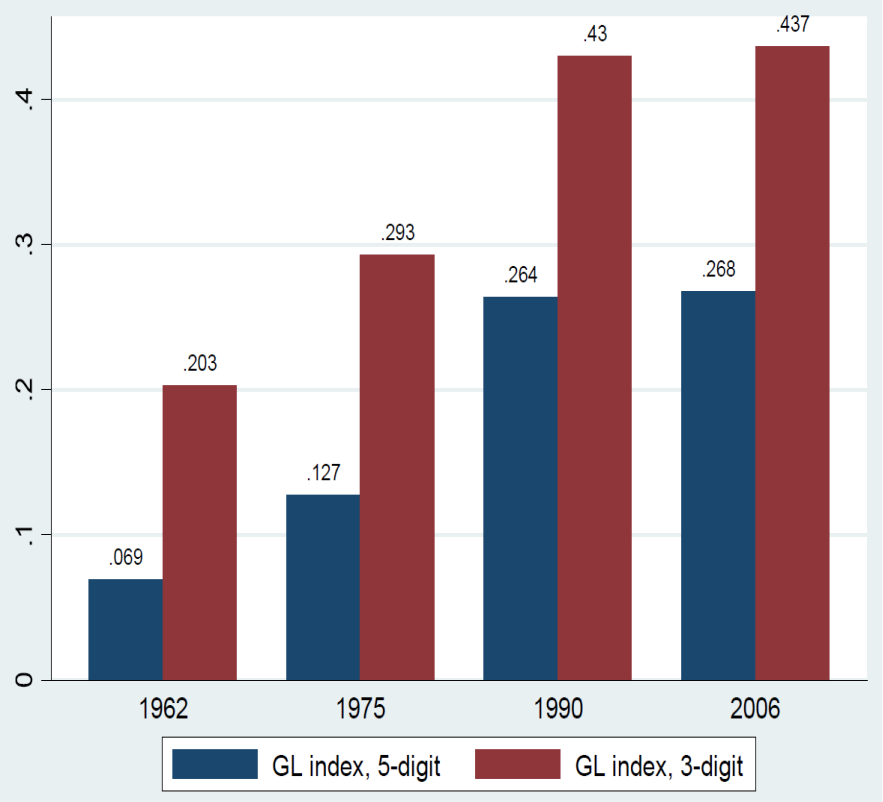
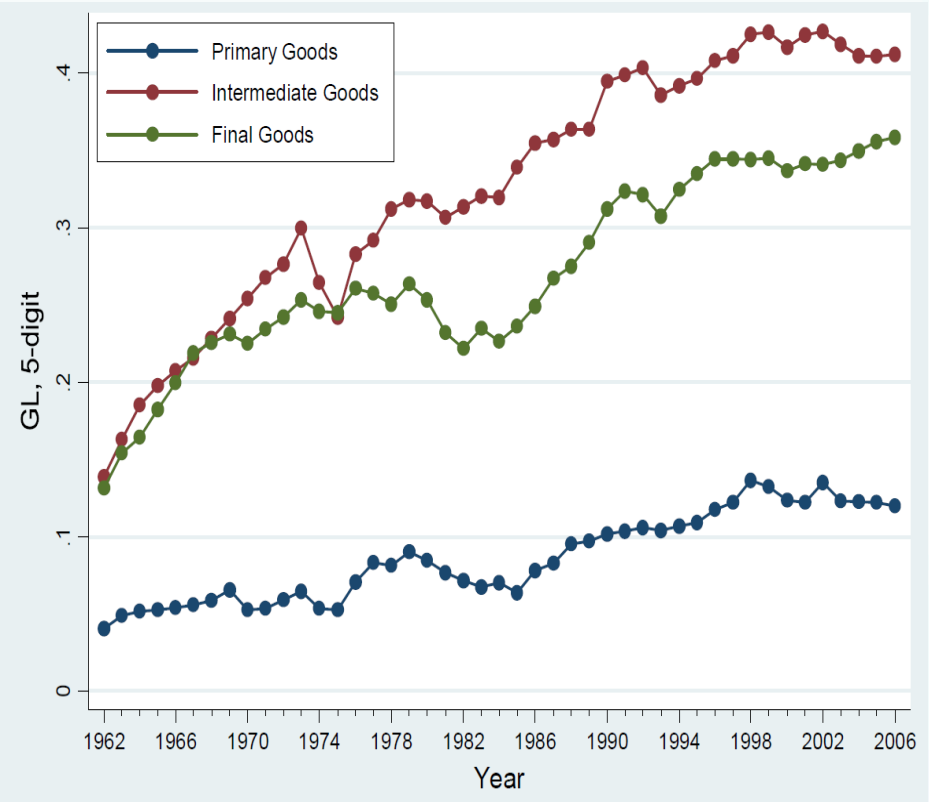
VI – Introduction to Trade under Imperfect Competition

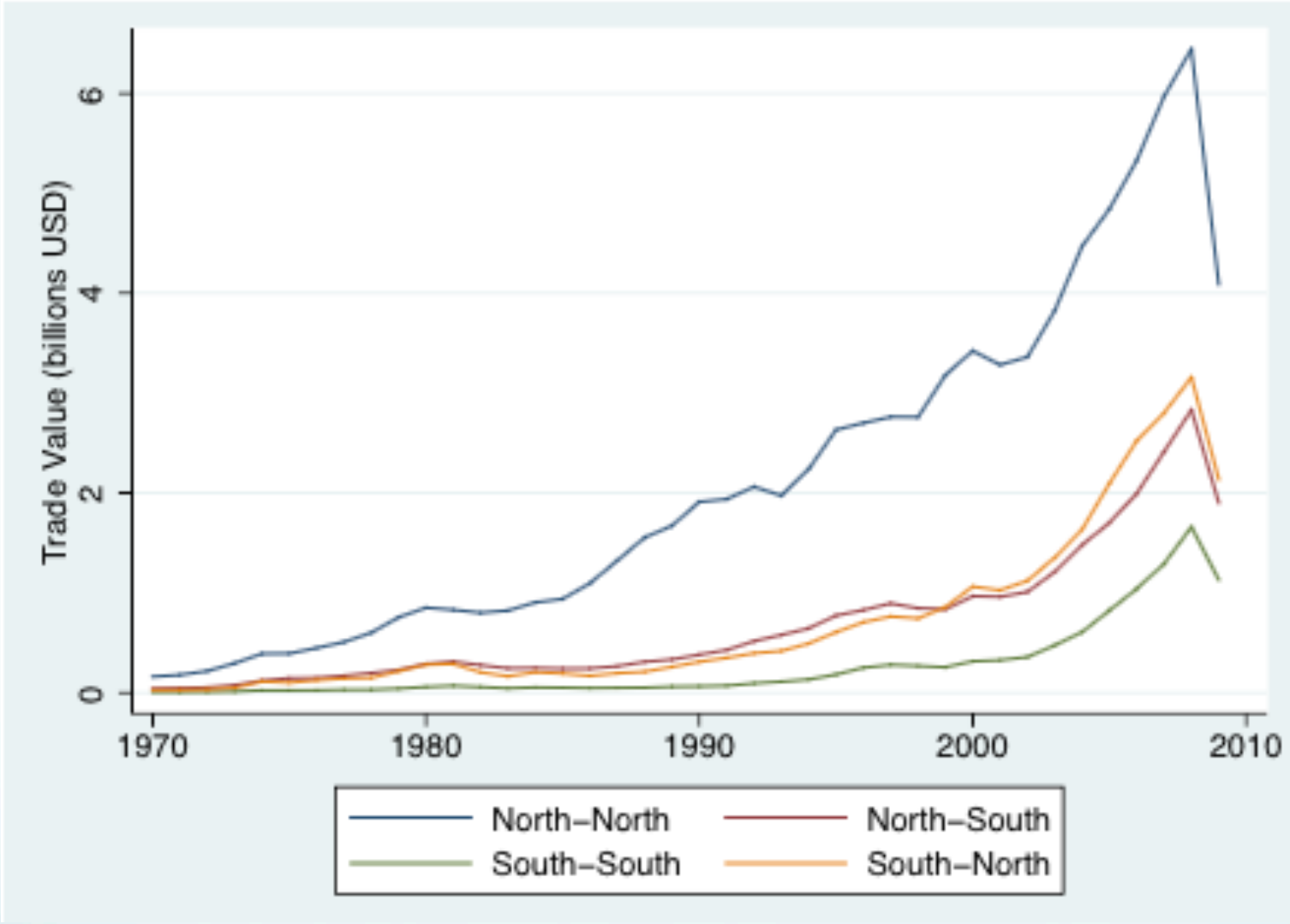
- In the 1970's "new trade theory" is introduced to complement HOS and Ricardo.
- Imperfect competition models capture strategic interaction and product differentiation:
  - two-way trade in an industry between similar countries can be explained
  - trade can increase competition and/or product variety and cause economies of scale





$$GLs = [(Xs+Ms) - |Xs - Ms|]100/(Xs+Ms)$$

A high value of the Grubel-Lloyd Index indicates a large share of intra-industry trade. Source: Brülhart (2008).

