Introduction to NEG

Steven Brakman, Harry Garretsen
Regensburg, November 9, 2004

- Why study NEG?
- Why are traditional Regional Economics and International Trade theory models unsatisfactory
- Introduction in the core NEG model
- Some empirical Evidence

An Introduction to Geographical Economics

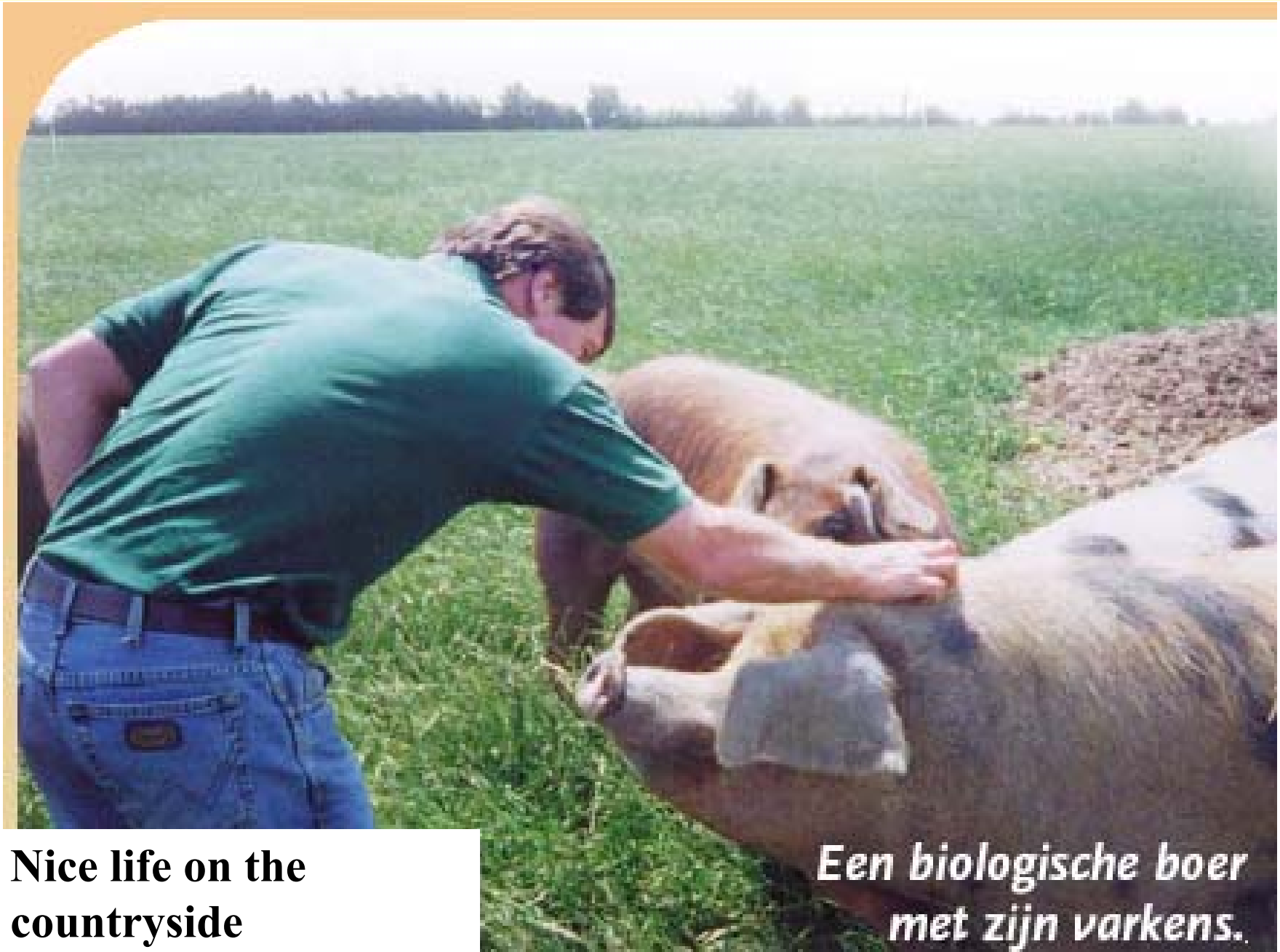
9 November Introduction

1. A first look at geography, trade, and development
- **Introduction**
- Clusters in the world economy
- Economic interaction
- Rapid change in population and production

