International Trade:
Theory and Policy

Lecture 9

November, 2016

Instructor: Natalia Davidson

Lecture is prepared by Prof. Sergey Kadochnikov, Natalia Davidson

Topic 7. International trade under increasing returns to scale and imperfect competition on the markets.

Lecture 9

7.1. New approaches to the analysis of international trade under increasing returns to scale and imperfect competition.

General equilibrium in closed economy under increasing returns to scale and imperfect competition on the markets.

7.2. International trade under increasing returns to scale:

- external economies to scale;

-internal economies to scale.

7.3. A model with **external economies to scale**.

Lecture 10

7.4. **Monopolistic competition**, returns to scale and international trade.

7.5. Models with **heterogeneous firms** (including the model by Marc Melitz (2003); models of choice between export and foreign direct investment).

7.6. Dumping. The structure and normative effects of international trade in 'large' economy under imperfect competition on the markets: the case of **international oligopoly**.

(7.1.) Contemporary issues of international trade: increasing returns to scale and imperfect competition - 1

- **Which trends of the world economy can't be explained using the concept of comparative advantages?**

  - Large volumes of international trade between very similar countries (for example, inside the group of industrially developed countries: USA, Canada, Japan, European Union countries);

  - Large volumes of intra-industry trade (for example, automobile industry)

Indicators of comparative economic advantages $RCAI_{ij}$ (1) for USA, 2003-2007

Revealed comparative advantage index (method 1): $RCAI_{ij}\ (1) = (Exp_{ij}/Exp_{wj}) / (Exp_i/Exp_w)$

Export Rank	SITC*	Good Category	$RCAI_{ij}$ (1)
1.	792	Airplanes	4.33
2.	781	**Automobiles**	0.71
3.	776	Electronics	1.5
4.	931	Other transactions and goods	0.98
5.	334	Oil	0.49
Import Rank	**SITC**	**Good Category**	**$RCAI_{ij}$ (1)**
1.	333	Crude oil	0.4
2.	781	**Automobiles**	0.71
3.	334	Oil	0.49
4.	752	Automatic data-processing machines	1.04
5.	931	Other transactions and goods	0.99

Source: *United Nations Statistical Division http://data.un.org*

* Standard international trade classification

(7.1.) Contemporary issues of international trade: increasing returns to scale and imperfect competition - 2

- International trade in case when countries have no comparative advantages (no difference in equilibrium prices in autarky);
- Imperfect competition on the markets (monopoly, oligopoly, monopolistic competition) – its impact on the international trade;
- The level of product differentiation * (non-homogeneity) – its impact on the international trade;
- Increasing returns to scale in production – its impact on the international trade.

* What is product differentiation?

(7.1.) Researchers in the field of International Economics

- **P. Krugman**, Princeton University, USA;
- **E. Helpman**, MIT, USA; Jerusalem University, Israel;
- **G. Grossman**, USA;
- **W. Ethier**, University of Pennsylvania, USA;
- **J. Brander**, Canada;
- **B. Spencer**, Canada;
- **J. Markusen**, USA;
- **E. Venables**, London School of Economics, Great Britain;
- **A. Dixit**, USA;
- etc.

(7.1.) What are trade volumes between relatively similar countries?

Volumes of export between developed and developing countries (% from total trade volume between these countries, 1985)

Export	Export	
	From developed countries	From developing countries
Into developed countries	59%	18%
Into developing countries	16%	7%

What kind of trade is likely to occur between developed countries?

(7.1.) What are the volumes of intra-industry trade?

Grubel-Lloyd index of intra-industry trade

(Grubel and Lloyd, 1975)

$$\Gamma_s^{ij} = 1 - \frac{\left| X_s^{ij} - M_s^{ij} \right|}{X_s^{ij} + M_s^{ij}}$$

i, j - countries

s – sectors

X_s^{ij} - export of sector s from country i to country j

M_s^{ij} - import of sector s to country i from country j

What are the values of index if there is no intra-industry trade? When there is intra-ind. trade?