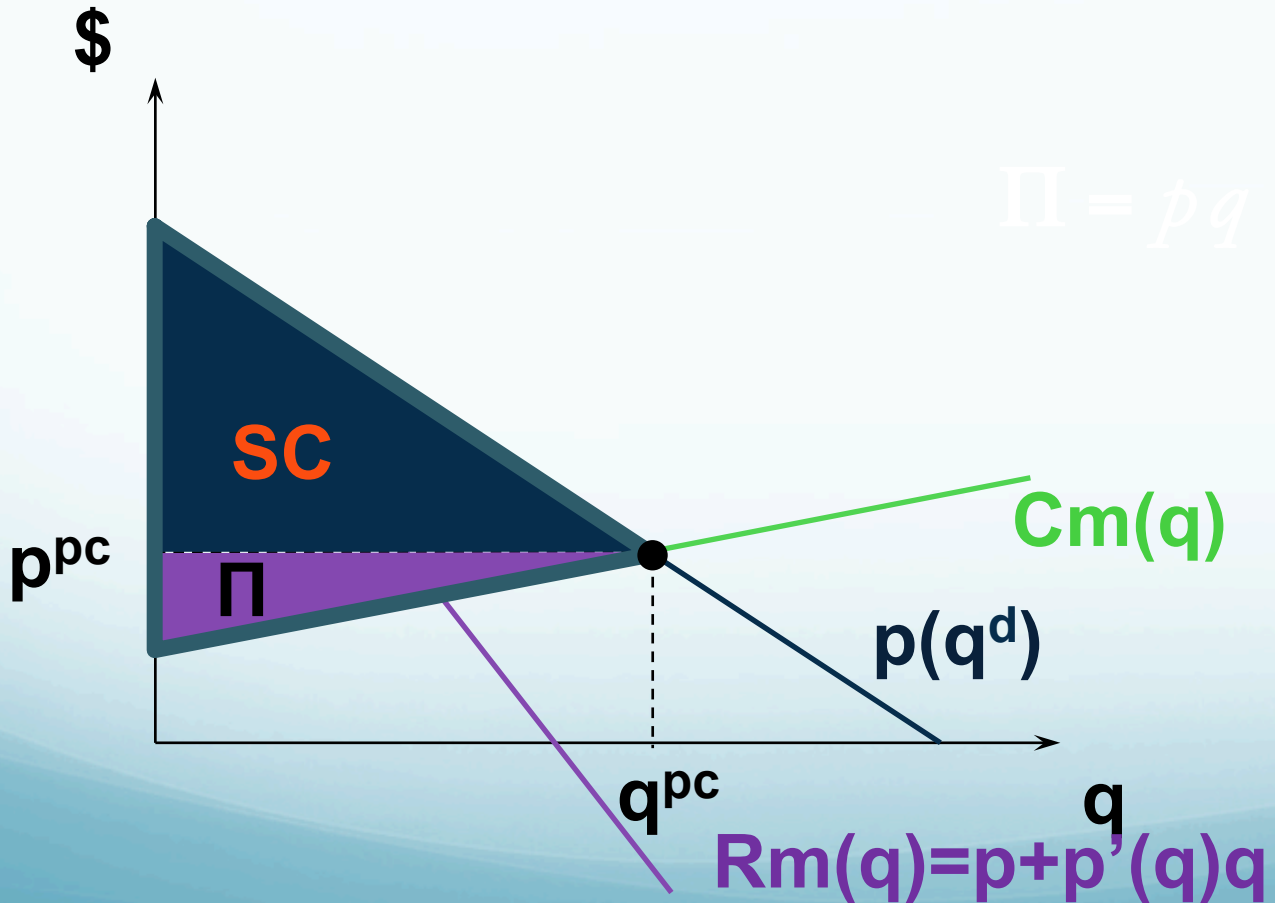


Most of world trade occurs between developed (North) countries. Source: UN COMTRADE.

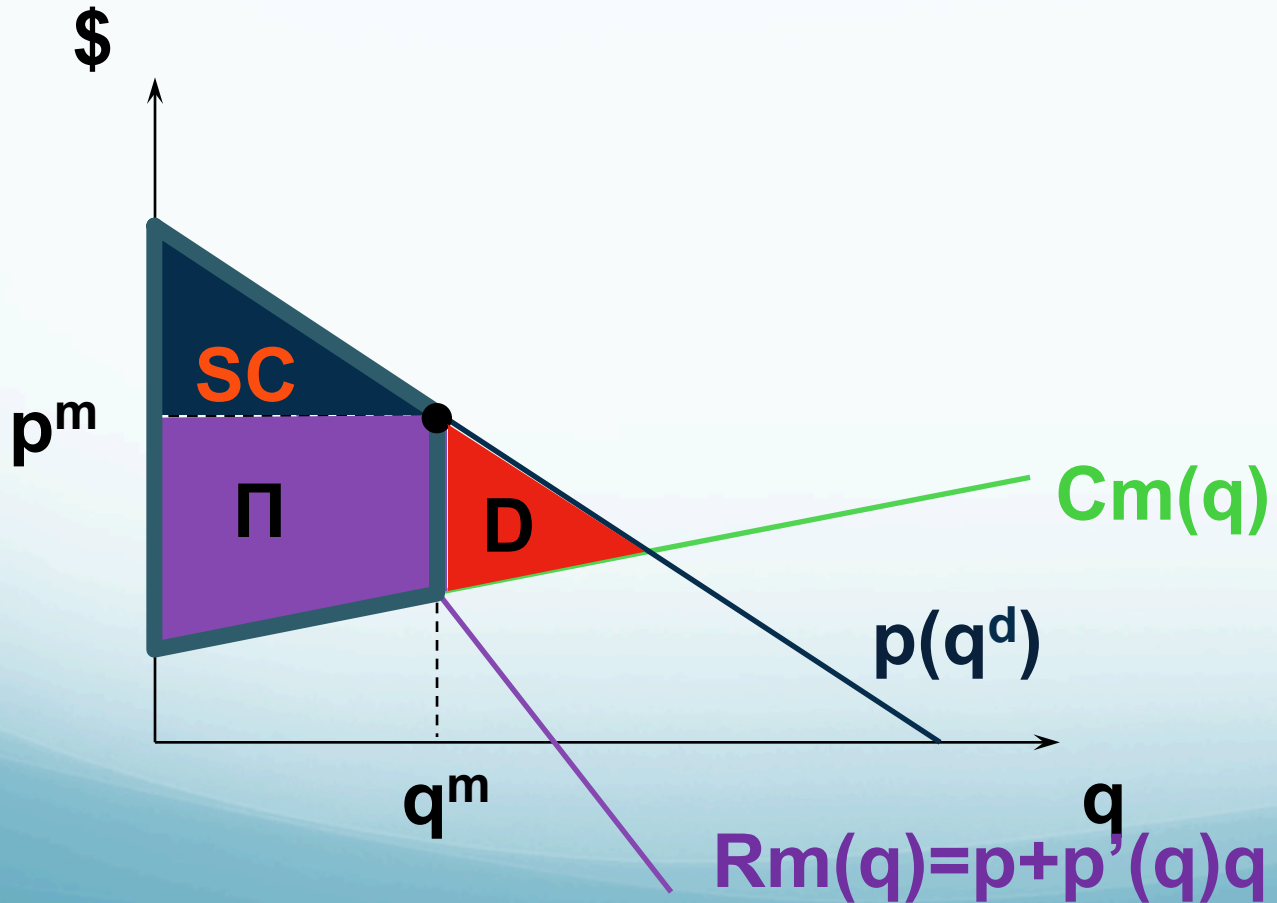
- Trade theory models under imperfect competition
  - monopolistic competition models
  - strategic interaction (oligopoly) models
- Identical endowments and technologies to abstract from HOS/Ricardo trade motives.
- Country size, number of firms become important variables.