2. Geography and economic theory
- Regional and urban economics
- Trade theory

Conclusions: Stylized Facts

Clusters: global, continental, and national

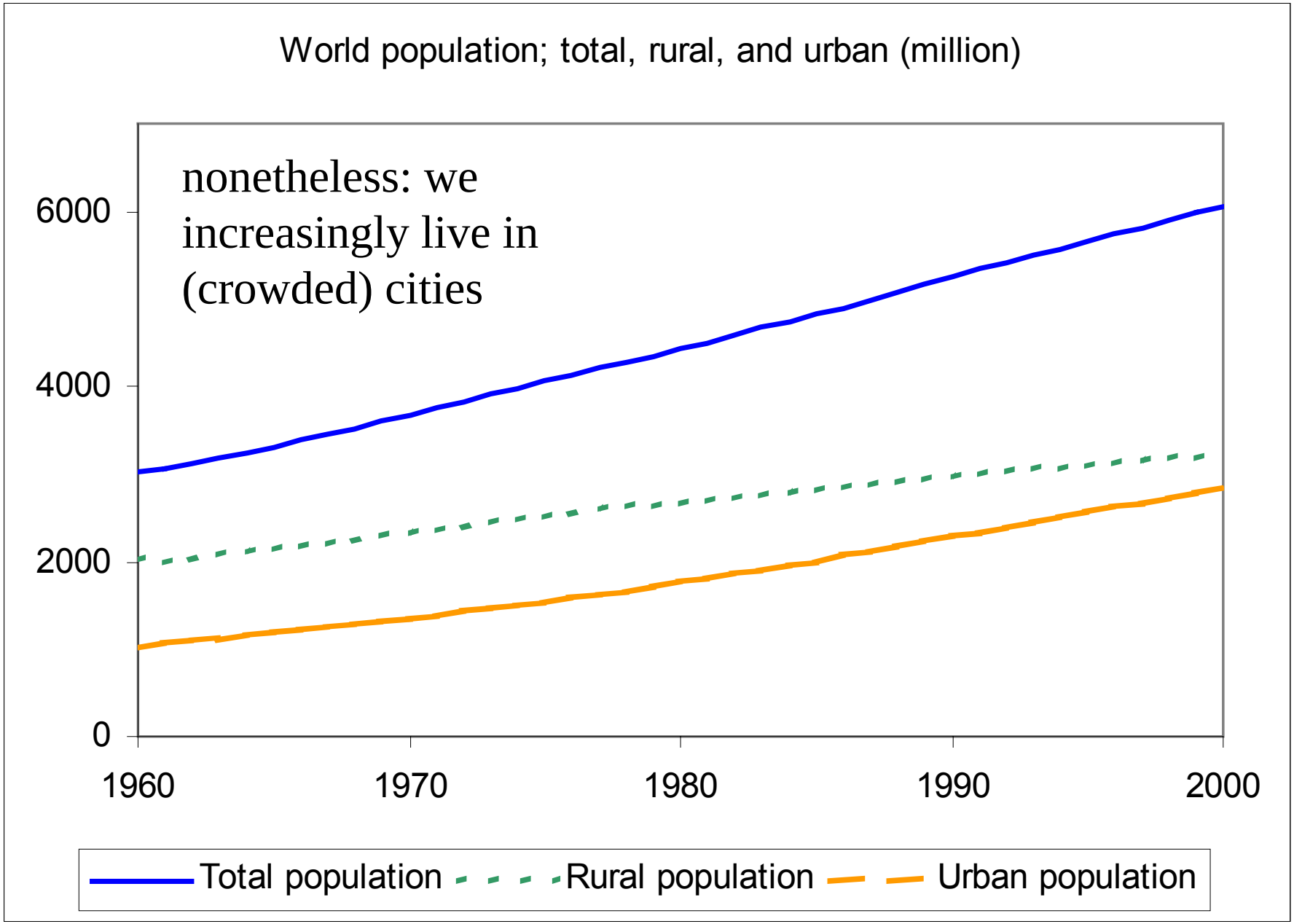


Nice life on the countryside

Clusters: global, continental, national

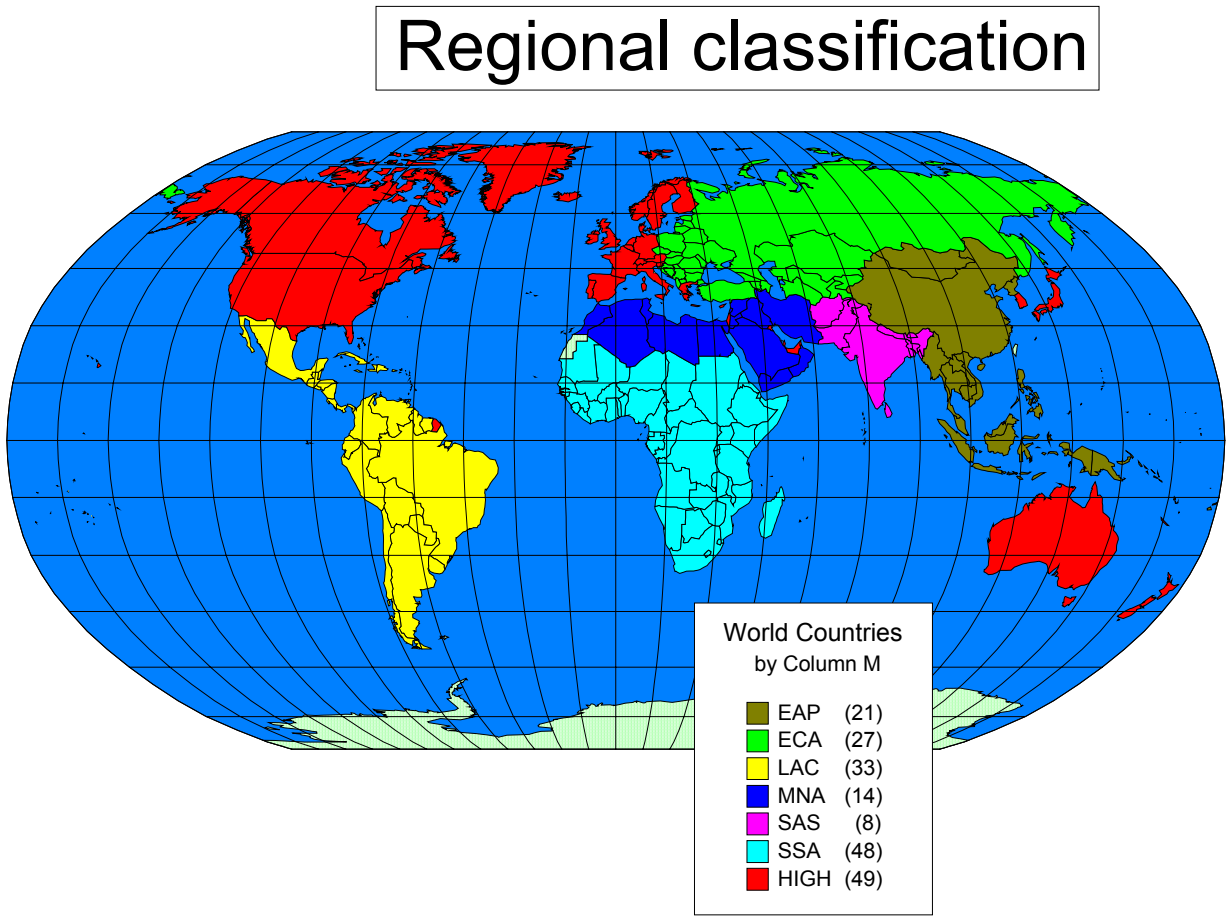
Crowded life in the city (Dordrecht, the Netherlands, 2002)