(7.1.) What are the volumes of intra-industry trade?

Grubel-Lloyd index of intra-industry trade

(Grubel and Lloyd, 1975)

$$\Gamma_s^{ij} = 1 - \frac{\left| X_s^{ij} - M_s^{ij} \right|}{X_s^{ij} + M_s^{ij}}$$

i, j - countries

s – sectors

X_s^{ij} - export of sector s from country i to country j

M_s^{ij} - import of sector s to country i from country j

The index is equal to 0, when there is no intra-industry trade
(there is only export or only import in some sector)

The index is equal to 1, when intra-industry trade is balanced
(export is equal to import in a sector)

(7.1.) Intra-industry trade

Grubel-Lloyd index: different aggregation levels

	China		
year	3-digit 237 sectors	2-digit 67 sectors	1-digit 10 sectors
1980	0.20	0.30	0.63
1985	0.20	0.29	0.44
1990	0.36	0.45	0.60
1995	0.38	0.48	0.67
2000	0.39	0.48	0.57
2005	0.42	0.49	0.58

Source: calculations by Charles van Marrewijk, Erasmus University Rotterdam based on data by United Nations (2006) COMTRADE , World Integrated Trade Solution (WITS), Geneva (Princeton University Press), http://www2.econ.uu.nl/users/marrewijk/pdf/marrewijk/Intra%20Industry%20Trade.pdf

(7.1.) General equilibrium of closed economy under increasing returns to scale and imperfect competition in the markets

- **The concept of <u>distortions</u> in production sectors and on the markets:**

  - Case 1: the producers' revenue is not maximized under the given prices;
  - Case 2: consumers' utility is not maximized under the given prices;
  - Case 3: the absence of unique market equilibrium;

  Overall: price signals are not valid when there are distortions;
  'quantitative' signals become important

What other distortions are usually present in the economy?

(7.1.) General equilibrium of closed economy under increasing returns to scale and imperfect competition in the markets

- **Specific features of general equilibrium in closed economy (autarky) under imperfect competition on one of the markets: graphical illustration**

  ***Example*: <u>monopoly</u> on one of the markets**

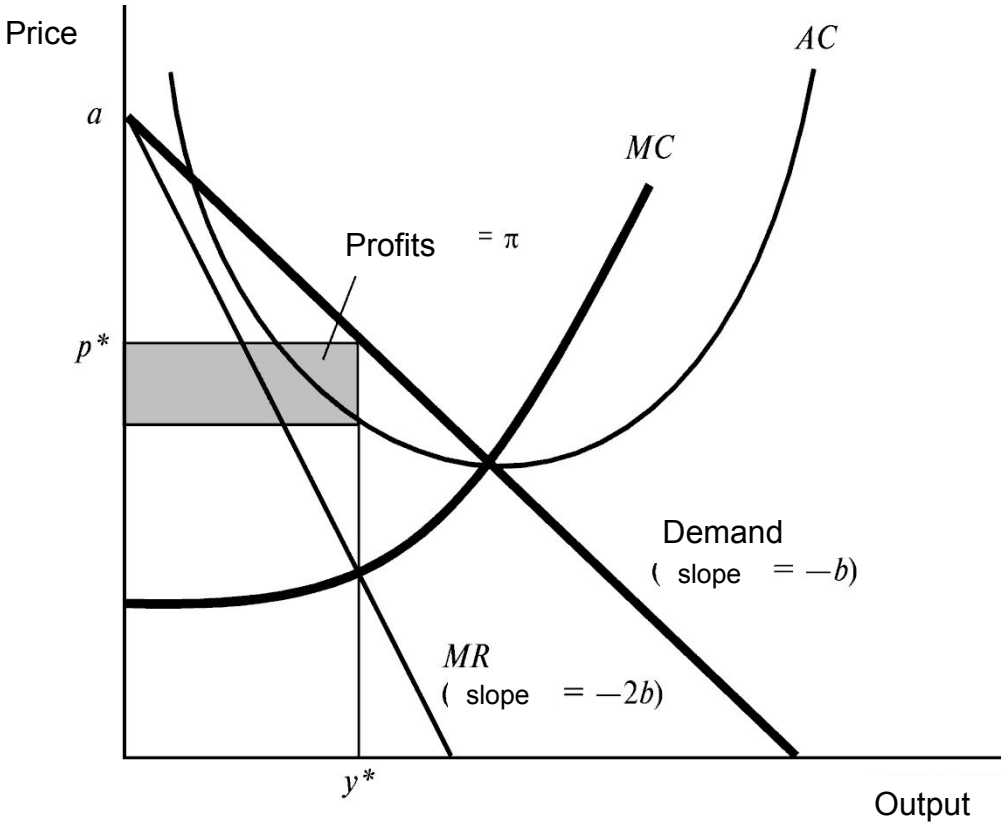
  - The diagram of partial equilibrium on the monopolistic market
  - The diagram of production possibility curve and indifference curves