Partial equilibrium analysis of monopoly pricing

- Total surplus equals consumer surplus plus profits SC+Π.
- Marginal cost pricing:



- Monopoly pricing:
  - Profit maximization satisfies $R'(q^m)=C'(q^m) \Rightarrow q^m, p^m$
  - Deadweight loss D



- In partial equilibrium, the consumer enjoys lower utility under monopoly pricing because of the deadweight loss.

- But the marginal cost may not be the same under closed and open economy

$\Rightarrow$ this figures does not encompass all effects when moving from autarky to trade under general equilibrium

$\Rightarrow$ need for a two good model

- **1. Pro-Competitive Gains From Trade**
- 2 good model
- constant returns to scale
- identical countries in all respects

⇒ focus on the role of imperfect competition

- 1.1 Autarky
- 1.1.1 Perfect competition in sector Y, imperfect competition in sector X
- Imperfect competition in sector X

⇒ small number of producers that take into account the demand elasticity when setting their price

⇒ price is above marginal cost

$$\Rightarrow \frac{p_X}{p_Y} > p^{pc} = \left(\frac{p_X}{p_Y}\right)^{perfect\ competition}$$

⇒ total production of X is lower than under perfect competition

- **Budget constraint**

$$p_X X^d + p_Y Y^d = w_X L_X + w_Y L_Y + \Pi$$

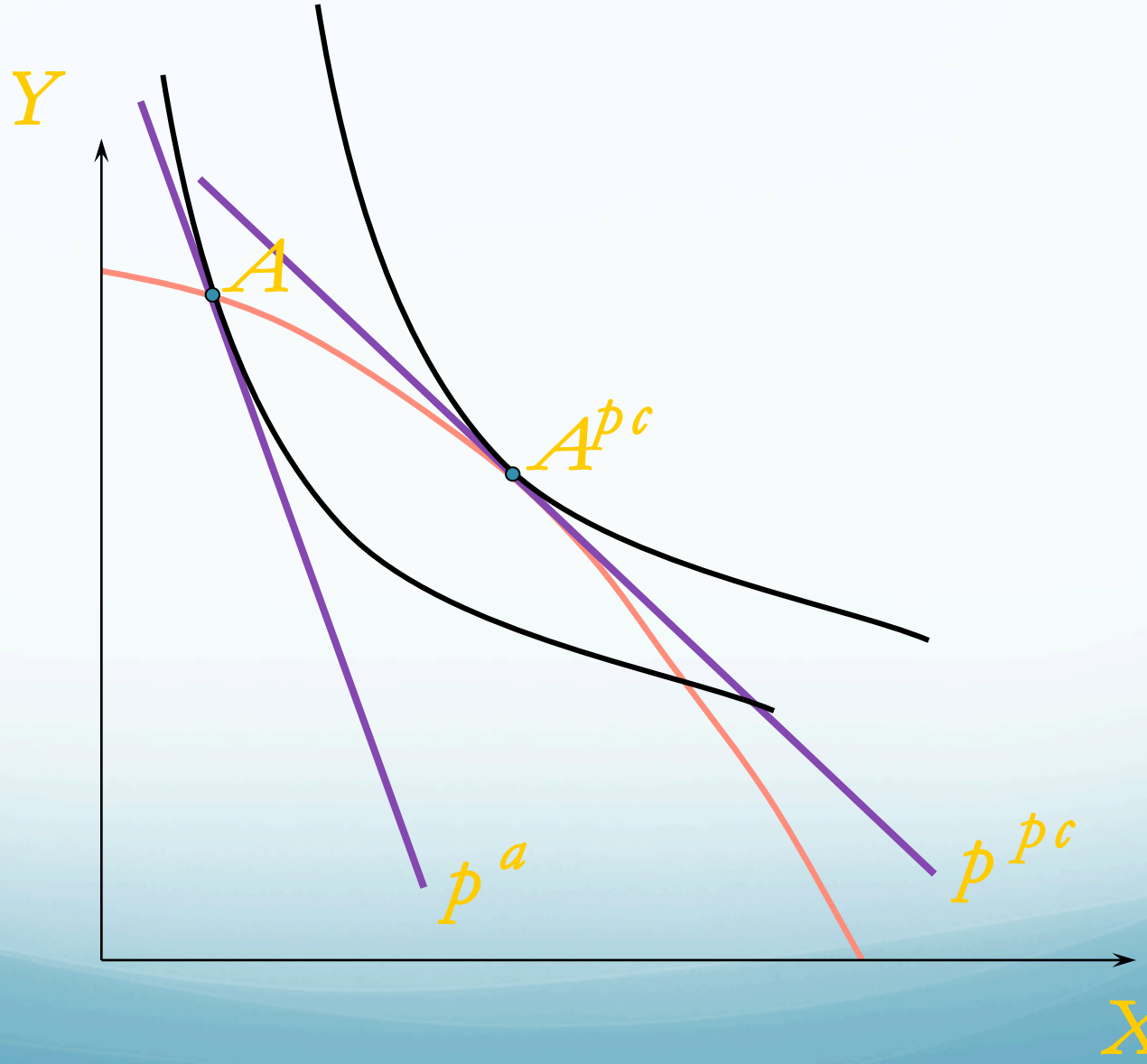
where Π are aggregate profits, if any

$$\Leftrightarrow \quad p_X X^d + p_Y Y^d = p_X X^s + p_Y Y^s$$

- **Since good Y production is perfectly competitive, all factor units not used by X are used to produce Y.**

$\Rightarrow$ **production is still on the PPF**

- Autarky under Perfect Competition in sector Y and Perfect/ Imperfect Competition in sector X



- **1.1.2 Imperfect competition in both sectors**
- **The price is above marginal cost in both sectors**
- **Not possible to rank *a priori* the relative price compared to the perfect competition price**

$$\frac{p_X}{p_Y} \gtrless ? \; p^{pc}$$

⇒ **again, higher welfare under perfect competition: inefficiency in both sectors in this case**

- **1.2 Trade Liberalization When World Markets Are Perfectly Competitive**

- Assumption: domestic producers of X lose all market power in the open economy.

- **1.2.1 Identical Countries**

- The world market price is a perfect competition price under autarky in any country:
  ⇒ higher welfare under free trade than under autarky: the deadweight losses disappear thanks to the marginal cost pricing

⇒ "pro-competitive" effect of trade

Proposition

When markets imperfectly competitive under autarky are open to free trade making them perfectly competitive, welfare increases in both countries thanks to pro-competitive effects

