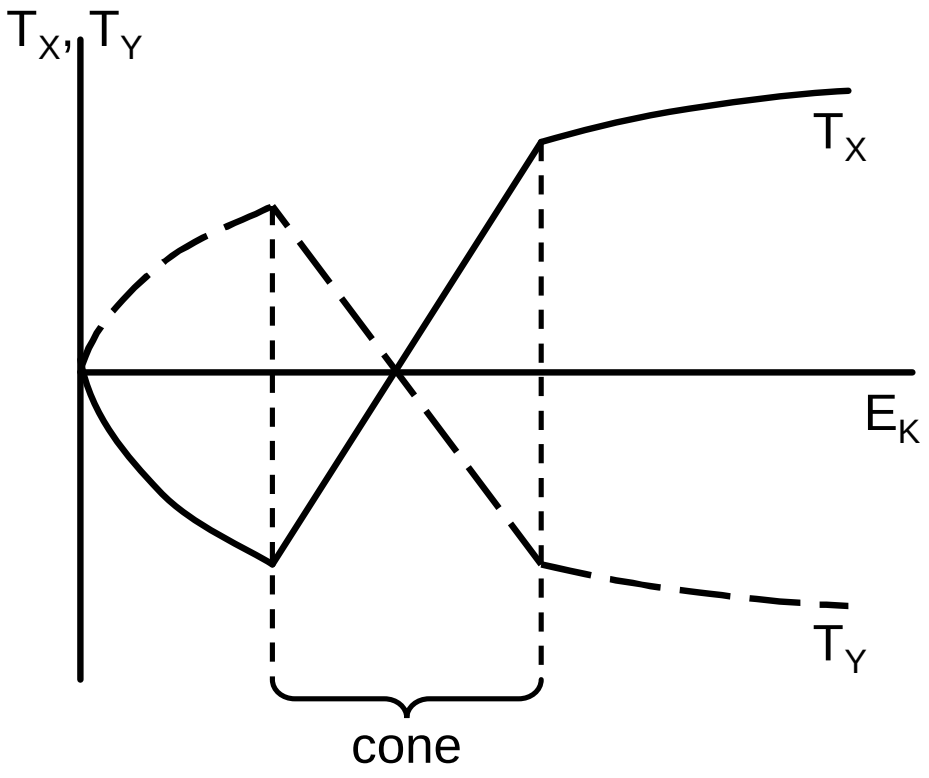
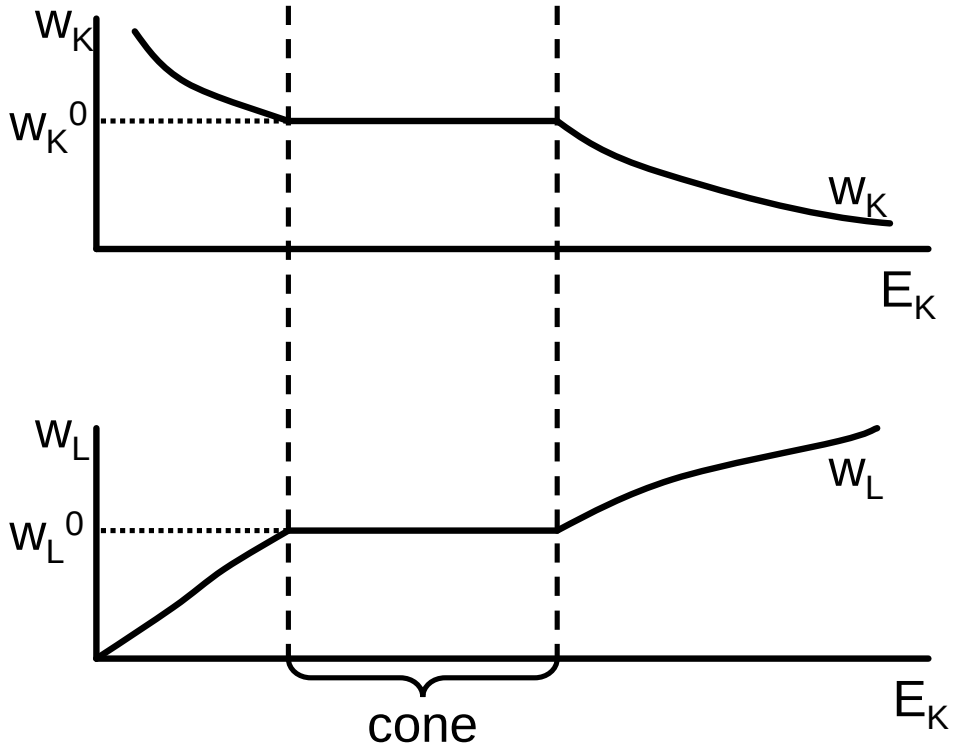
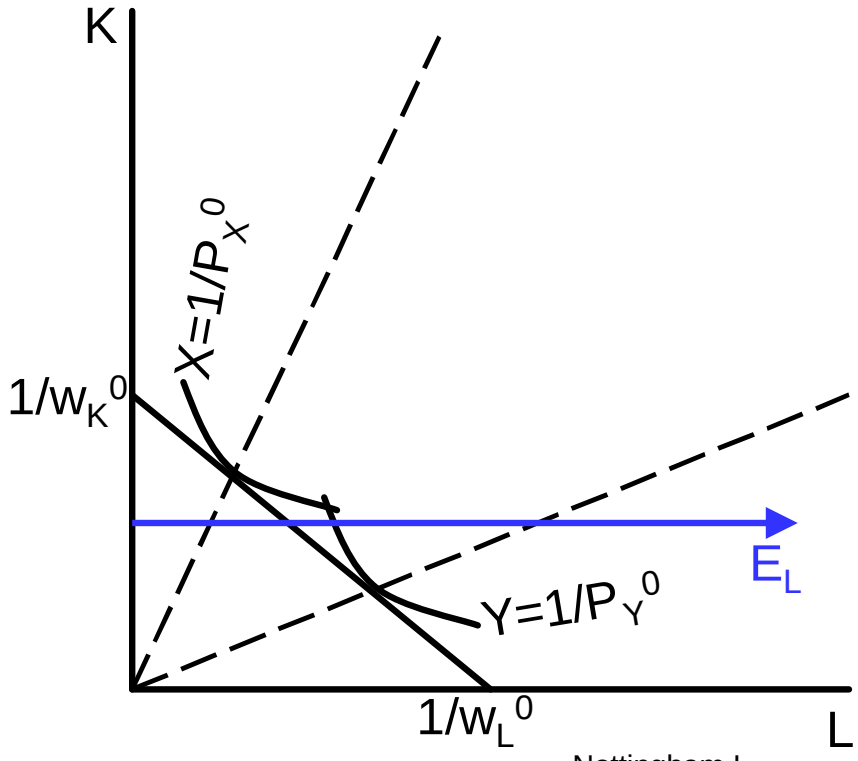


Effects of Increasing E_K

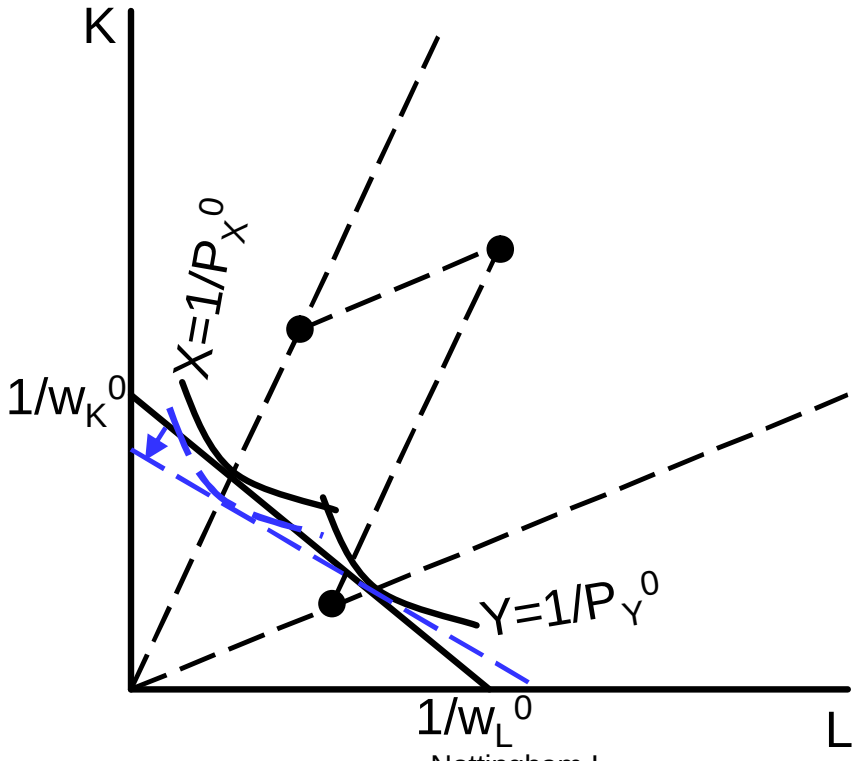


Effects of Increasing Labor Endowment, E_L



Effects are mirror image of increasing E_K

Effects of Increasing Price of X, P_X



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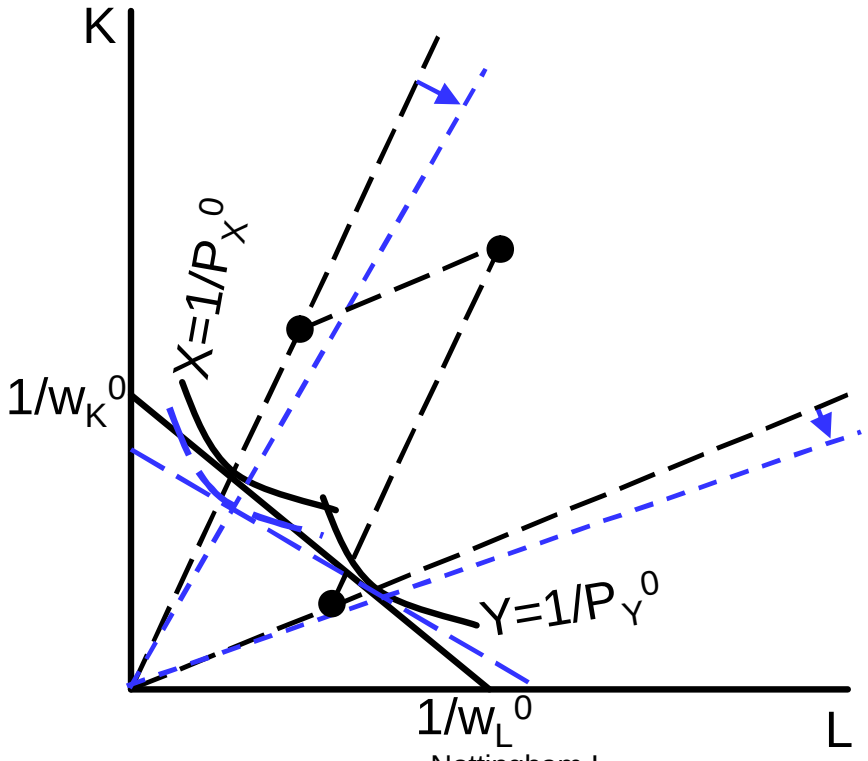