Clusters: global, continental, national



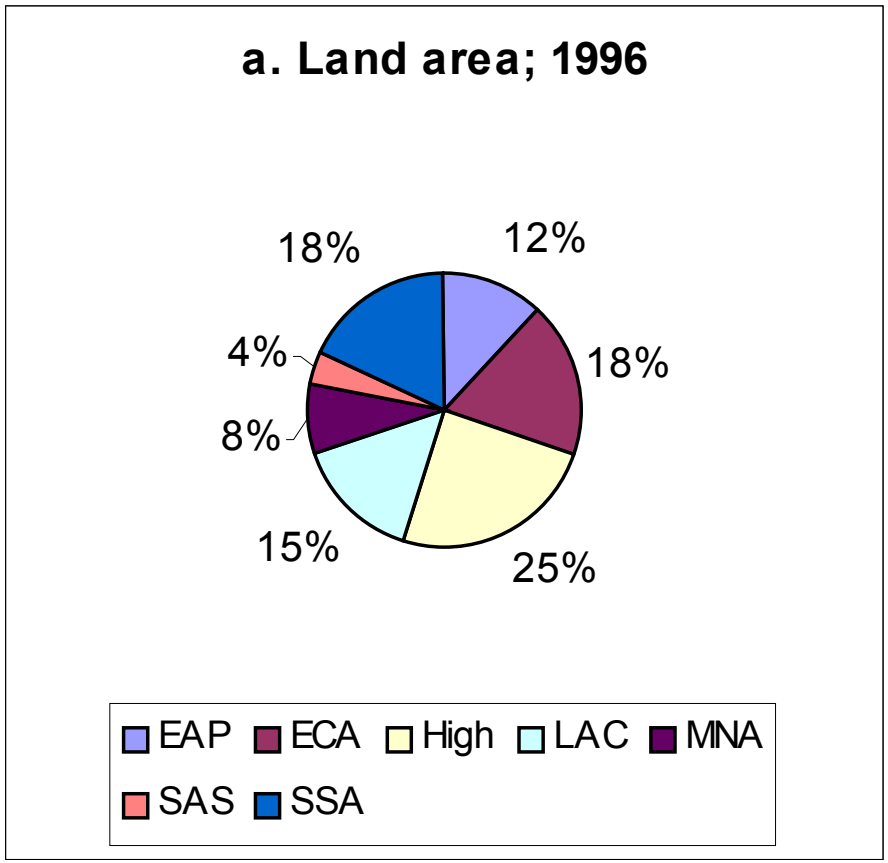
global

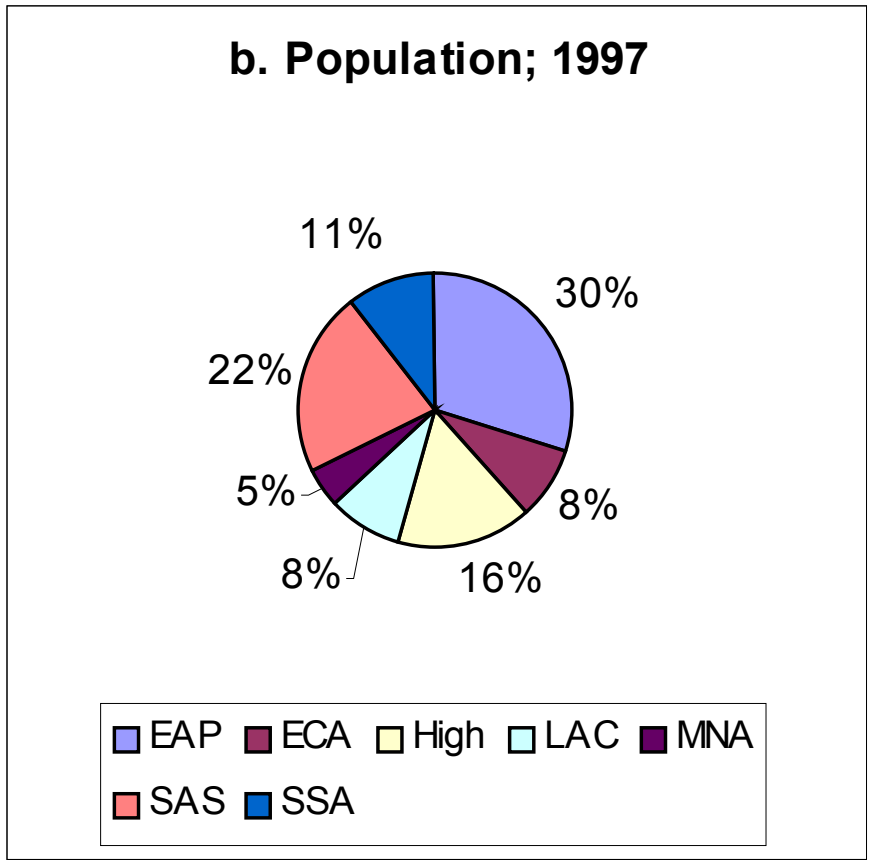
Figure 1.1 World Bank regional classification*



*EAP = East Asia and Pacific; ECA = Europe and Central Asia; LAC = Latin America and Caribbean; MNA = Middle East and North Africa; SAS = South Asia; SSA = Sub-Saharan Africa; HIGH = High-income countries.

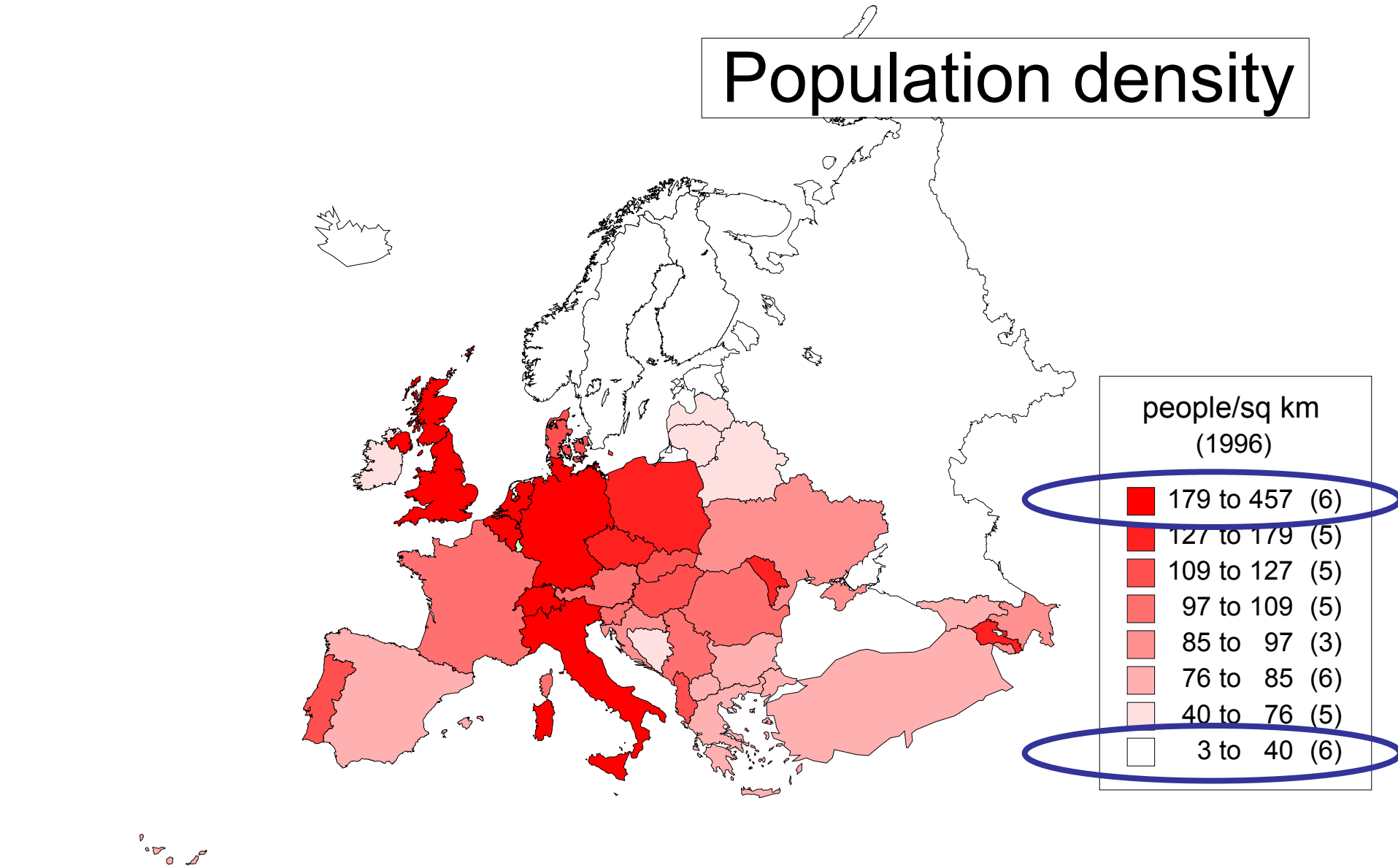
Figure 1.2 Life expectancy and regional shares of population, land, and income*