---

See Вэриан (1997), гл. 23 «Монополия» / H. Varian. A chapter on Monopoly.

Krugman, P., Obstfeld, M. and M. Melitz (2011) International Economics: theory and policy (9th edition). – Pearson. – Ch. 8

(7.1.) General equilibrium of closed economy under increasing returns to scale and imperfect competition in the markets



Suppose that a monopolist faces a linear demand function:

$p(y) = a - by.$

Then the total revenue function will look like this:

$r(y) = p(y)y = ay - by^2,$

and a marginal revenue function will be:

$MR(y) = a - 2by.$

Diagram of partial equilibrium on the monopolistic market. A monopoly with linear demand function. Profit maximizing output of a monopolist corresponds to a point, where marginal revenue is equal to marginal costs.

Source: Вэриан (1997), гл. 23 «Монополия», стр. 448 / H. Varian. A chapter on Monopoly.

(7.2) Returns to scale and international trade. External and internal returns to scale.

The models of comparative advantage: constant returns to scale

The models with monopolistic competition: increasing returns to scale (internal)

Internal returns to scale: returns to the size of a firm

External economies of scale/agglomeration effects: on the industry or city level

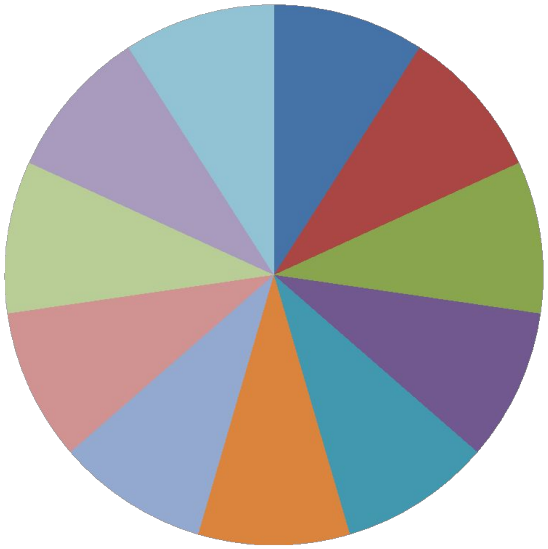
Localization effects *(эффекты от специализации/локализации)* – generated by firms belonging to the same industry and located closely (Alfred Marshall, 1920)

Diversity effects *(эффекты от разнообразия/диверсификации)* – generated by firms belonging to different industries and located closely (Jane Jacobs, 1969)