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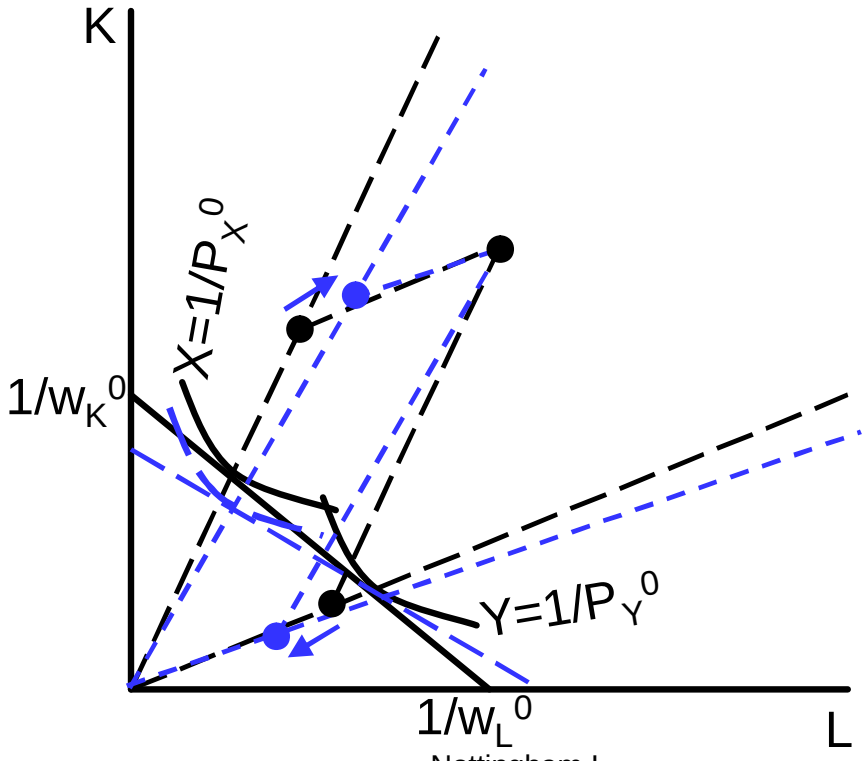

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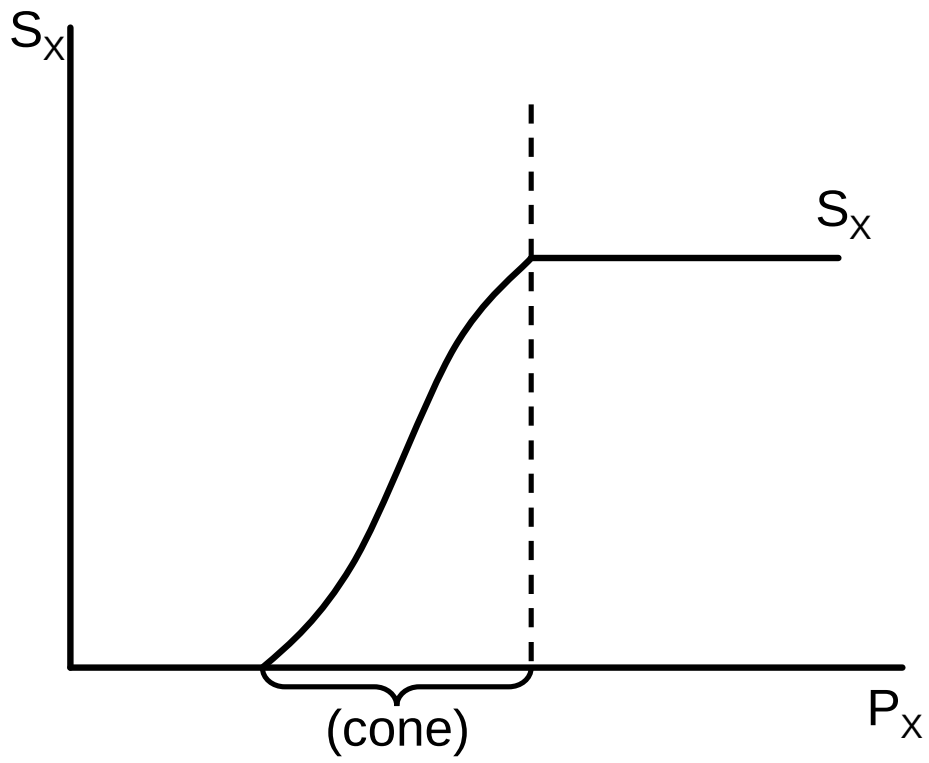

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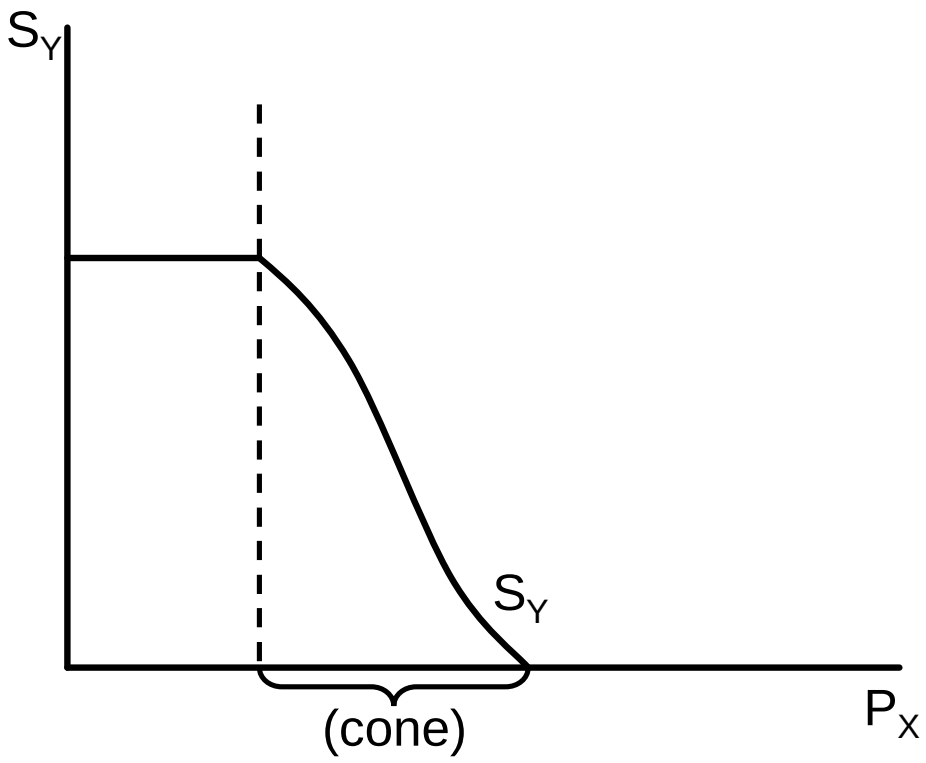

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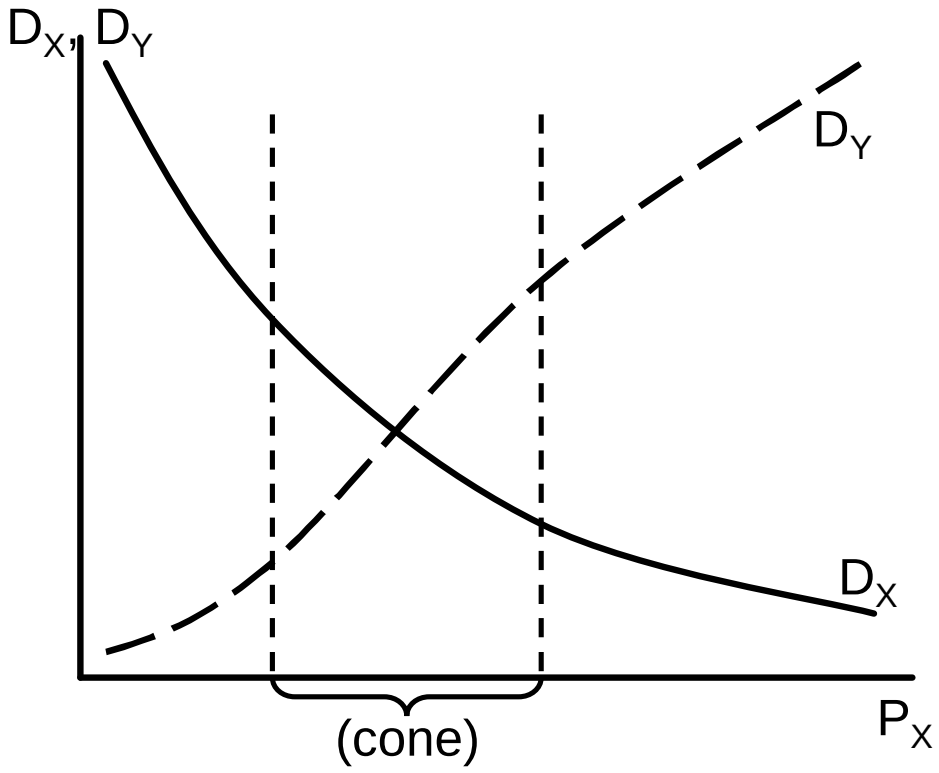