continental

Figure 1.4 Population density in Europe

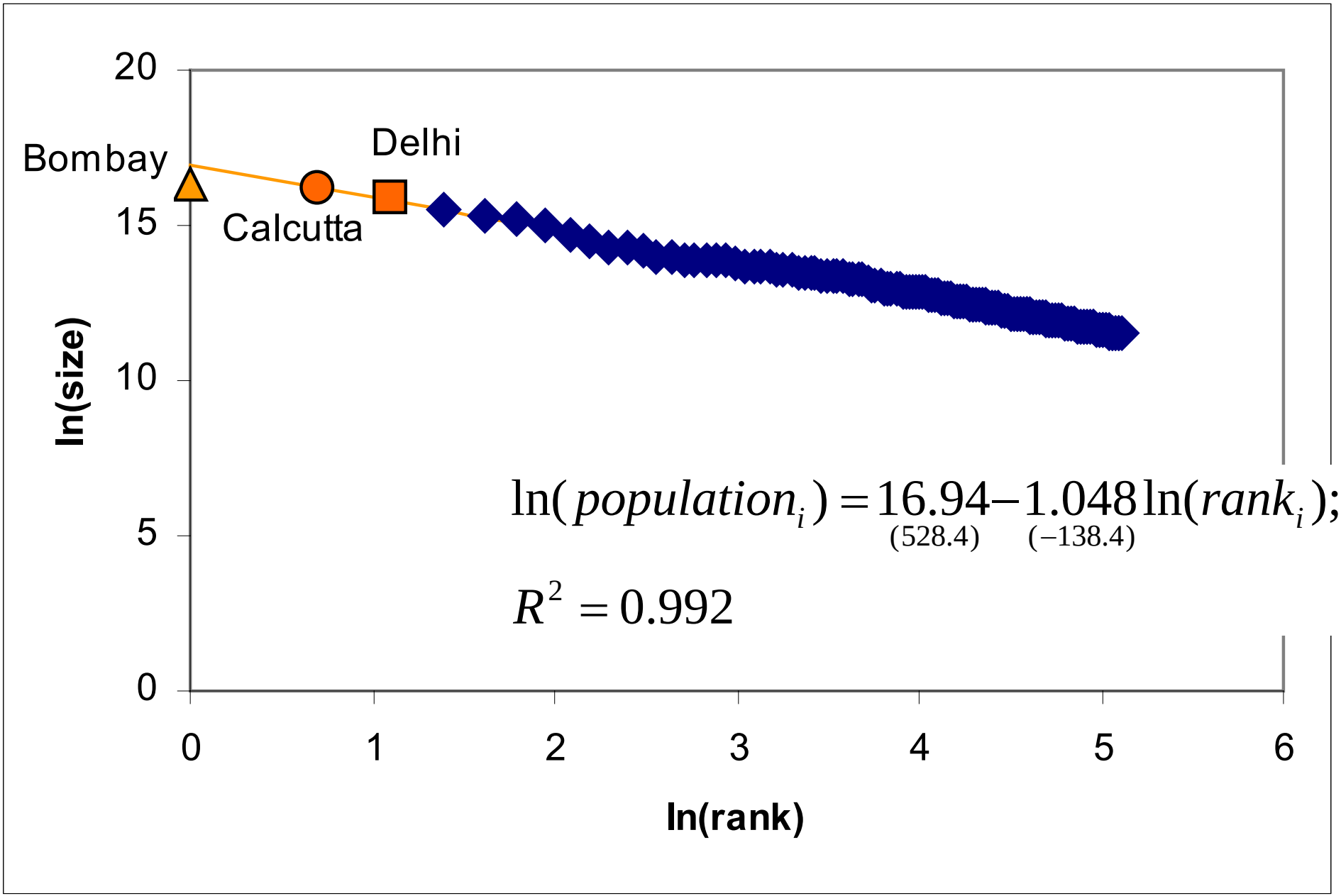


national

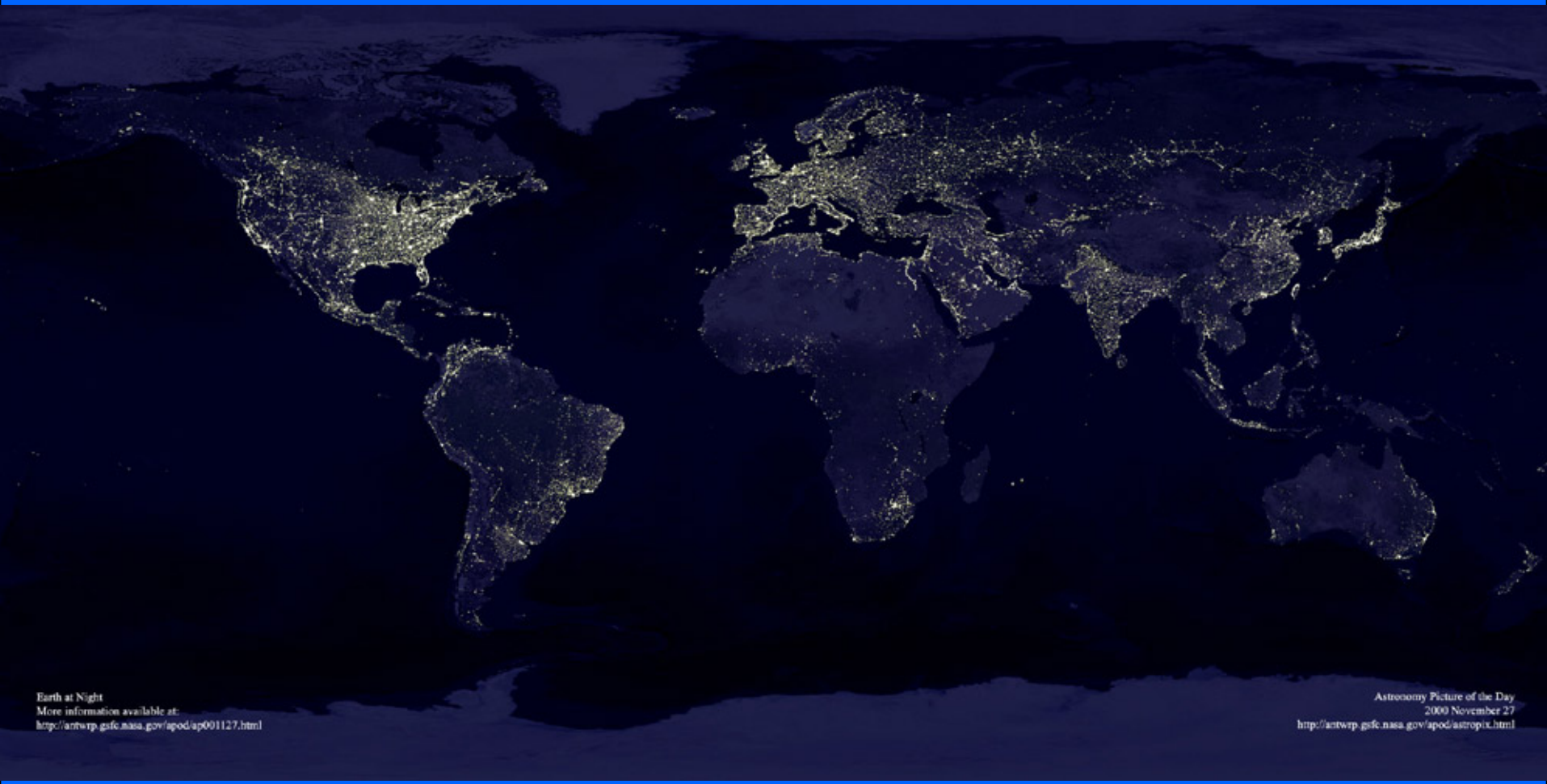
Table 1.1 Ten largest urban agglomerations in India*

Name	Population	Rank	Ln(rank)	Ln(population)
Bombay	12,596	1	0.0	16.3
Calcutta	11,022	2	0.7	16.2
Delhi	8,419	3	1.1	15.9
Madras	5,422	4	1.4	15.5
Hyderabad	4,344	5	1.6	15.3
Bangalore	4,130	6	1.8	15.2
Ahmedabad	3,312	7	1.9	15.0
Pune	2,494	8	2.1	14.7
Kanpur	2,030	9	2.2	14.5
Lucknow	1,669	10	2.3	14.3