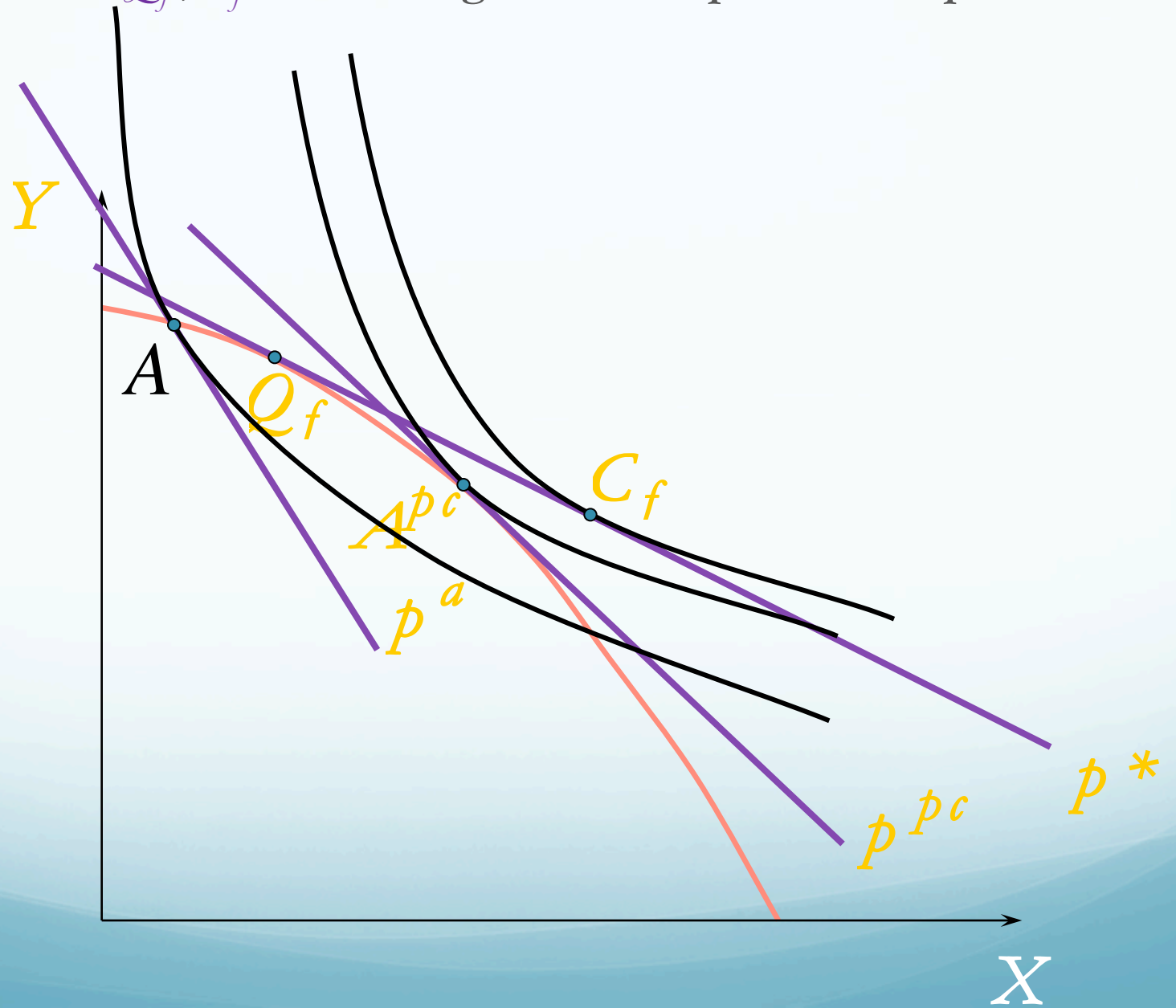
- **Note: since countries are identical, no trade takes place in equilibrium**

⇒ no specialization and exchange gains

⇒ the pro-competitive effect is a new effect

- **1.2.2 Different Countries**
- **The autarkic prices are *a priori* different in both countries and, under free trade, the world price is between the autarkic prices**
- **The "standard" specialization and exchange gains add to the pro-competitive gains: see next figure**

- $A \rightarrow A^{pc}$: pro-competitive gains from trade
- $A^{pc} \rightarrow Q_f$, C_f: standard gains under perfect competition



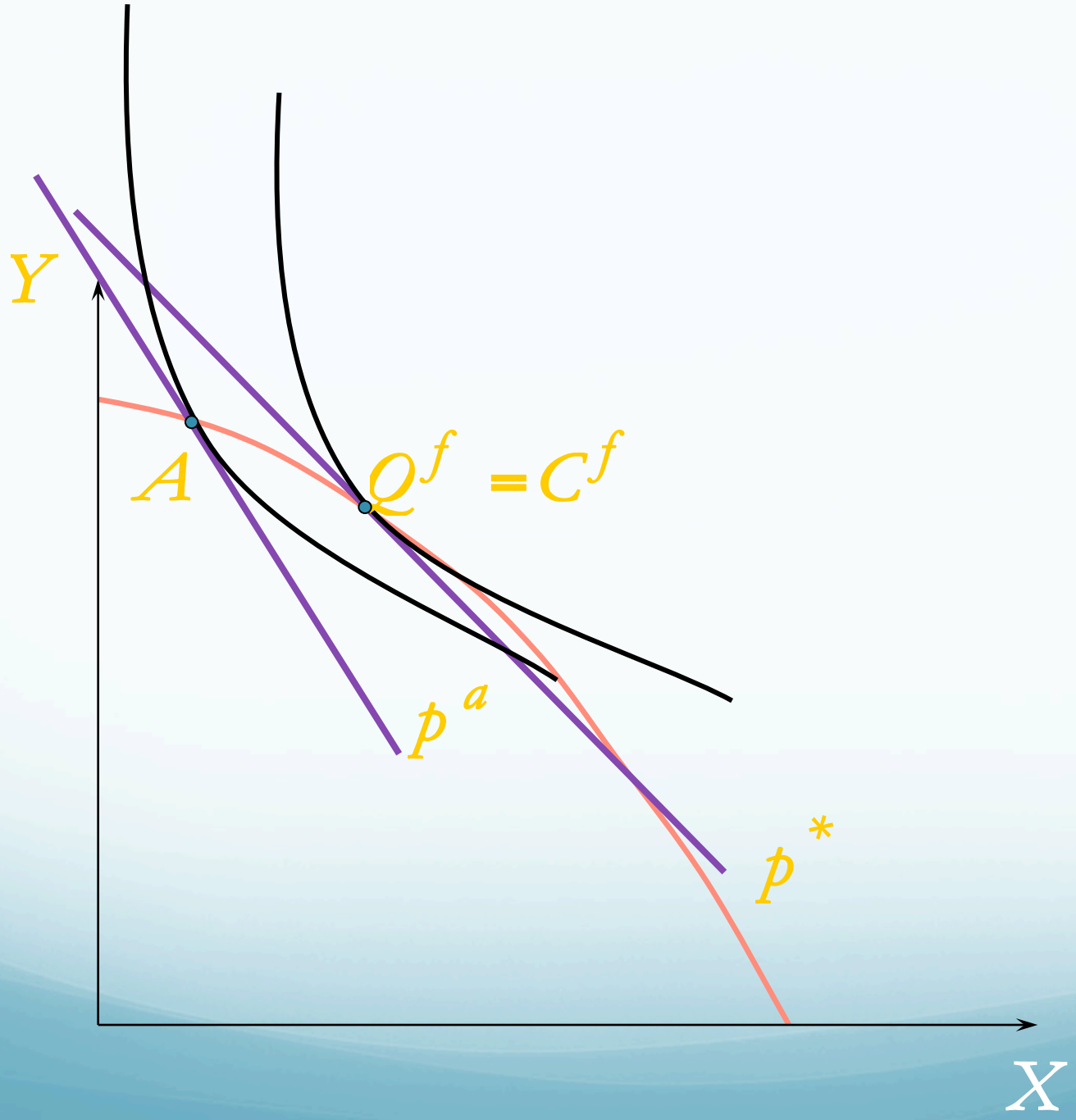
- **1.3 Trade Liberalization When World Markets Are Imperfectly Competitive**

- **1.3.1 Identical Countries**

- Assumption: competition is still imperfect on the world market, but stronger than on each local market

- The world market price is below the autarkic price under imperfect competition, but above the perfect competition price
  - production and consumption increase
  - no trade since identical countries

⇒ not possible to compare the relative world price to the price under autarky, but welfare gains thanks to the reduction of the deadweight loss: pro-competitive gains