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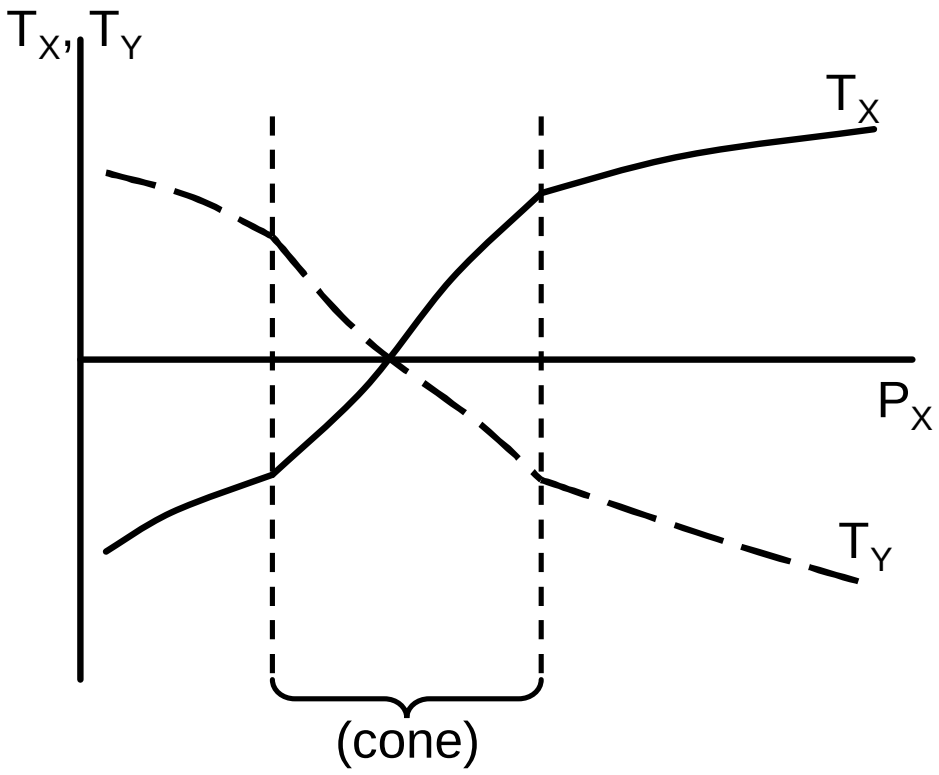

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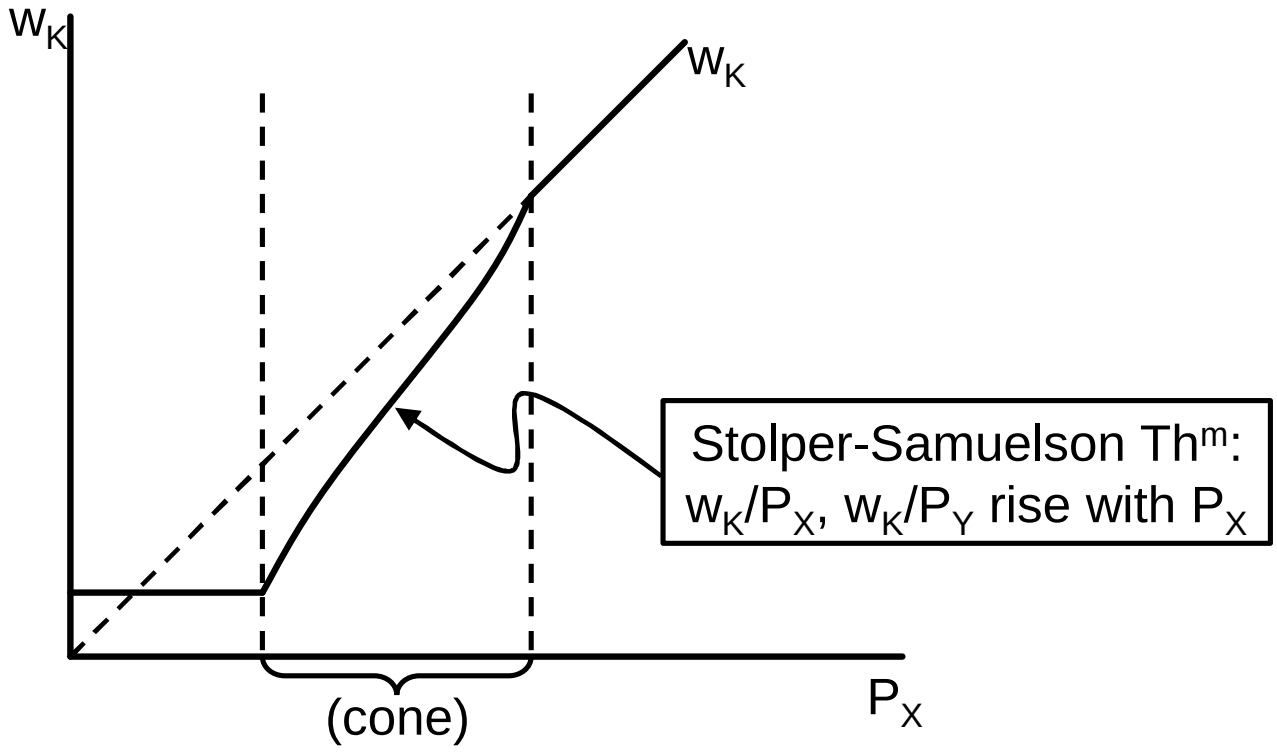

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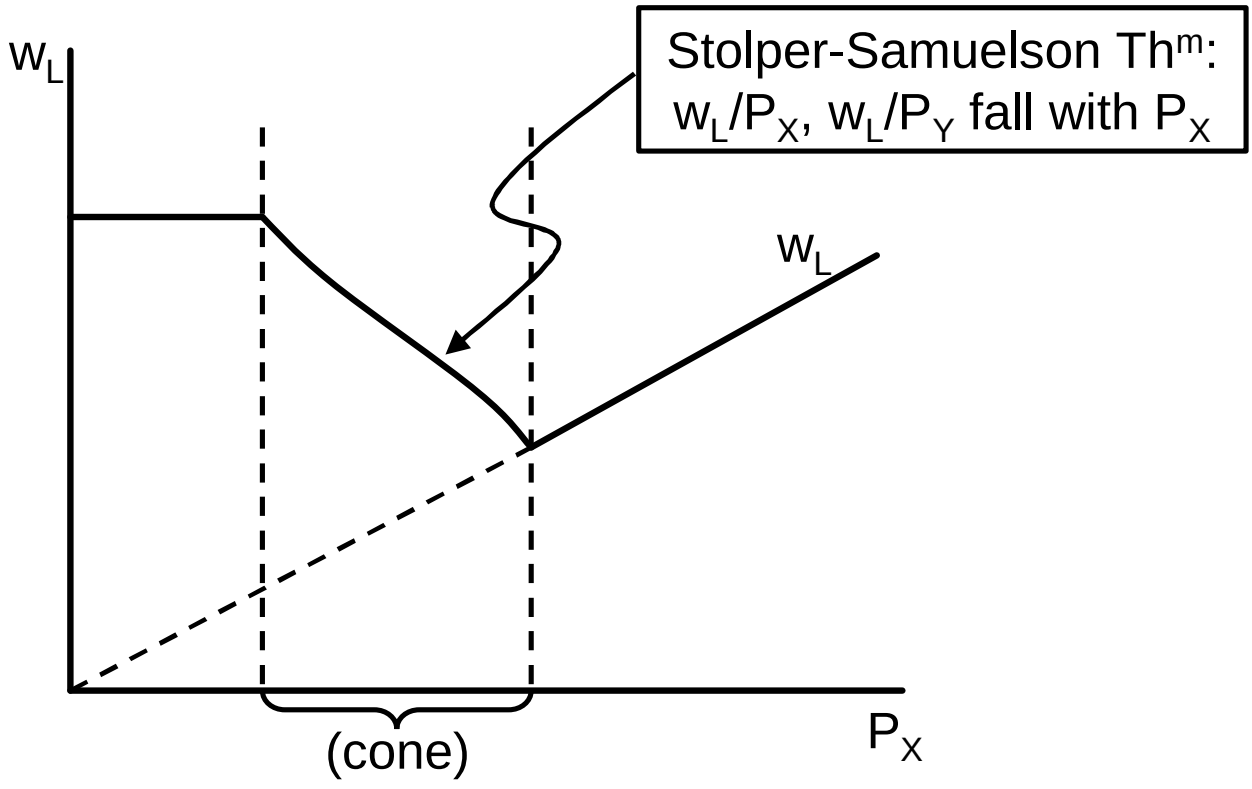