Zipf's Law


20
15
10
5
0
Bombay
Delhi
Calcutta
ln(size)
0
1
2
3
4
5
6
ln(rank)
$\ln(population_i) = \underset{(528.4)}{16.94} - \underset{(-138.4)}{1.048}\ln(rank_i);$
$R^2 = 0.992$

Distribution of economic activity at night



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Chapter 1 A first look at geography, trade, and development
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- Rapid change in population and production

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- Trade theory

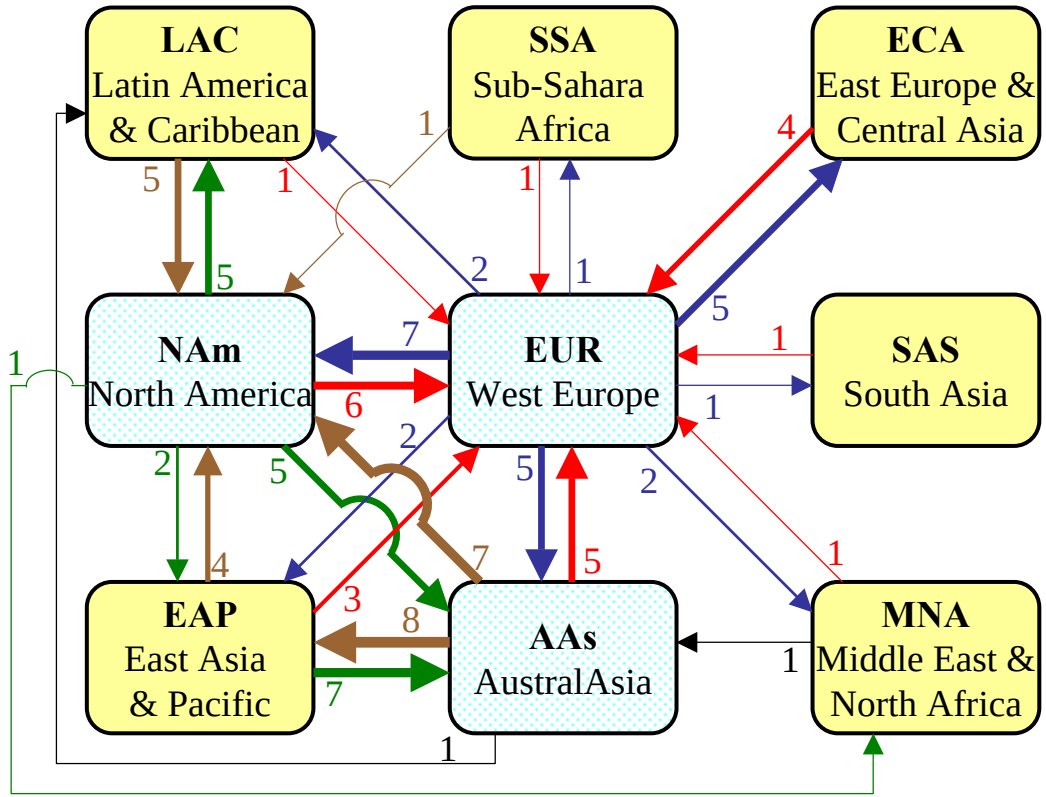
Conclusions

Inter-regional trade flows

developing region

high income region

The thickness of an arrow is proportional to the size of the trade flow (percent of total inter-regional trade flows, rounded to nearest integer)

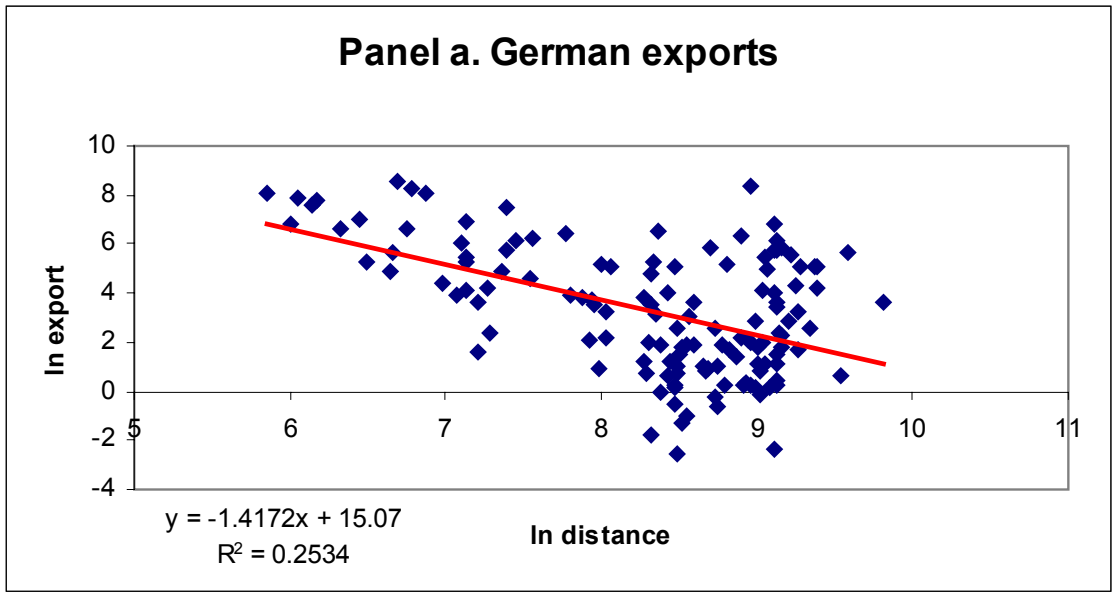


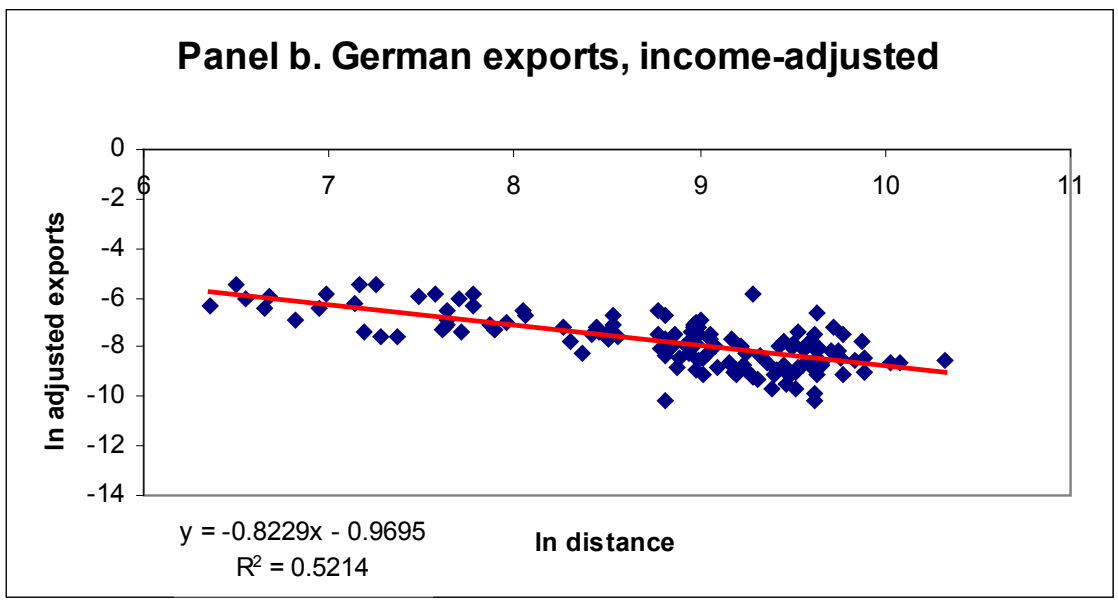
- the slide show of this figure depicts inter-regional trade flows in decreasing order of magnitude.
- 44 of the 72 inter-regional trade flows are smaller than 0.5 per cent; these are not shown in the picture.