Y
A
$Q^f = C^f$
p^a
p^*
X

- **1.3.2 Different Countries**

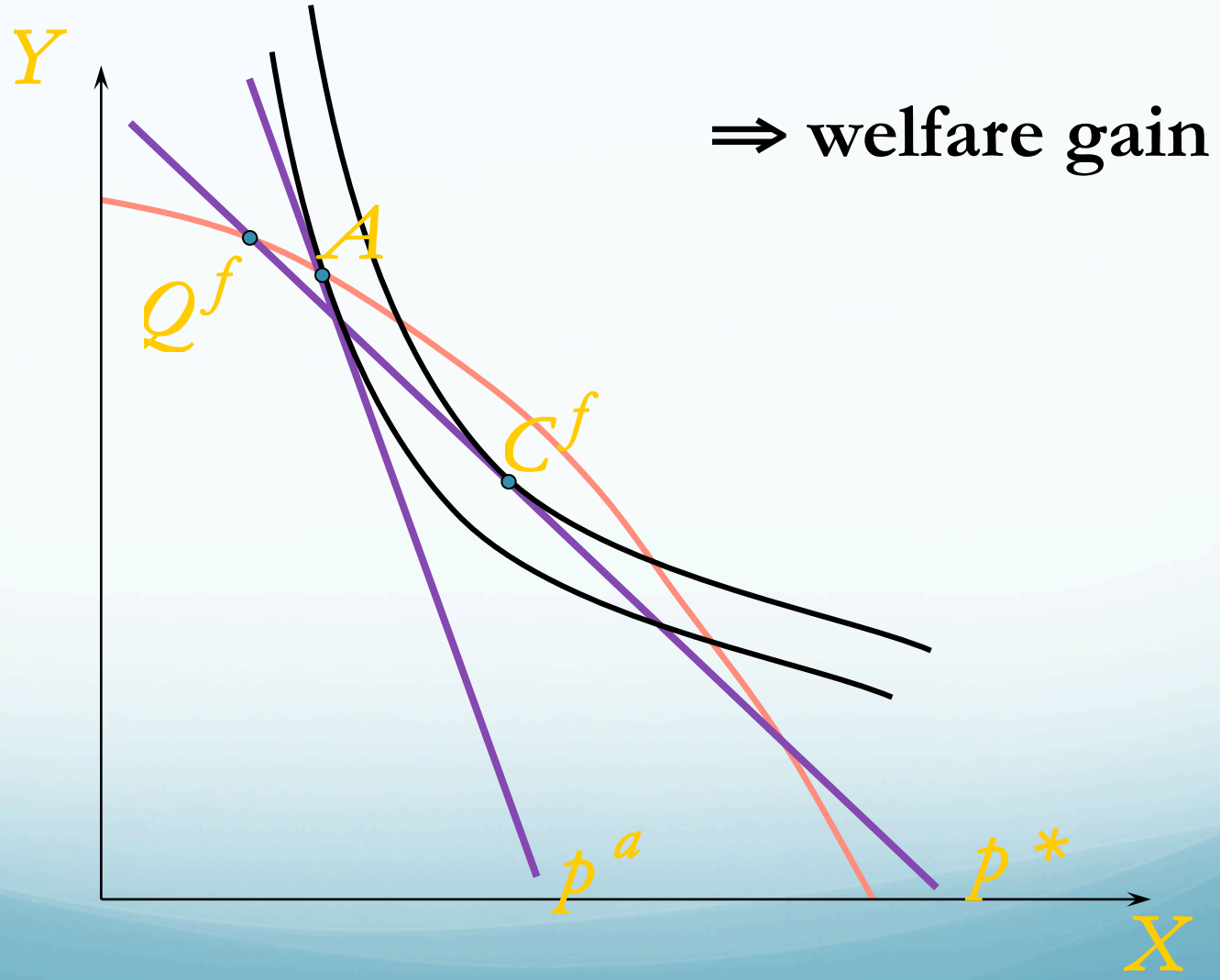
Imperfect competition in sector X, perfect in sector Y

- **Proposition:** *The less productive, or the larger demand, or the smaller firm number country imports the good produced in the imperfectly competitive sector and gains less from free trade, may even lose*

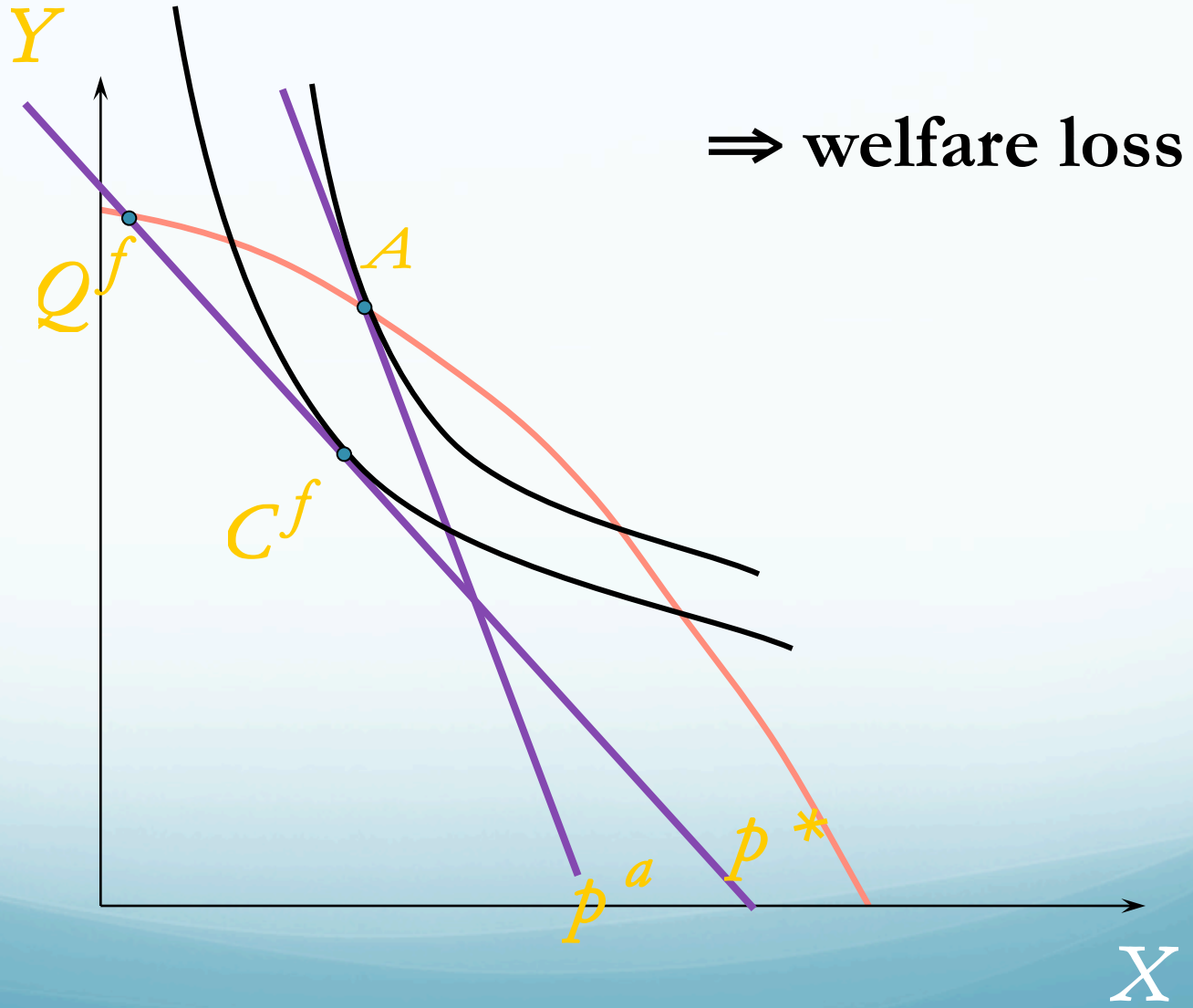
Intuition:

- **On country loses income (sales + profit) in the imperfect competition sector, the other country gains.**
- **That effect is added to the pro-competitive effect and other gains from trade**

⇒ ambiguous total impact on welfare



$\Rightarrow$ welfare gain



⇒ welfare loss

⇒ Welfare gain if

- strong specialization / exchange and pro-competitive gains
- small good X production contraction and income losses (or income gains)

- Welfare loss if strong income losses compared to specialization / exchange and pro-competitive gains

- Welfare always increases if the perfect competition situation is reached

- Other remarks
  - to make more precise predictions we need a model of imperfect competition
  - firms in the less efficient sector lose, but consumers gain: redistributive effects if consumers are not all firm owners
  - trade takes place when countries are different

- **2. Increasing Returns to Scale**

- **Increasing returns to scale are in most cases incompatible with perfect competition**

- **Additional channel for gains from trade**

trade ⇒ specialization ⇒ larger production scale ⇒ lower average production cost: efficiency gains

- **Assumption: increasing returns are strong enough to make the PPF** *monotonically convex*
  - includes constant variable cost and fixed cost, or decreasing variable cost
  - excludes fixed cost and decreasing marginal returns as in HOS