Effects of Increasing Price of Y, P_Y

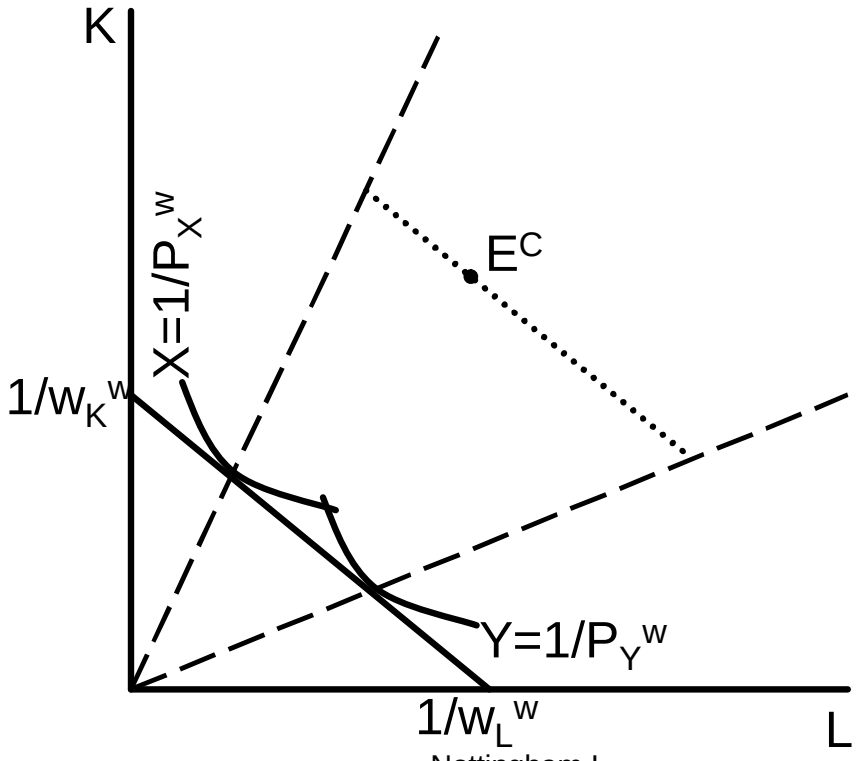
- Effects are mirror image of increasing P_X

Effects of Presence of Trade Costs

- Assume iceberg trade cost t- 1>0, equals fraction of each good that disappears in transit to world market (must ship t for 1 to arrive)
- Implication for domestic prices if world prices are P_X^w, P_Y^w:
  - If country exports X: $P_X=P_X^w/t$; $P_Y=tP_Y^w$
  - If country exports Y: $P_Y=P_Y^w/t$; $P_X=tP_X^w$
  - If country does not trade:

$$(P_X^w/P_Y^w)/t^2 = P_X/P_Y = t^2(P_X^w/P_Y^w)$$

Presence of Trade Costs



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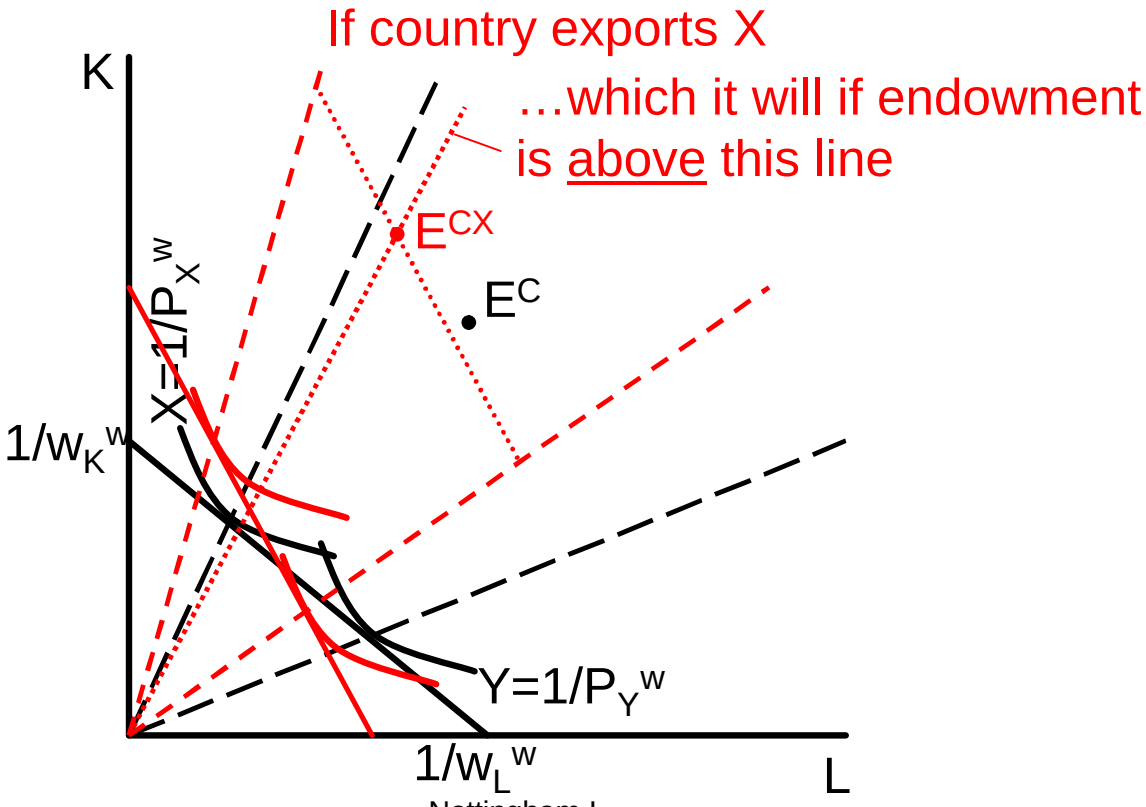

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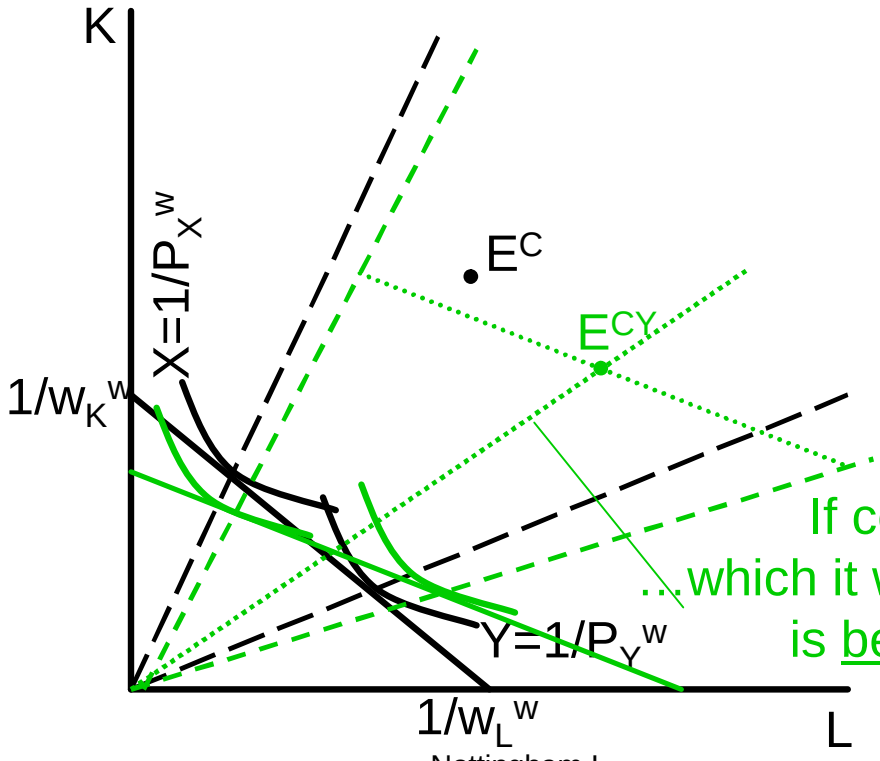
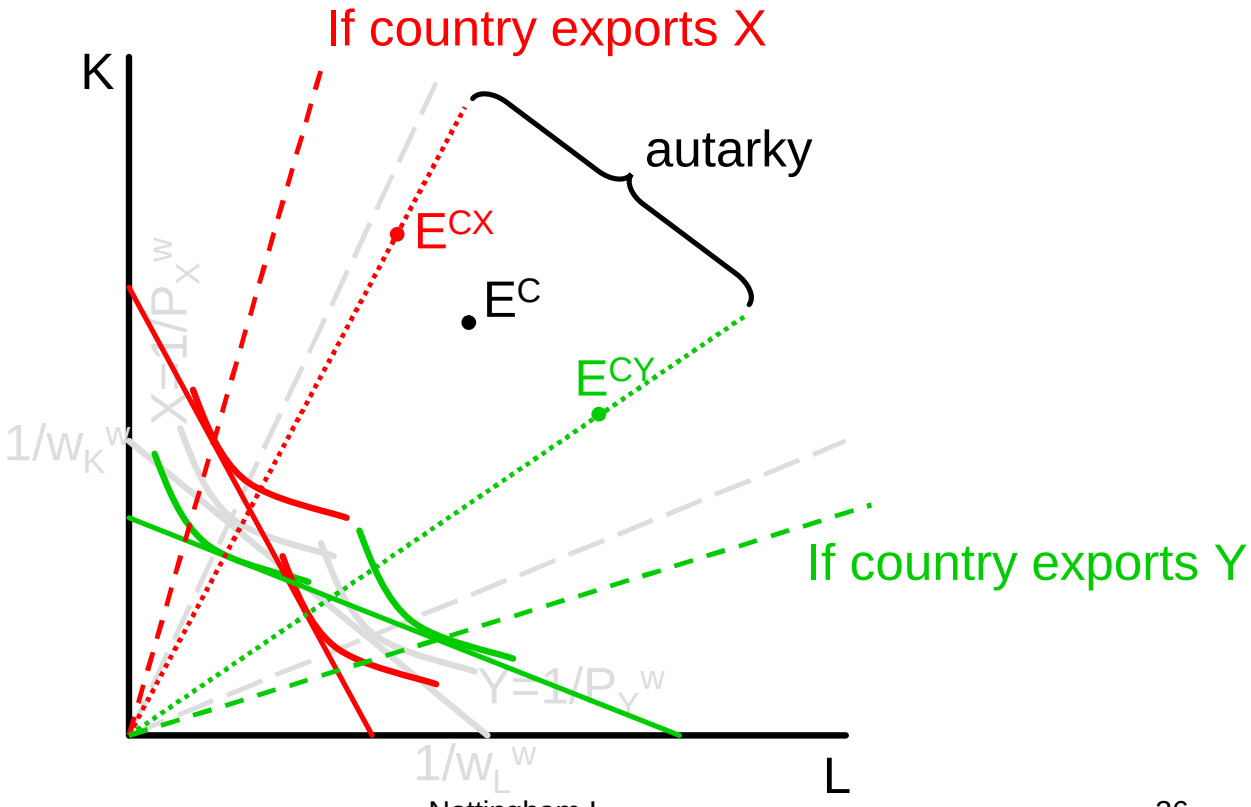
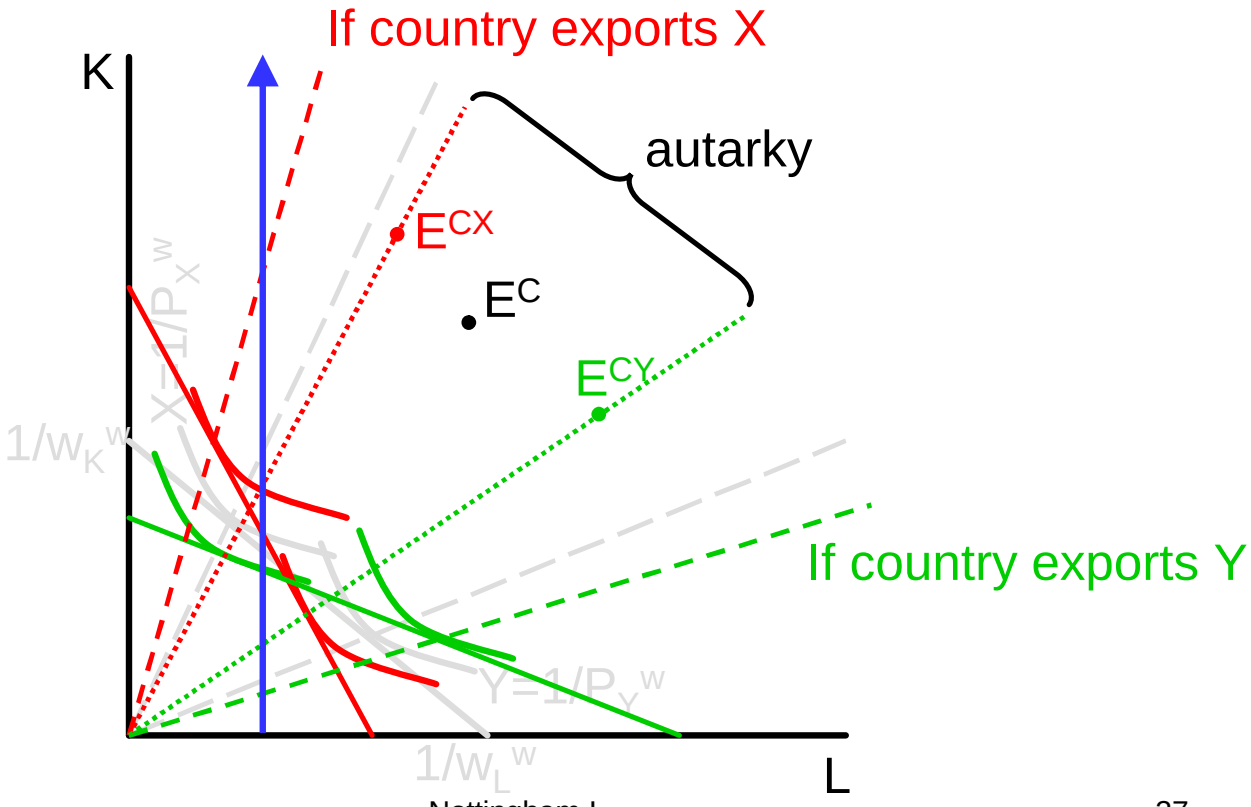