Table 1.3 Germany; 15 largest export markets, 1998

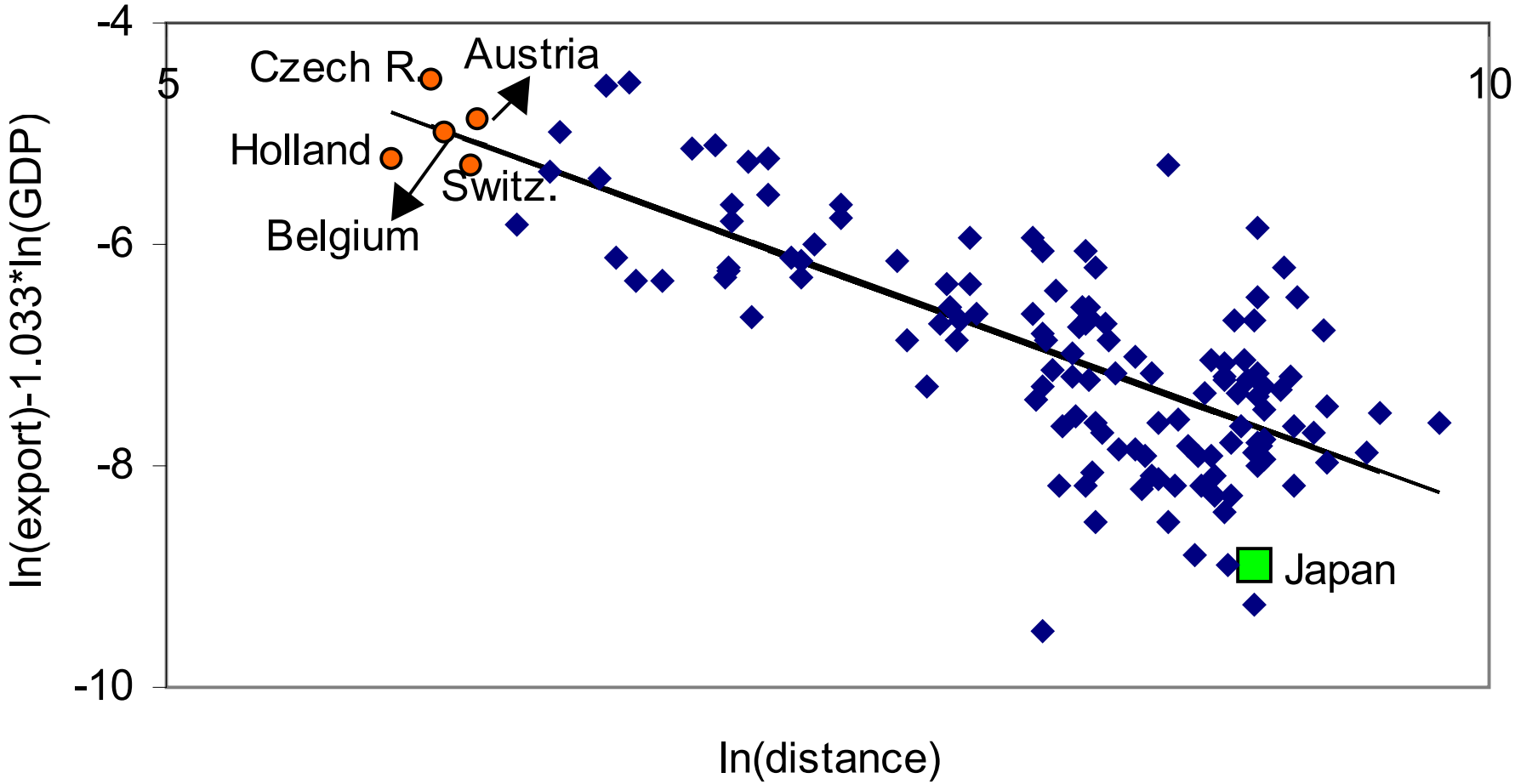
	Exports from Germany	GDP	Distance to Germany
1 France	60.3	1,427	809
2 United States	51.1	8,230	7,836
3 United Kingdom	46.3	1,357	876
4 Italy	40.1	1,172	963
5 Netherlands	38.1	382	349
6 Belgium[#]	30.9	248	425
7 Austria	29.5	212	482
8 Switzerland	24.3	264	468
9 Spain	21.9	553	1,632
10 Poland	13.7	159	632
11 Sweden	12.5	226	1,259
12 Czech Republic	10.7	56	404