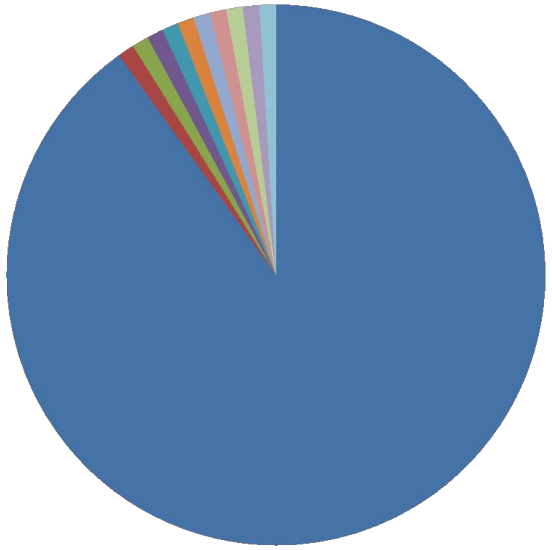
Krugman, P., Obstfeld, M. and M. Melitz (2011) International Economics: theory and policy (9th edition). – Pearson. – Ch. 7-8

(7.2) Agglomeration has two types in the industrial dimension

Diversity:
variety of industries in a city



Localization:
one industry prevails



Each segment on the graph represents a share of a particular industry in a city

(7.2) Microfoundations of external economies of scale - sources of agglomeration economies

Based on classification by Alfred Marshall (*A. Marshall. Principles of Economics. London: MacMillan, 1920 - in Duranton, Puga, 2004)*

- **Sharing**/Specialized suppliers *(совместное использование ресурсов)* – firms reduce their cost by sharing common resource (infrastructure)
- **Matching**/Labour market pooling *(поиск работников на рынке труда)*– firms can find exactly what they need (workers)
- **Learning**/Knowledge spillovers *(обмен знаниями/технологиями)* – firms use knowledge of others "for free"

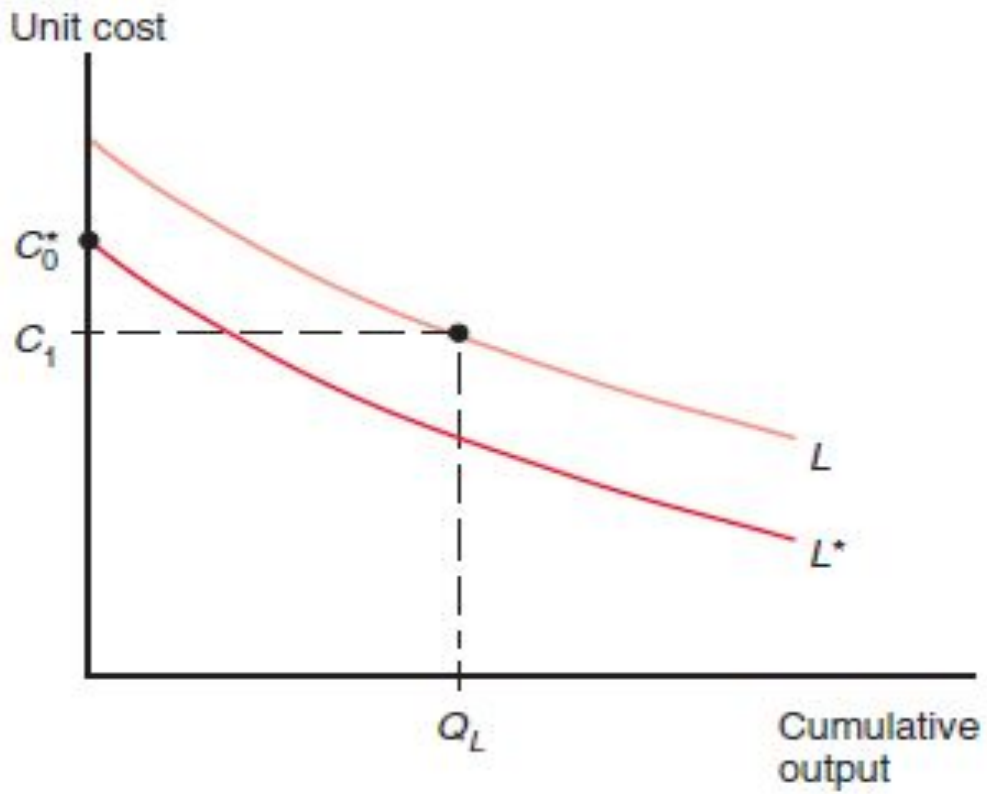
Case study: Annalee Saxenian. Regional Advantage. Cambridge: Harvard University Press, 1994. [Comparison of California's Silicon Valley and Boston's Route 128.]