If country exports Y
...which it will if endowment
is <u>below</u> this line

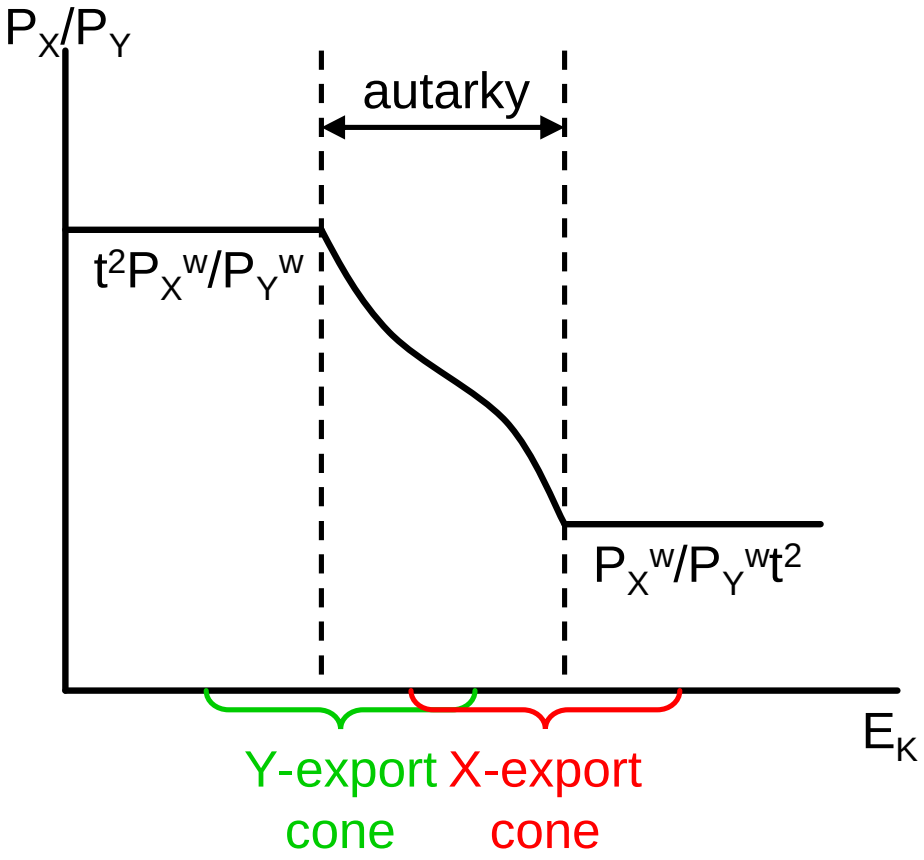
Presence of Trade Costs



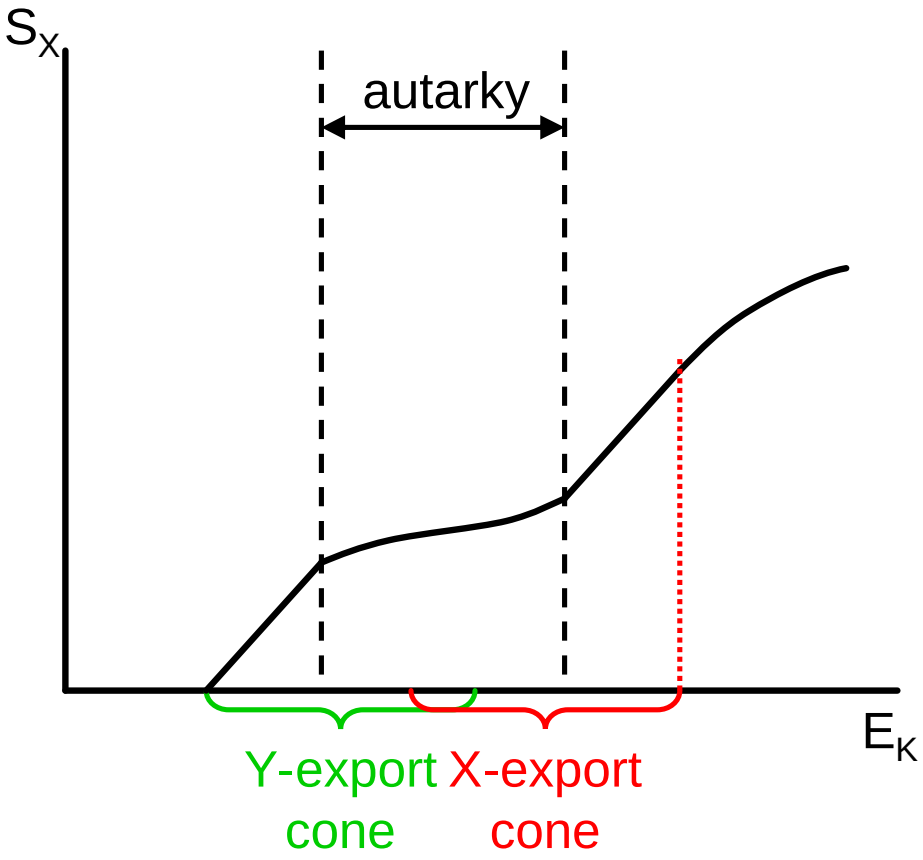
Effects of Increasing E_K in Presence of Trade Costs