Figure 1.7 German exports and distance, 1998 monthly average





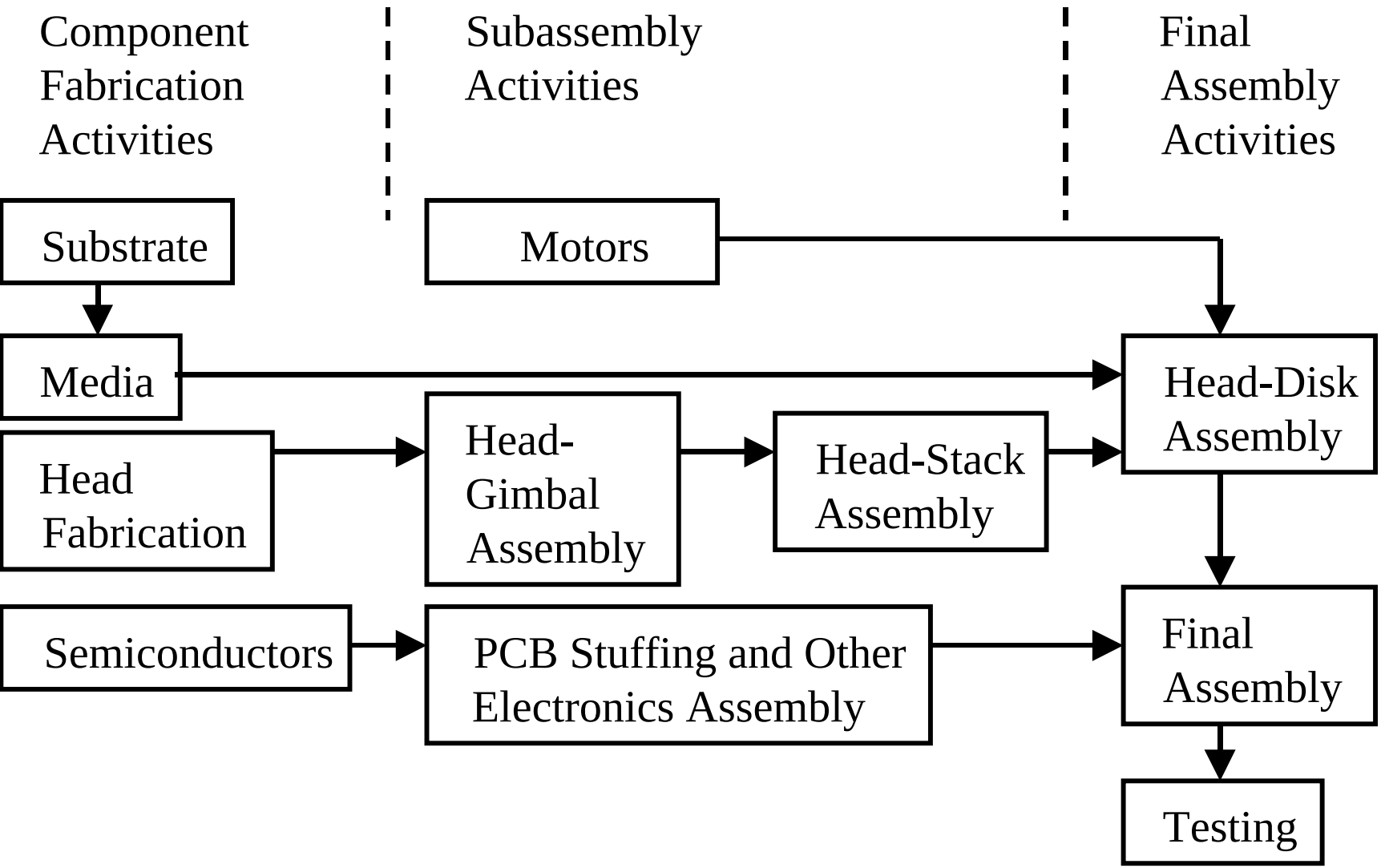
Gravity equation



$$\ln(export_i) = \underset{(-0.40)}{0.281} + \underset{(34.86)}{1.033}\ln(GDP_i) - \underset{(-12.77)}{0.869}\ln(distance_i)$$

$$R^2 = 0.926$$

Figure 1.6 The Hard Disk Drive value chain*



*Simplified version of Gourevitch et al. (2 000), Figure 1.

Table 1.2 Hard Disk Drives; Indicators of nationality of production*

Measure#	US	Japan	S.E. Asia	Other Asia	Europe	Other
Nationality of firm	88.4	9.4	0	2.2	0	0
Final assembly	4.6	15.5	64.2	5.7	10.0	0
Employment	19.3	8.3	44.0	17.1	4.7	6.5
Wages paid	39.5	29.7	12.9	3.3	8.5	6.1

*Source: Gourevitch et al. (2000), Table 2 (data for 1995). All numbers as percentage of world total.

Nationality of firm (% of unit output); location of final assembly; employment in value chain; and wages paid in value chain, respectively.

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- Trade theory
- Growth and development

Conclusions

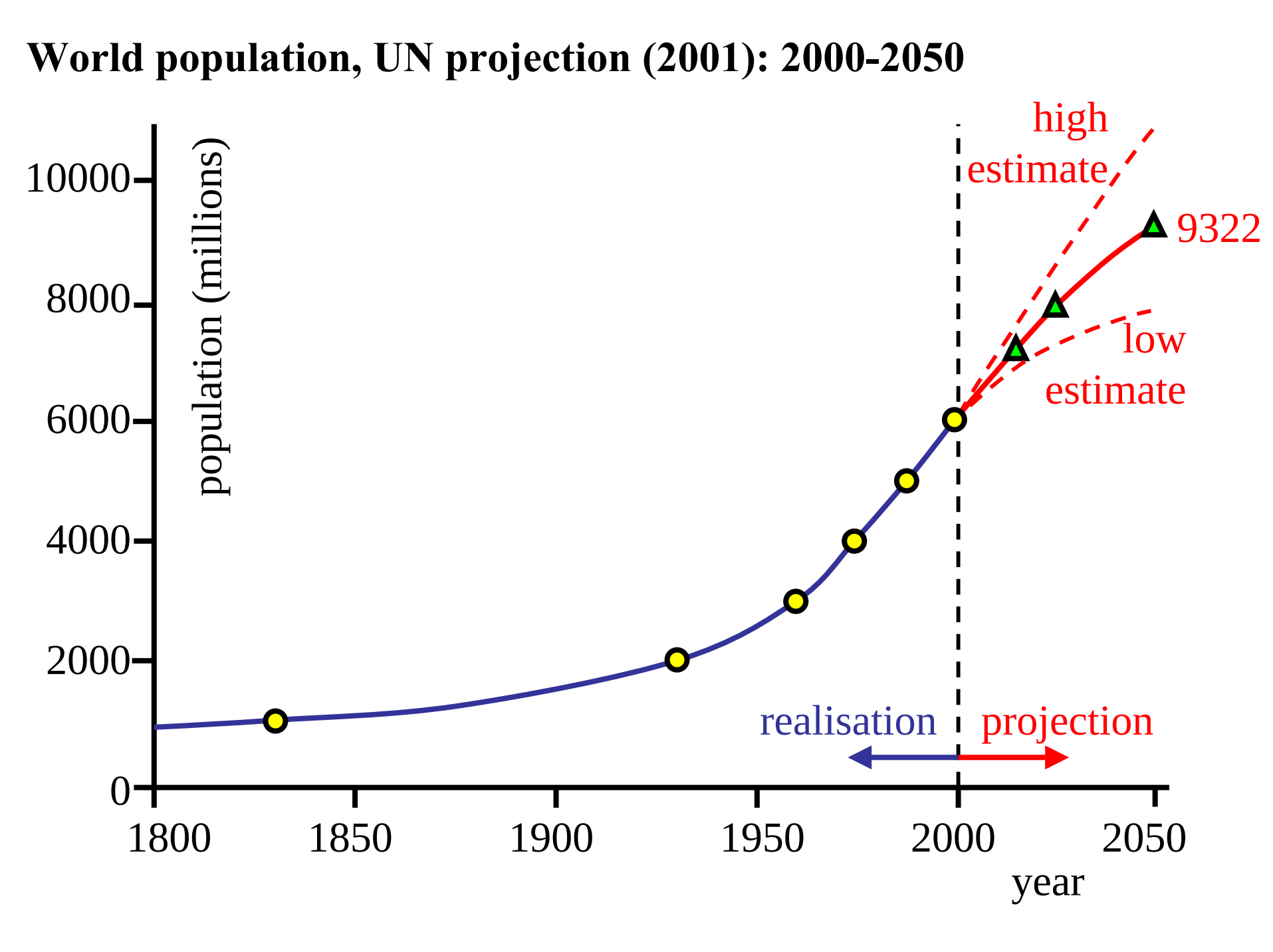
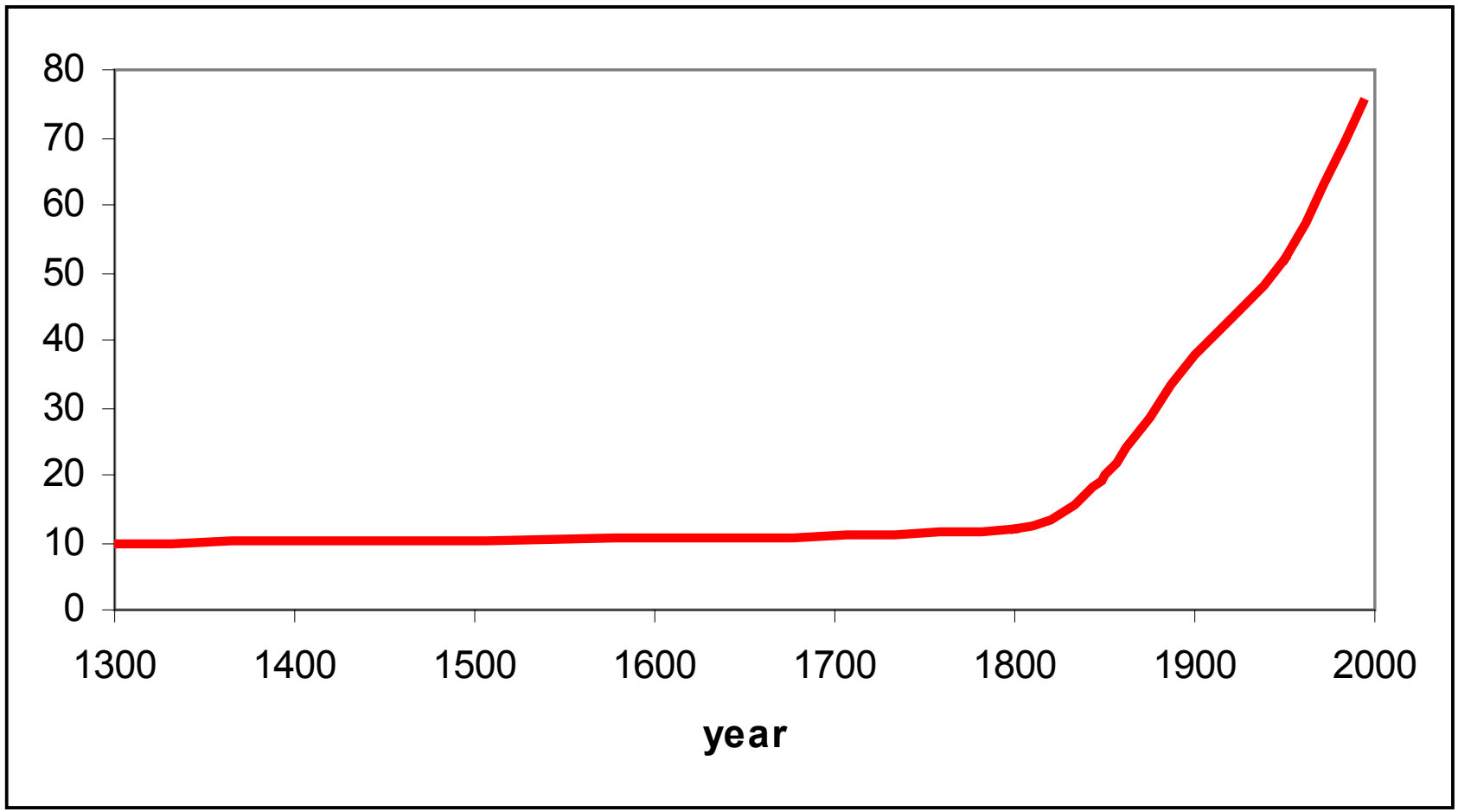