Krugman, P., Obstfeld, M. and M. Melitz (2011) International Economics: theory and policy (9th edition). – Pearson. – Ch. 7.

(7.2) Dynamic increasing returns and *external* returns

The Learning Curve

The learning curve shows that unit cost is lower the greater the cumulative output of a country's industry to date. A country that has extensive experience in an industry (L) may have lower unit cost than a country with little or no experience, even if that second country's learning curve (L^*) is lower—for example, because of lower wages.



Krugman, P., Obstfeld, M. and M. Melitz (2011) International Economics: theory and policy (9th edition). Pearson. – Ch. 7, p. 149

(7.2) External returns to scale

Life cycle theory (Vernon, 1960)

Young industries: benefit from diversity

Mature industries: benefit from localization (specialization)

Empirical evidence

Doubling of city size

-> increase in productivity by 3-8% (US data, Rosenthal and Strange, 2004)

'Centre' vs. 'periphery'

-> increase in productivity by 20-50% (Okubo, Tomiura, 2010)

Evidence for Russia (based on data for 2005-2006)

Doubling city size -> increase in productivity by 5% ('Predpriyatiya i rynki', 2010)

Plants in urban agglomerations have 17-21% higher labor productivity (Gonchar and Ratnikova, 2014).

Some literature: Michael Porter. The Competitive Advantage of Nations. New York: Free Press, 1990. ['A best-selling book that explains national success as the results of self-reinforcing industrial clusters, i.e., external economies.']

(7.3.) International trade under *external* economies to scale: structure of the model

International trade and economic geography:
trade between countries *and* between regions within a country

TABLE 7-2 Some Examples of Tradable and Nontradable Industries

Tradable Industries	Nontradable Industries
Motion pictures	Newspaper publishers
Securities, commodities, etc.	Savings institutions
Scientific research	Veterinary services

Source: J. Bradford Jensen and Lori. G. Kletzer, "Tradable Services: Understanding the Scope and Impact of Services Outsourcing," in Lael Brainard and Susan M. Collins, eds., *Brookings Trade Forum 2005: Offshoring White Collar Work* (Washington, D.C.: Brookings Institution, 2005), pp. 75–116.

Examples of specialization: the City of London, Wall Street (New York), Hollywood (Los Angeles), …

Krugman, P., Obstfeld, M. and M. Melitz (2011) International Economics: theory and policy (9th edition). Pearson. – Ch. 7, p. 150

(7.3.) International trade under *external* economies to scale: structure of the model

- ***External* and *internal* economies to scale and their impact on the market structure;**

  Structure of the world economy:

  - 2 countries (h, f);
  - All final goods are tradable;
  - Production factors are immobile between the countries.

- **Structure of the production sector:**
  - 2 industries that produce 2 final homogeneous goods (X, Y);
  - 2 homogeneous, non-specific resources (K, L), mobile between industries;
  - Countries do not differ in absolute endowment of production factors;
  - Specific features of the production technology:
    - *External* economies to scale;
    - Technologies may differ among the industries but not among the countries; the technologies in production of good X and good Y are characterized by the same levels of IRS.

- **Structure of the household sector :**
  - Tastes are identical and homogeneous among the households and the countries.

- **Market structure:**
  - Perfect competition on the markets of production factors and of final goods.