Effects of Increasing E_K in Presence of Trade Costs



Effects of Increasing E_K in Presence of Trade Costs



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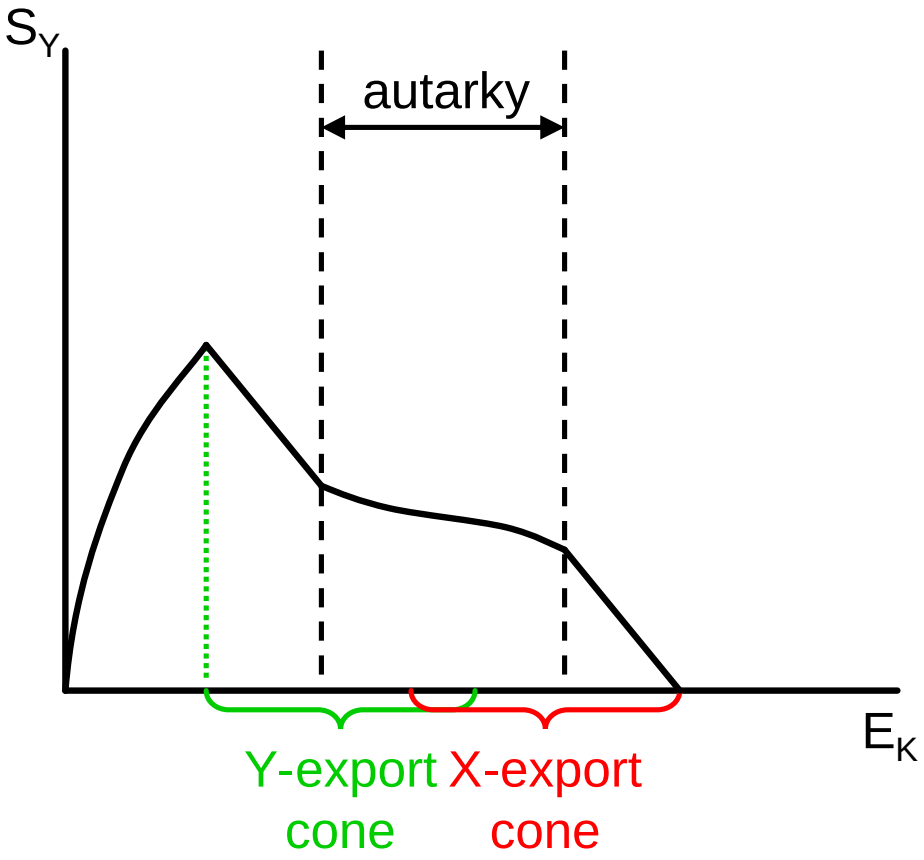

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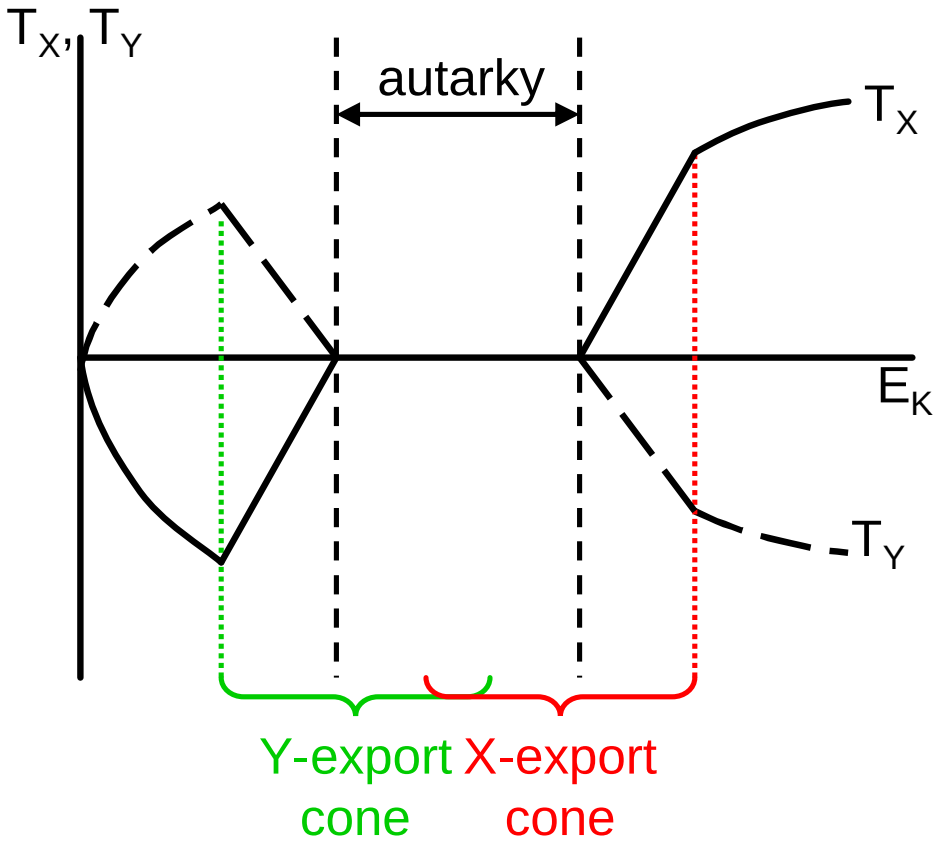

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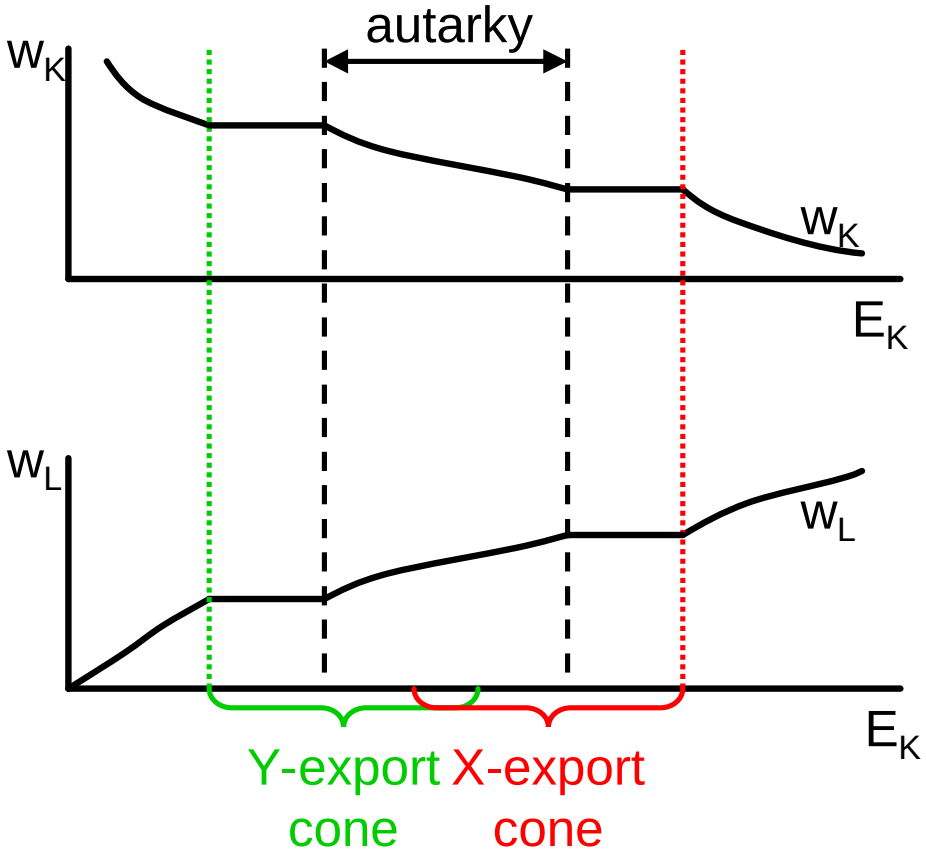
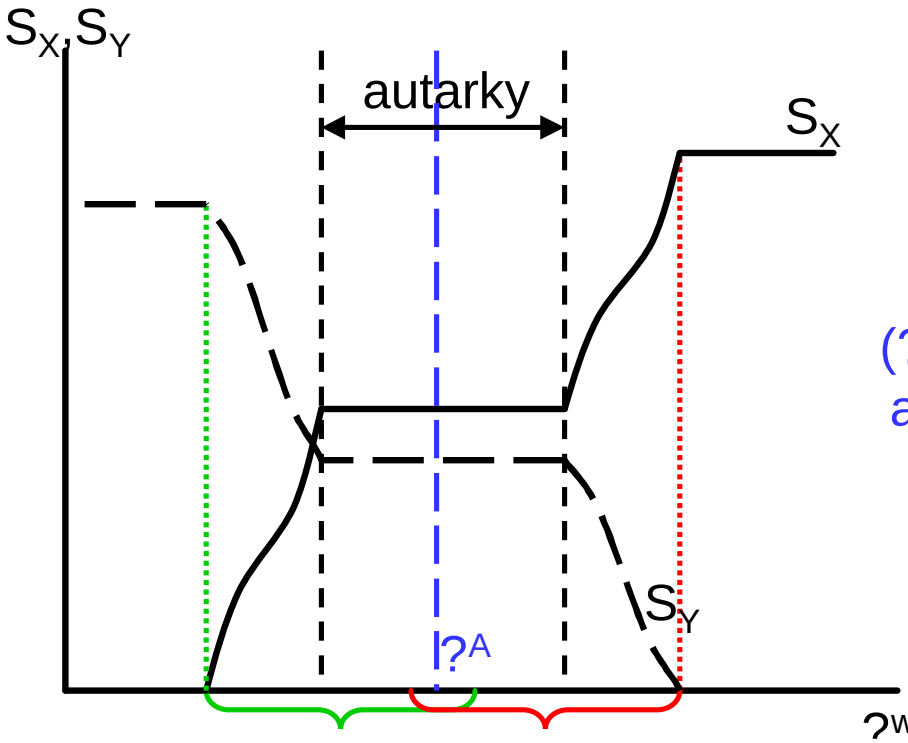
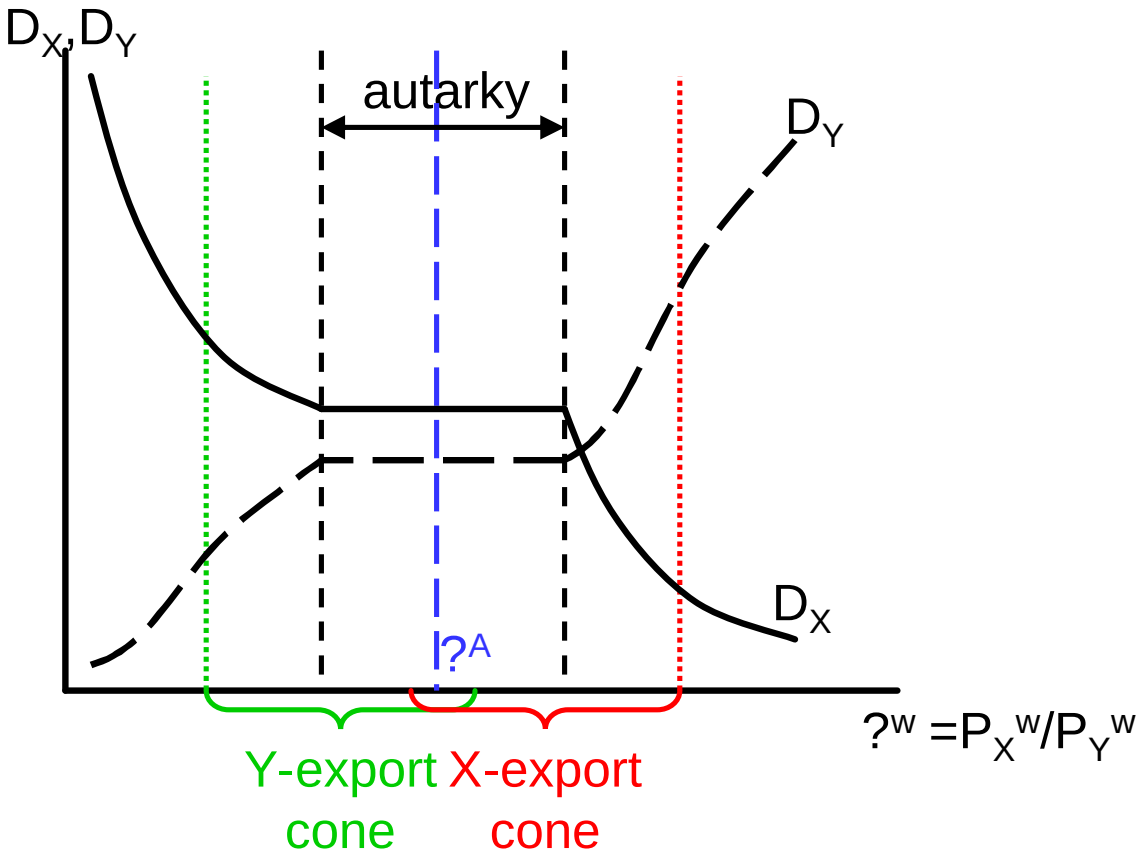