- **2.1 External Economies of Scale**

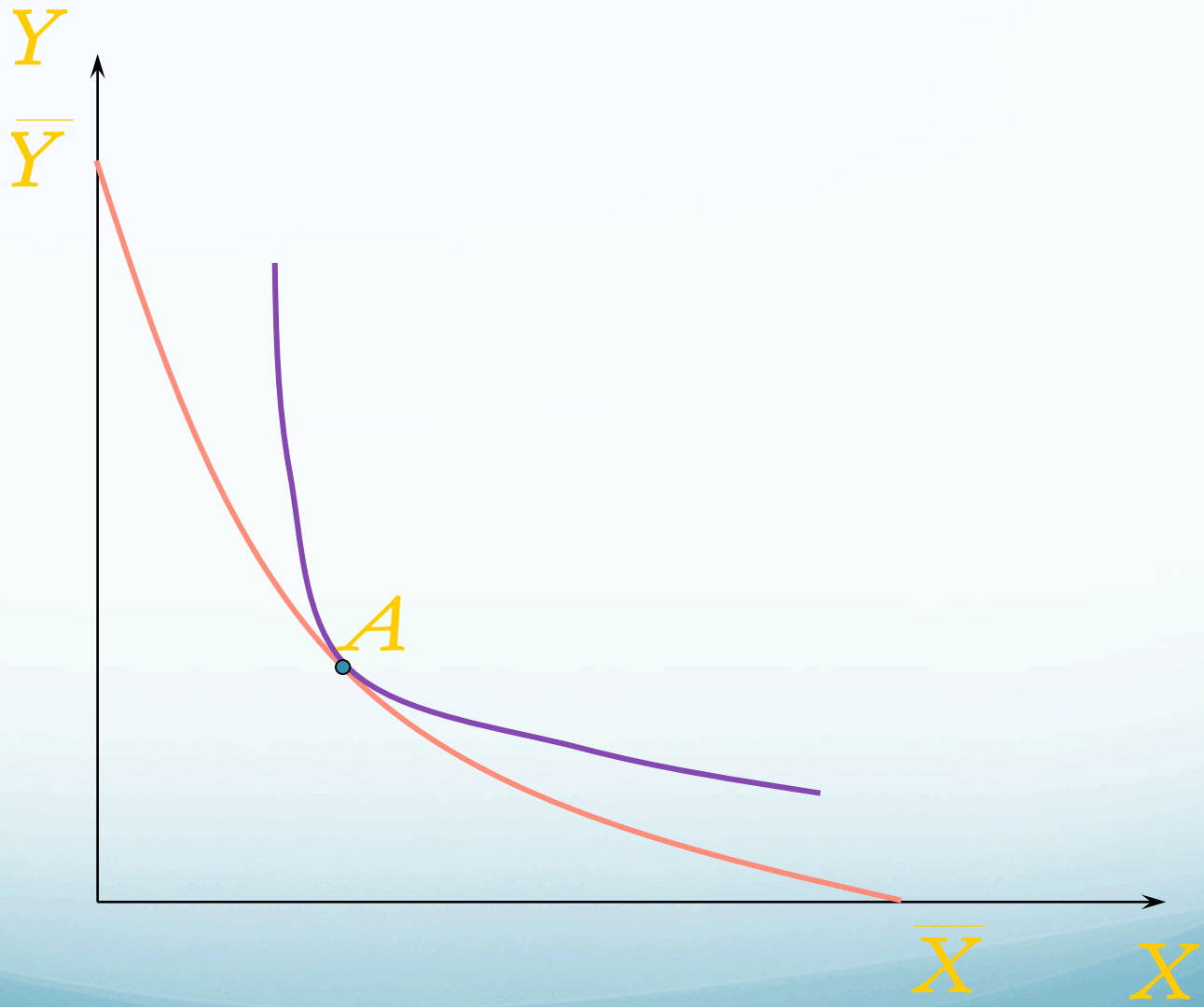
- Assumption: CRS at the firm level, but productivity increases with the total size of the economy
  - firms do not internalize the national externality
  - standard assumption in the AK endogenous growth models

- Examples
  - infrastructure: national research organizations, education system, transport network
  - labor market pooling for highly-skilled workers, specialized suppliers
  - knowledge spillovers

- Implication: perfect competition with a convex PPF

Assume identical preferences and technology.

Autarky is represented by point A.



- **Despite identical technology and preferences, there are gains from trade.**

- **Optimal situation at the world level: each country produces only one good (full specialization) and freely exports / imports**

⇒ minimizes the average production cost

- **Proposition**

If there are some increasing returns to scale, if trade induces some specialization in production compared to autarky and the degree of competition increases, the world as a whole (sum of both countries) gains from free trade

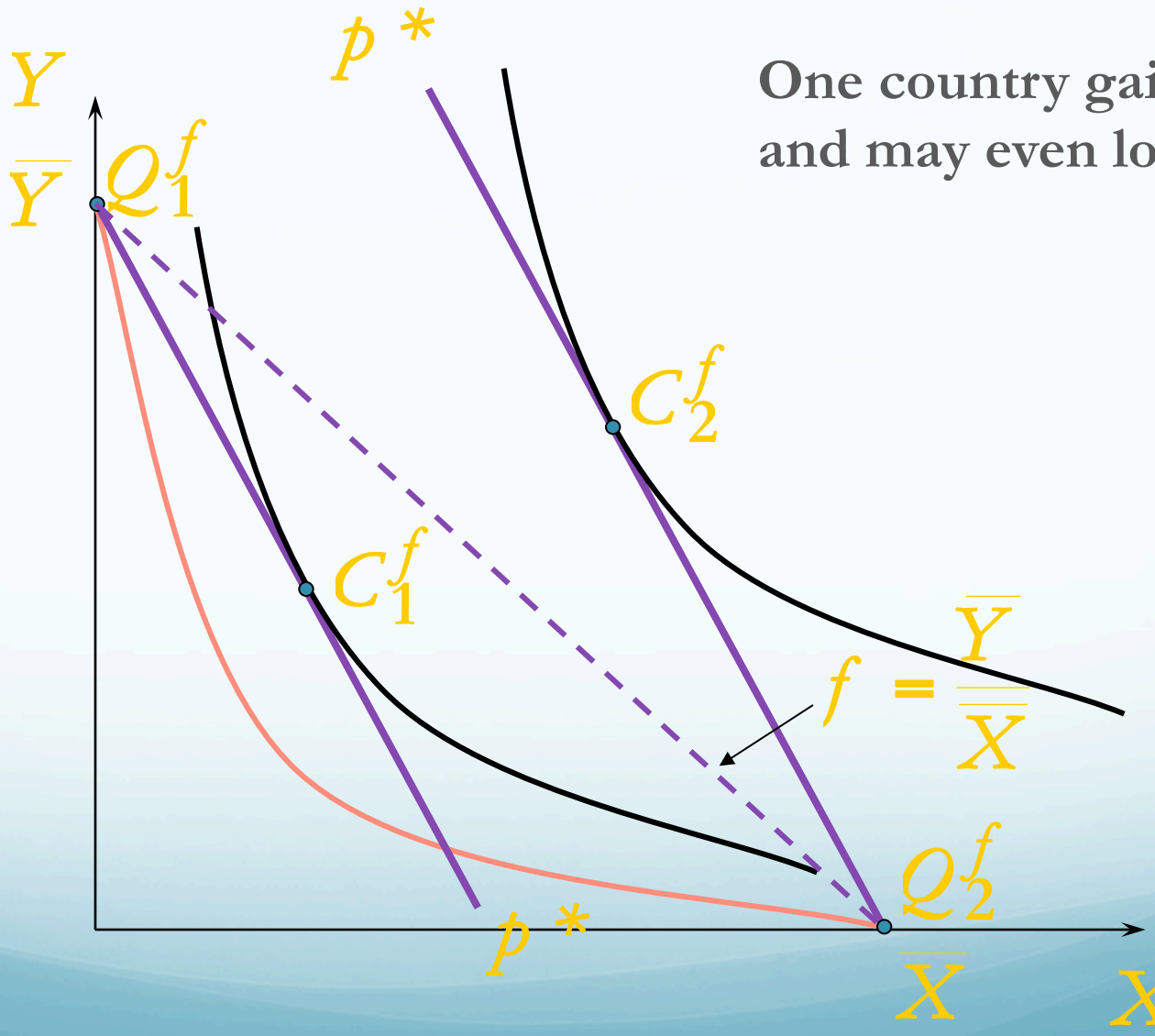
⇒ the IRS effect is referred to as "productive efficiency gains"

- But the gains from trade are different between countries due to price effects

(⇒ "production shifting" effects)

- Example of the case with two identical countries such that free trade implies full specialization of each country in a given good: see next figure

- Figure: Trade Liberalization Effects if Full Specialization



One country gains less and may even lose.