(7.3.) The model of International trade under *external* economies to scale: exogenous parameters

(1) Exogenous parameters of the model:

- Production technologies - production functions:
  - $X_h = f_{xh}(Q_{xh}, K_{xh}, L_{xh}) = Q_{xh}^{\lambda} K_{xh}^{\alpha} L_{xh}^{(1-\alpha)}$; $Y_h = f_{yh}(Q_{yh}, K_{yh}, L_{yh}) = Q_{yh}^{\mu} K_{xh}^{\beta} L_{xh}^{(1-\beta)}$;
  - $X_f = f_{xf}(Q_{xf}, K_{xf}, L_{xf}) = Q_{xf}^{\lambda} K_{xf}^{\alpha} L_{xf}^{(1-\alpha)}$; $Y_f = f_{yf}(Q_{yf}, K_{yf}, L_{yf}) = Q_{yf}^{\mu} K_{xf}^{\beta} L_{xf}^{(1-\beta)}$; where $\lambda = \mu > 1$, $\alpha = \beta$.
- Resource endowment in each economy: K_h, K_f, L_h, L_f;
- Preferences of representative household in each of the economies – utility functions:
  - $U_i = U_i(X_i, Y_i)$; $i = h, f$;
- Market structure on the final goods markets – perfect competition.
- Market structure on the resource market – perfect competition.

(7.3.) The model of International trade under *external* economies to scale: endogenous parameters

(2) Endogenous parameters of the model:

- Equilibrium production and consumption of final goods in closed economies – X_h^a, Y_h^a, X_f^a, Y_f^a;
- Equilibrium price ratios for final goods in closed economies – P_{xh}^a/P_{yh}^a, P_{xf}^a/P_{yf}^a;
- Equilibrium production of final goods in the open economy – X_{ph}^*, Y_{ph}^*, X_{pf}^*, Y_{pf}^*;
- Equilibrium consumption of final goods in the open economy – X_{ch}^*, Y_{ch}^*, X_{cf}^*, Y_{cf}^*;
- Import and export of the countries:
  - If $(X_c^*-X_p^*)>0$ or $(Y_c^*-Y_p^*)>0$ – the good is imported;
  - If $(X_c^*-X_p^*)<0$ or $(Y_c^*-Y_p^*)<0$ – the good is exported;
- Equilibrium world price ratio for final goods – P_x^*/P_y^*.

(7.3.) The model of International trade under *external* economies to scale: characteristics of general equilibrium

- **Characteristics of equilibrium conditions in closed economy:**
  - In each country, standard conditions of general equilibrium under perfect competition on the markets are the following:
    - Producer optimization: $MRT_h^a = P_{xh}^a / P_{yh}^a$, $MRT_f^a = P_{xf}^a / P_{yf}^a$;
    - Consumer optimization: $MRS_h^a = P_{xh}^a / P_{yh}^a$, $MRS_f^a = P_{xf}^a / P_{yf}^a$;
    - Market clearing in the final goods markets:
      $X_{ch}^a = X_{ph}^a$, $Y_{ch}^a = Y_{ph}^a$, $X_{cf}^a = X_{pf}^a$, $Y_{cf}^a = Y_{pf}^a$.
  - There is no difference in price ratios of closed economies (there is no comparative advantage): $P_{xf}^a / P_{yf}^a = P_{xh}^a / P_{yh}^a$.