Effects of Increasing P_X^w/P_Y^w in Presence of Trade Costs



($?^A = P_X^A/P_Y^A$ = autarky price)

Effects of Increasing P_X^w/P_Y^w in Presence of Trade Costs



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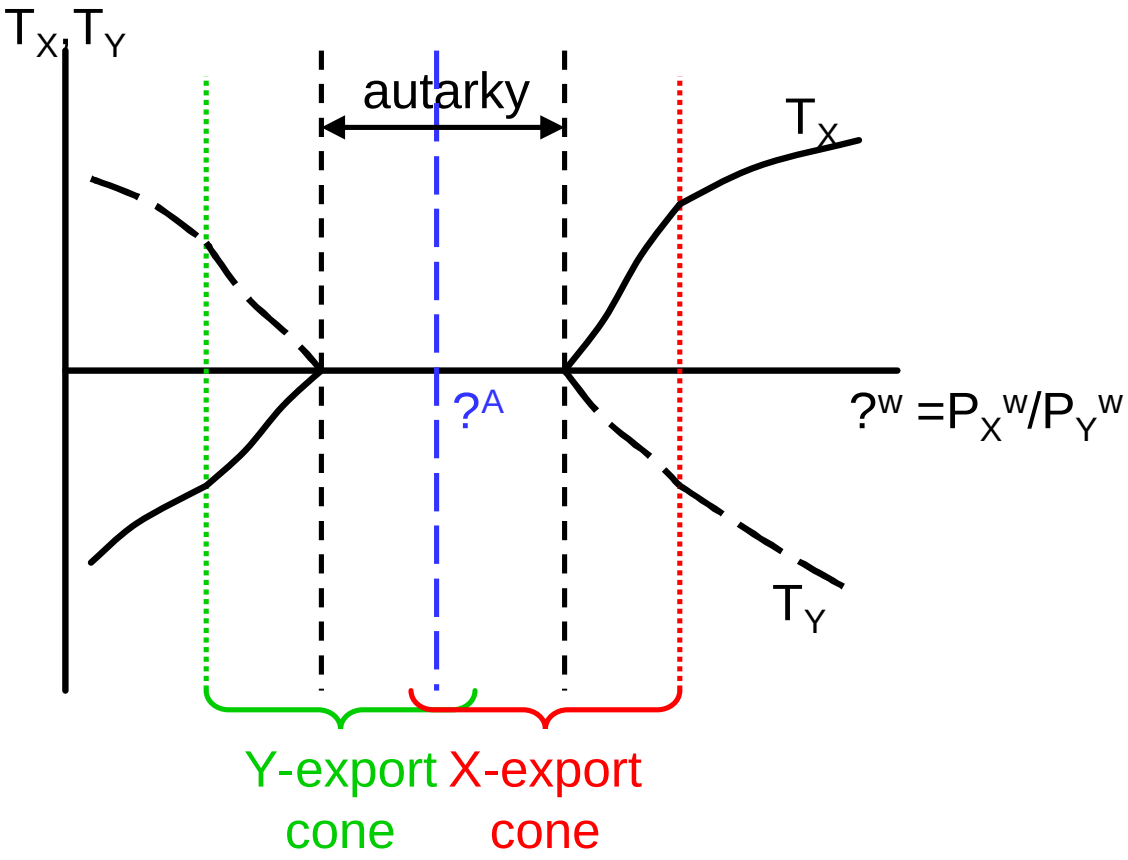

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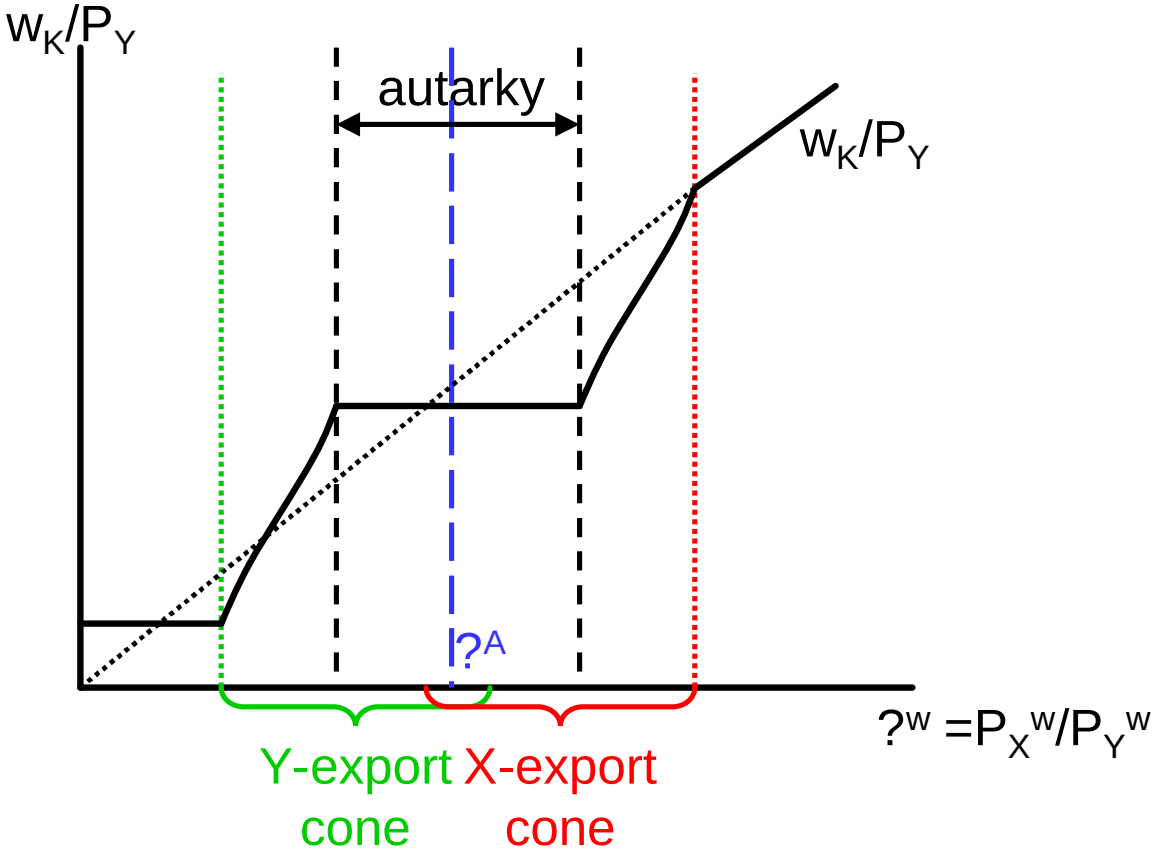