In general the relative price that clears world markets is different from $f = \frac{\overline{Y}}{\overline{X}}$

If the relative price is greater than f :

- the country that specializes in good X gains more than the other country
- country 2 gains more because it specializes in the good whose price is "high" (highly demanded relative to production possibilities)
- country 1 may even lose from trade
- trade causes specialization and factor price unequalization

Proposition

(i) A country may lose from trade liberalization if it specializes in a good whose price is low

(ii) Both countries gain from trade liberalization if the world price is close to "f"

- **2.2 Internal Economies of Scale**
- Example: firm-level fixed costs (R&D sector, marketing, headquarters…)
- Technical definition of internal increasing returns to scale:

⇔ marginal cost lower than the average cost

⇔ $C'(q) < \frac{C(q)}{q}$

⇔ $\frac{C(q)}{q}$ is a decreasing function

- Implication: marginal cost pricing cannot be an equilibrium because it implies negative profits

$$\pi(q) = pq - C(q) = \left(p - \frac{C(q)}{q}\right)q$$

$$C'(q) < \frac{C(q)}{q}, \quad p = C'(q) \quad \Rightarrow \quad \pi(q) < 0$$

Direct and Indirect Pro-competitive Effects of Trade Liberalization

- Same direct pro-competitive effect as in 1.3
  - increased competition ⇒ lower firm mark-up ⇒ lower deadweight losses
  - imperfect competition is justified here by the presence of increasing returns to scale that limit firm entry
- Indirect pro-competitive effect: scale economies
  - new effect: lower prices ⇒ higher scale ⇒ lower cost per unit
  - same kind of effect as in the case of external economies of scale but induced here by the direct pro-competitive effect

- Example 1 (short-run): fixed number of firms n
  - assumptions:
    - ✓ identical countries: no trade in equilibrium
    - ✓ exogenous number of firms (short-run situation) such that profits are positive under both autarky and free trade
    - ✓ free trade does not affect the number of firms
  - technology
    - ✓ $Y = L_Y$
    - ✓ $l_X = ax + F$ is the labor needed for a given firm in sector X in order to produce x units of good X

F : fixed cost in terms of labor units, a : unit labor requirement

- aggregate production function in sector X:

$$X = nx = \frac{L_X - nF}{a}$$

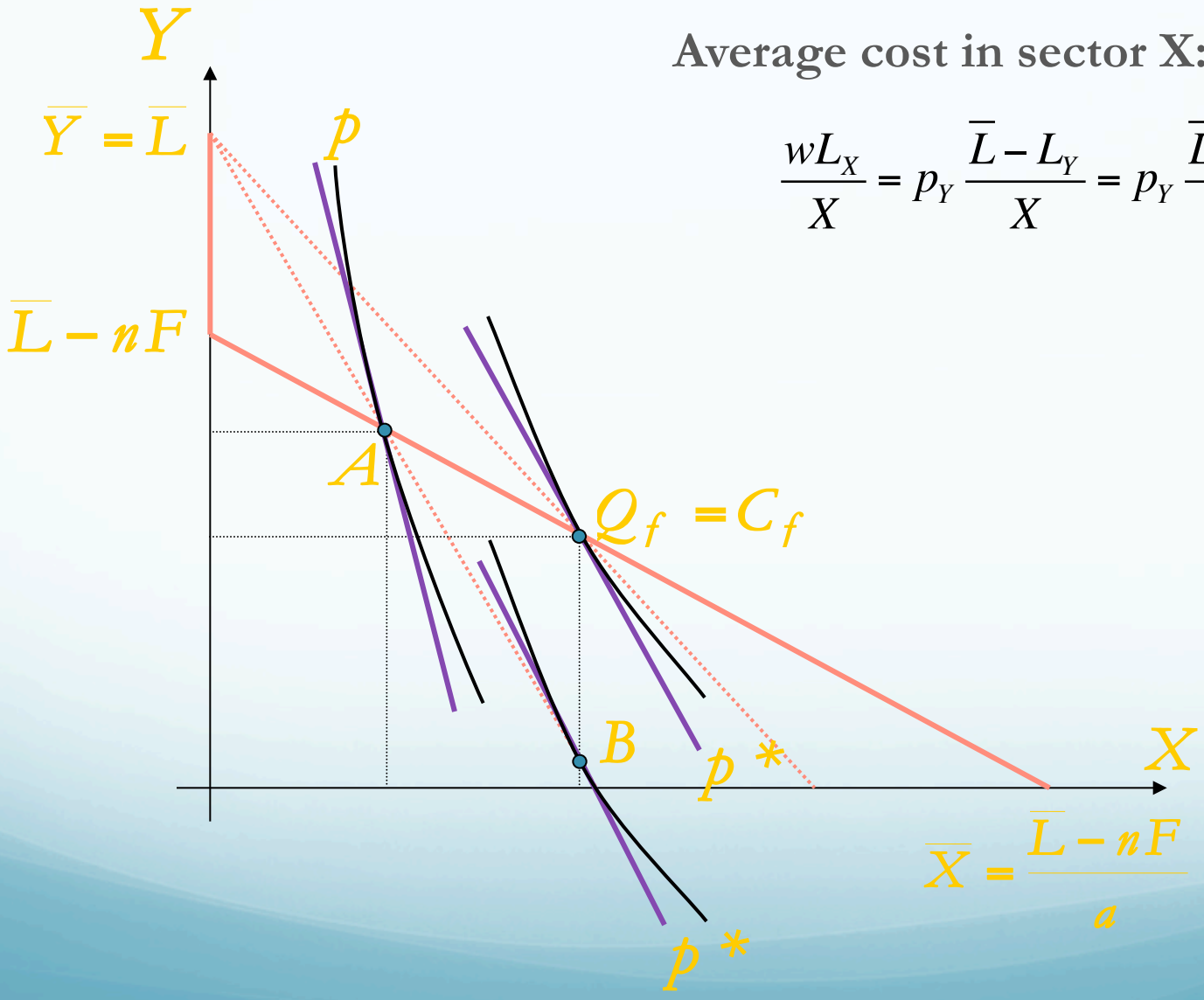
where n is the firm number, and L_x is total employment in sector X: $L_X = n.l_X$

- production frontier ⇔ full-employment constraint

⇔ $Y + aX + nF = \bar{L}$

- unique input ⇒ wage normalized to 1
- competition
  - ✓ perfect in sector Y
  - ✓ imperfect in sector X
- graphic representation : see next figure

- A → B: direct pro-competitive gains
- B → Qf =Cf : efficiency gains due to the decrease in average cost (indirect pro-competitive gains)



Average cost in sector X:

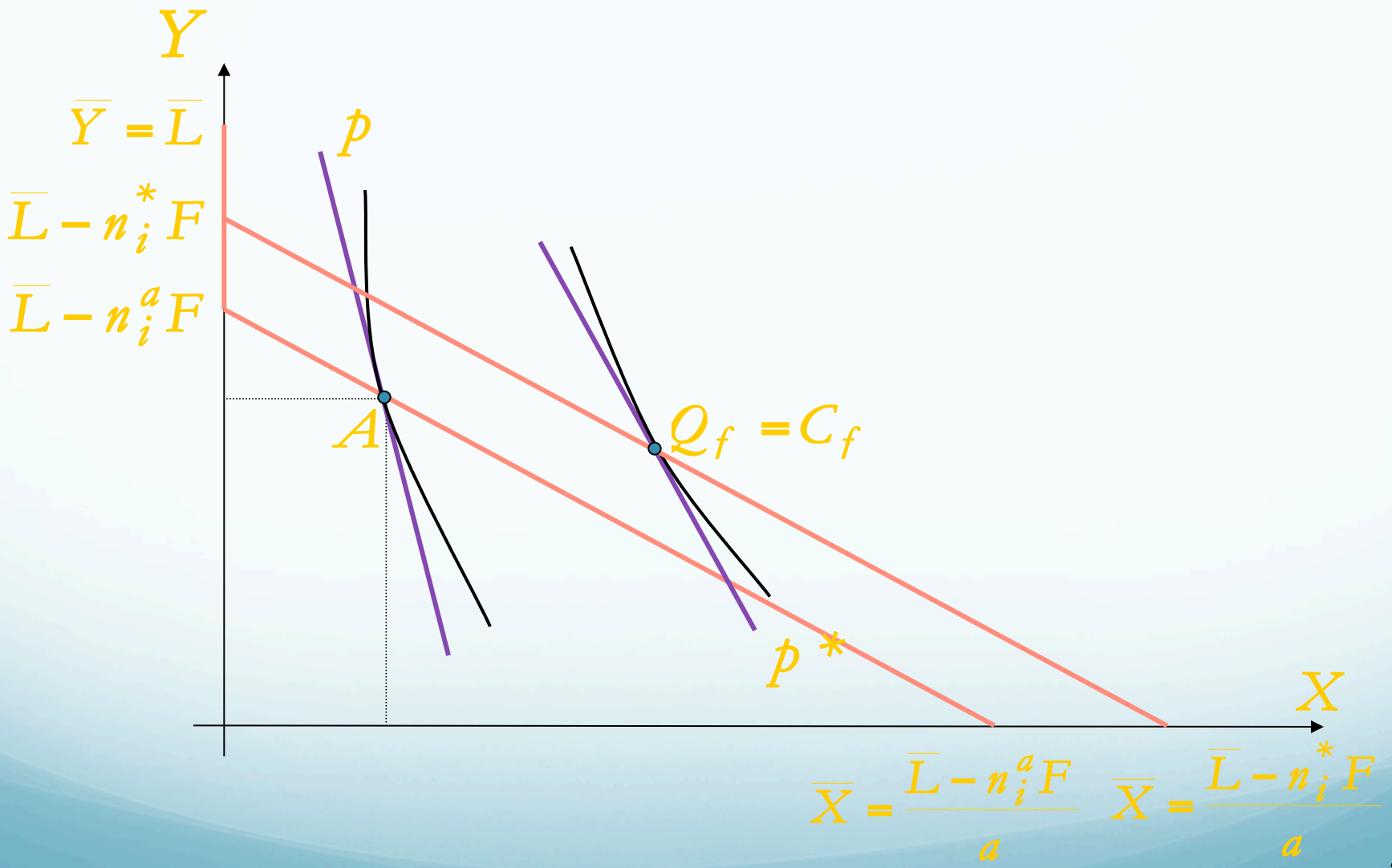
$$\frac{wL_X}{X} = p_Y \frac{\bar{L} - L_Y}{X} = p_Y \frac{\bar{L} - Y}{X}$$