Graphical illustration: ***Markusen, Ch. 12***

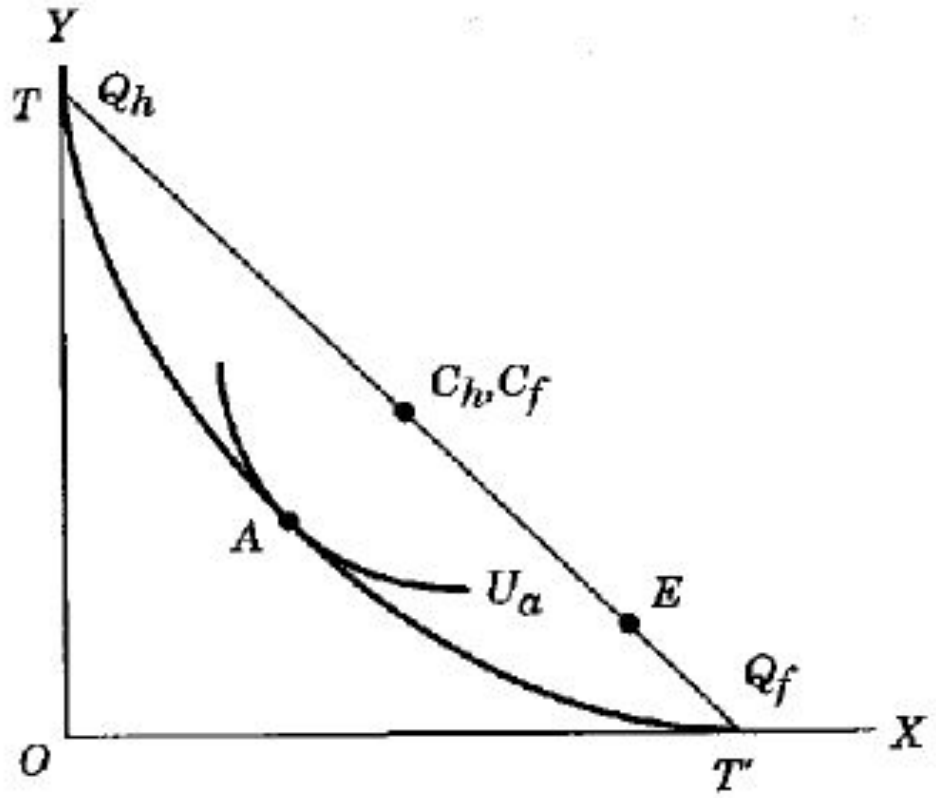
(7.3.) The model of International trade under *external* economies to scale: characteristics of general equilibrium

- **Characteristics of equilibrium conditions in open economy:**
  - Equilibrium conditions for economy f: $MRT_f^* \neq P_x^*/P_y^* = MRS_f^*$;
  - Equilibrium conditions for economy h: $MRT_h^* \neq P_x^*/P_y^* = MRS_h^*$;
  - Trade balance for two economies:
    - $(P_x^*/P_y^*)\,(X_{cf}^*-X_{pf}^*) + (Y_{cf}^*-Y_{pf}^*) = 0$;
    - $(P_x^*/P_y^*)\,(X_{ch}^*-X_{ph}^*) + (Y_{ch}^*-Y_{ph}^*) = 0$.
  - Market clearing on the markets of goods X and Y:
    - $X_{cf}^*+X_{ch}^* = X_{pf}^*+X_{ph}^*$;
    - $Y_{cf}^*+Y_{ch}^* = Y_{pf}^*+Y_{ph}^*$.

Graphical illustration: ***Markusen, Ch. 12***

How will the situation change if production technology in X is characterized by higher IRS, than production technology inY ($\lambda > \mu > 1$)?

(7.3.) The model of International trade under *external* economies to scale: characteristics of general equilibrium