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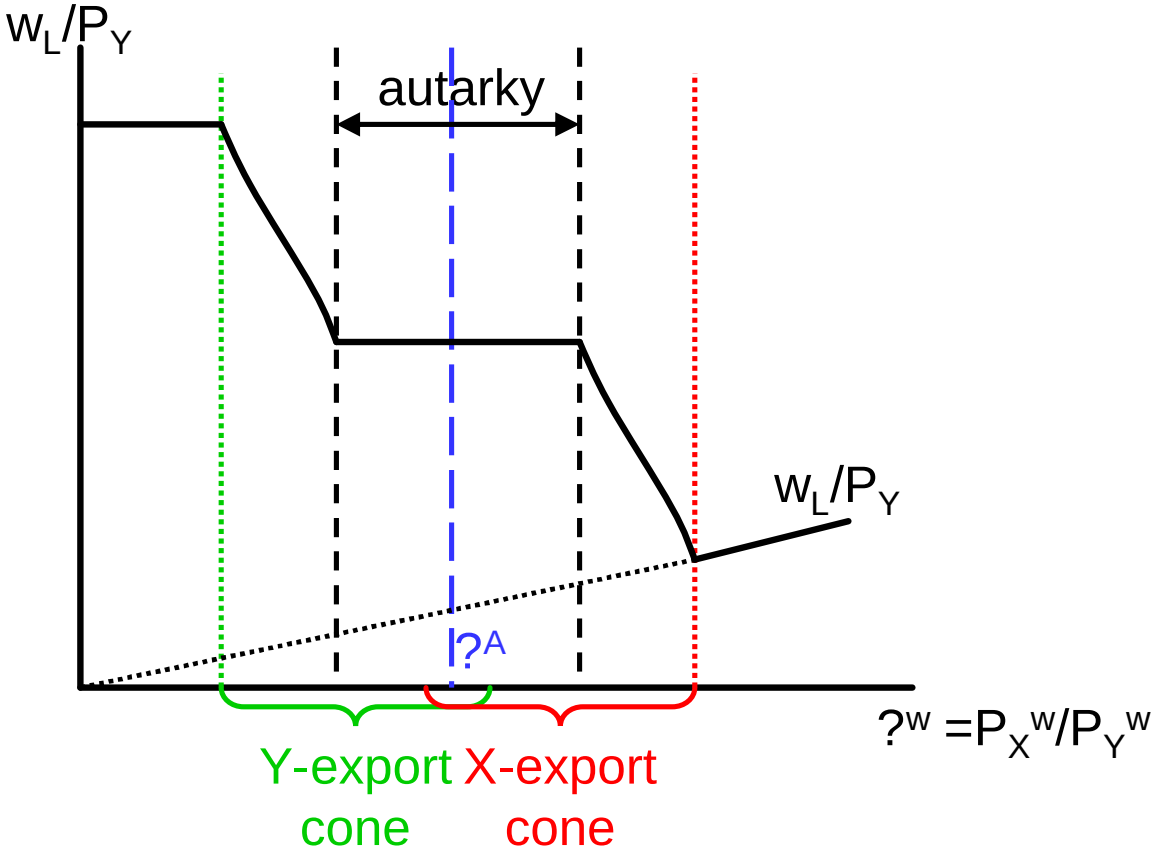


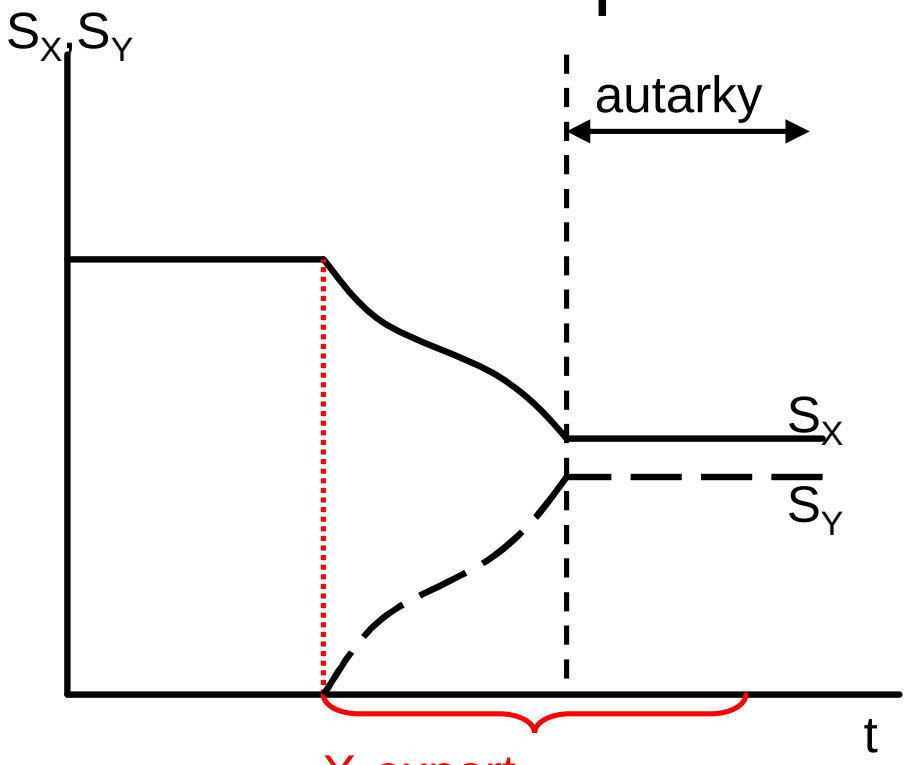
Effects of Increasing Trade Costs

- As trade cost, *t*, rises from zero, Y-export cone and the X-export cone move further apart, and the “autarky” range of factor endowments and world prices gets larger
- For any given endowment and world prices, a rise in *t* reduces the volume of trade and moves other variables in the direction of their autarky values.

Effects of Increasing Trade Costs

- Example:
  - Consider a country whose factor endowments have it completely specialized in good X at world prices

Effects of Increasing Trade Costs: Example



The World Market: The Textbook 2×2×2 H-O Model

- To model the world economy, add a second country (country "*")
- Solve for world (relative) price that clears the world market

$$T_X(E_K, E_L, P_X / P_Y) \; ? \; ? T_X^*(E_K^*, E_L^*, P_X / P_Y)$$

The World Market: The Textbook 2×2×2 H-O Model

- Results

$$S_I \;?\; S_I(E_K, E_L, E_K^*, E_L^*), \qquad I \;?\; X, Y$$

$$D_I \;?\; D_I(E_K, E_L, E_K^*, E_L^*), \qquad I \;?\; X, Y$$

$$T_I \;?\; T_I(E_K, E_L, E_K^*, E_L^*), \qquad I \;?\; X, Y$$

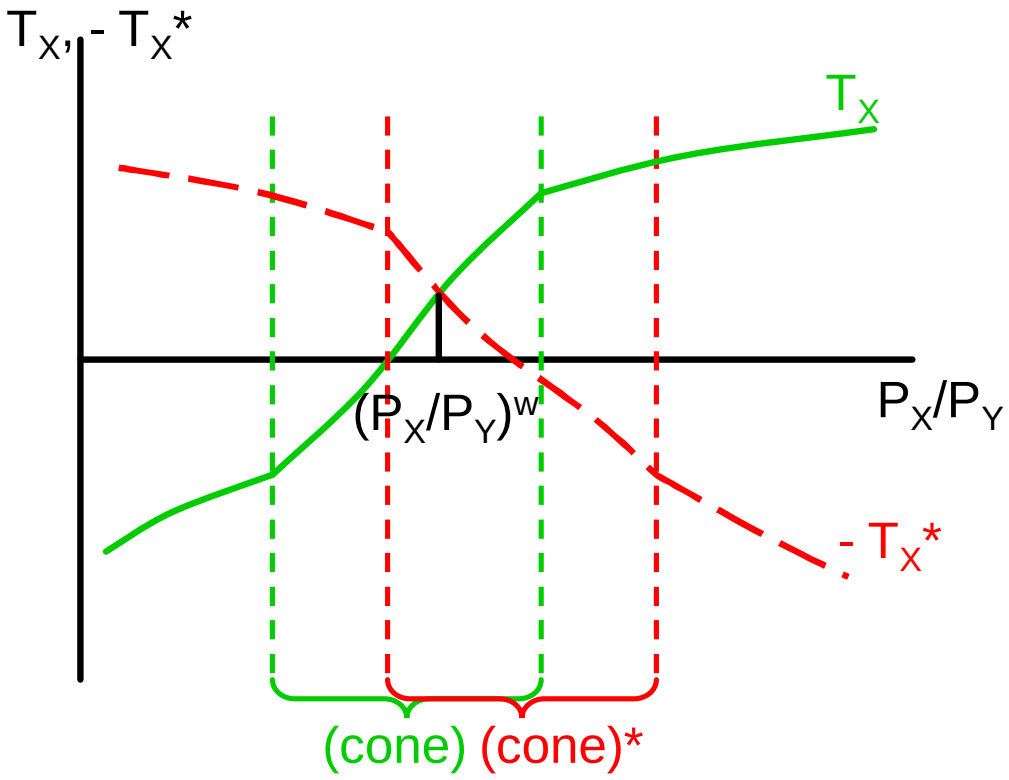
$$w_J \;?\; w_j(E_K, E_L, E_K^*, E_L^*, P_Y), \quad J \;?\; K, L$$

with analogous expressions for the other country

The World Market: The Textbook 2×2×2 H-O Model

- Depictions of world equilibrium
  - Offer curves (Meade)
  - Integrated-world-economy diagram (Dixit-Norman)
  - Sufficient (but not elegant) to use supply and demand of just one of the goods

World Equilibrium



Conclusions from the 2×2(×2) H-O Model

- Equilibria are well defined
- Equilibrium quantities are unique
- Equilibrium prices are unique up to a numeraire

Conclusions from the 2×2(×2) H-O Model

- Includes three types of equilibria
  - Autarky (when there are trade costs)
  - Diversified
  - Specialized
- Determinants of equilibrium type are mostly clear
- Several relationships between variables depend importantly on type of equilibrium

Conclusions from the 2×2(×2) H-O Model

- Classic “Theorems” are clear and precise
- Countries specialize, but only if endowment differences are large
- Prices and quantities vary continuously with exogenous changes in
  - Endowments
  - Trade costs
- In particular, trade responds sensibly to
  - Prices and
  - Trade costs

What's Next?

- My point in the next lecture will be that some of these attractive properties are lost in higher dimensions – i.e., especially when there are more than 2 of goods and countries