- Example 2 (long-run): exogenous firm exit
  - assumptions
    - ✓ exogenous initial number of firms
    - ✓ free trade reduces the local number of firms, but competition increases at the world level

$$n_i^* < n_i^a < n_1^* + n_2^*$$

    - ✓ identical countries

- **Figure: Internal Economies of Scale and Trade Liberalization, Changes in Firm Numbers**



⇒ to the direct and indirect pro-competitive gains, add now efficiency gains due to the decrease in the number of firms

- Note:
  - no endogenous reasons for firm exit in the short-run case
  - multiple equilibria on the identity of the exiting firms
  - if not identical countries, the smaller demand / larger firm number / more productive country gains more than the other one: see 1.3.2 and next chapter

- Example 3 (long-run): example 2 + endogenous exit
  - assumptions:

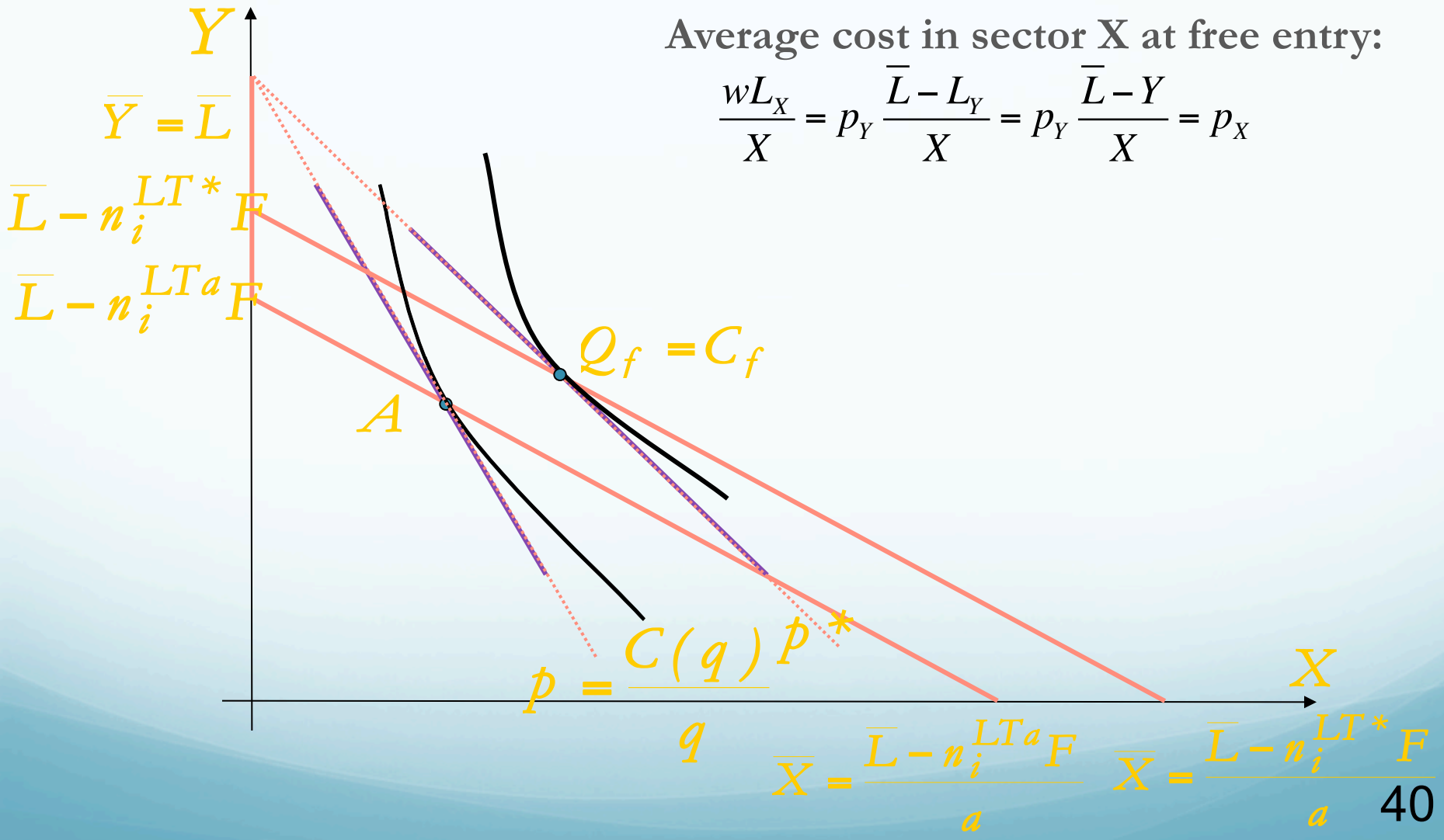
✓ free entry assumption: firms enter and exit until profits are zero

⇔ price = average cost

✓ free trade increases competition at the world level and thus reduces the number of firms in each country

✓ identical countries with the same number of firms in equilibrium under both autarky and free trade

- **Figure: Internal Economies of Scale and Trade Liberalization, Endogenous Changes in the Number of Firms**



Average cost in sector X at free entry:

$$\frac{wL_X}{X} = p_Y \frac{\bar{L} - L_Y}{X} = p_Y \frac{\bar{L} - Y}{X} = p_X$$

- Production at A and Q=C is higher than on the previous Figure, since the number of firms is lower

- Note:
  - same pro-competitive and efficiency gains than in the previous case, but endogenous firm exit, and more optimal situation thanks to the zero profit condition
  - unequal country gains if country have different productivity or size
    - ✓ the smaller / more productive country gains more: see next chapter
  - indeterminacy of exiting firms in equilibrium
  - first-best = unique firm pricing at marginal cost
    - ✓ because of negative profits, the central planner has to subsidize the unique firm (optimal if lump-sum transfers are possible)
    - ✓ the country where the firm is localized gains more: transfers across countries are necessary

- **3. Gains from Increased Variety**

- When consumers value the diversity of goods in their utility function:

⇒ free trade implies a higher number of firms, which may imply a higher number of varieties available

⇒ new gains from free trade

- See the monopolistic competition model...

- **4. Conclusions**

- **These new gains from trade apply to firms if the goods are used as inputs.**

⇒ input users benefit from pro-competitive effects (direct and indirect), global efficiency gains, gains from firm exit, love for diversity gains due to free trade…

⇒ some of these gains are passed onto consumers in the form of lower prices

- Some indeterminacy may exist under the open economy equilibrium as regards which country produces what, and thus which country gains more from free trade
  - problem of equilibrium selection
  - "history matters"?
- Perfect and imperfect competition models are complementary explanations to trade and to the effects of trade liberalization
- References

Markusen, J., J. Melvin, W. Kaempfer, and K. Maskus, 1995. *International Trade - Theory and Evidence*, **Mc Graw-Hill. Chapters 11 and 12.**