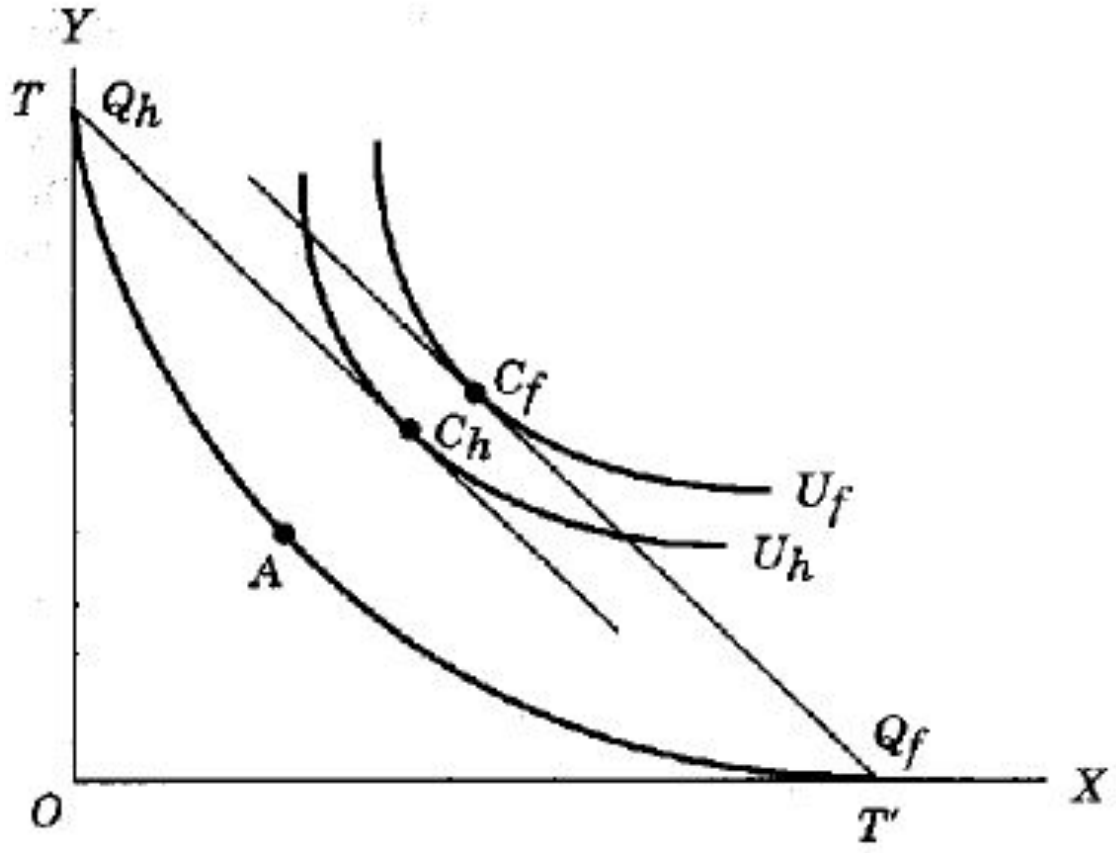
External economies.
Source: Markusen, Ch. 12, p. 176.

(7.3.) The model of International trade under *external* economies to scale: the main positive and normative results

- **Structure of international trade in the model:**
  - International trade exists in the absence of comparative advantages in the countries;
  - Each country fully specializes in production of one of the goods. A specific variant of specialization depends on the ‘first move advantage';
  - Inter-industry nature of international trade, the same as in the models with comparative advantages;
  - International trade occurs because of the opportunity of economies to scale under conditions of deep specialization and a broader market (world market).
- **The main normative results in the model:**
  - Each country gains from specialization under diminishing average production costs;
  - Gains from international trade can be uneven for trading countries. A country can lose from international trade.

Graphical illustration: ***Markusen, Ch. 12***

(7.3.) The model of International trade under *external* economies to scale: characteristics of general equilibrium



Uneven gains from trade.
Source: Markusen, Ch. 12, p. 177.

Why do uneven gains from trade arise?
In which case are gains from trade even (the same)? Draw the graph and explain.(*Hint:*

Homework

(1) Exercise sessions 5 and 6

(2) Think about topics for reports during exercise sessions; work on presentation of the paper.

Office hours: Friday 13:50 – 14:30, room 216.

E-mail: natalya.davidson@gmail.com (Наталья Борисовна Давидсон)

The next lecture

Continuation of topic 7:

Lecture 10

7.4. **Monopolistic competition**, returns to scale and international trade .

7.5. Models with **heterogeneous firms** (including the model by Marc Melitz (2003), models of choice between export and foreign direct investment).

7.6. Dumping. The structure and normative effects of international trade in ‘large’ economy under imperfect competition on the markets: the case of **international oligopoly**.