World population, UN projection (2001): 2000-2050
high
estimate
9322
low
estimate
population (millions)
10000
8000
6000
4000
2000
0
realisation
projection
1800
1850
1900
1950
2000
2050
year

Figure 1.8 Share of urban population in Europe*



*Data source: Huriot and Thisse (2000, p. ix).

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Introduction

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- **Regional and urban economics**
- Trade theory

Conclusions

An Introduction to Geographical Economics

- Regional economics

structural modeling in neo-classical tradition; regions/cities

- Urban economics

structural modeling in neo-classical tradition; cities, newer

- Economic geography

Eclectic approach/heterodox economics; emphasis on empirics, outside influences (sociology, political science, regulation theory)

Roots in German tradition: von Thuenen, Christaller, Weber, Loesch

briefly discuss
- von Thuenen; flat plane, city in the middle
- central place system; flat plane, where cities?

common feature: no endogenous explanation of size and location

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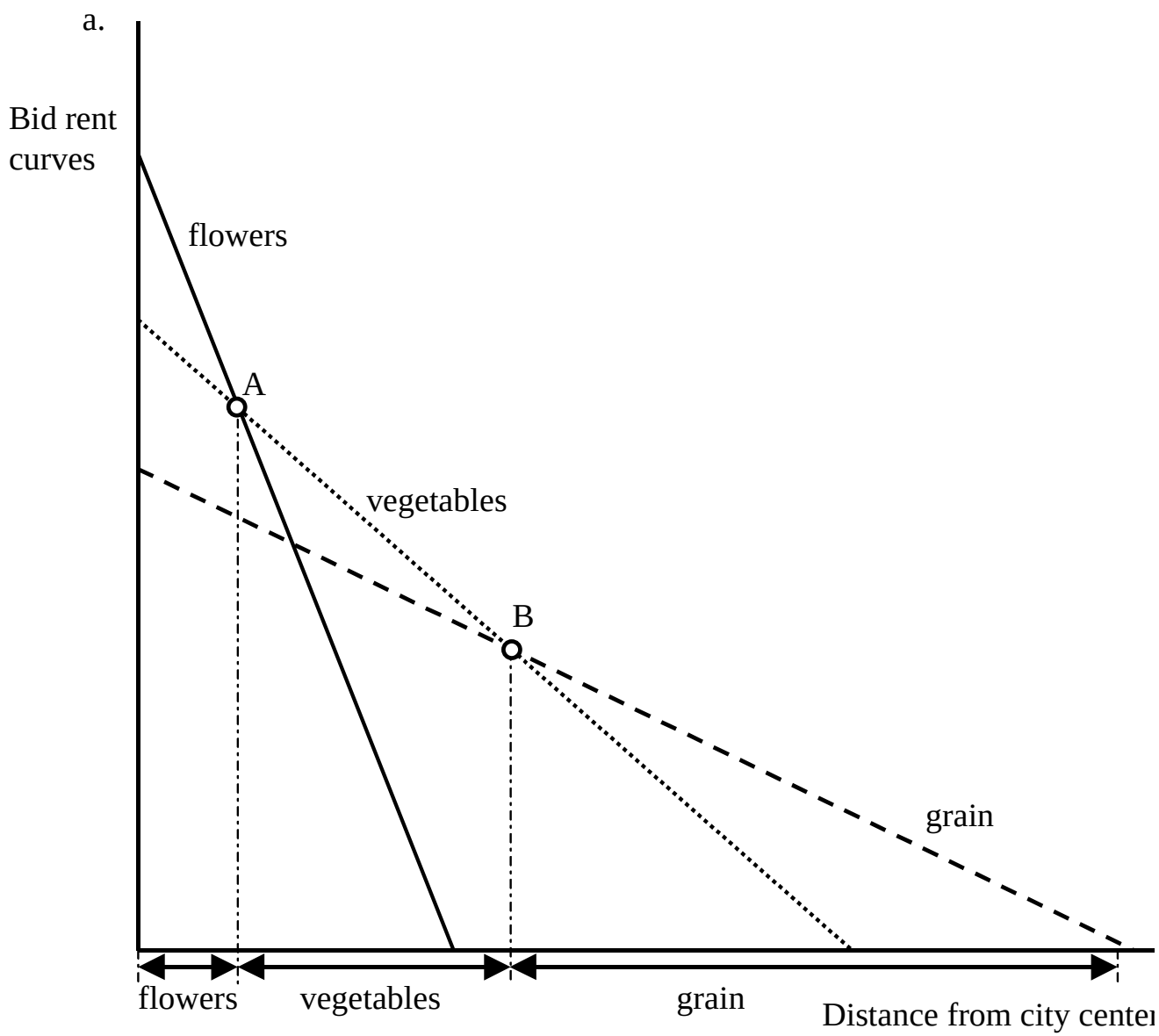
Figure 2.1 The Von Thünen model



b.

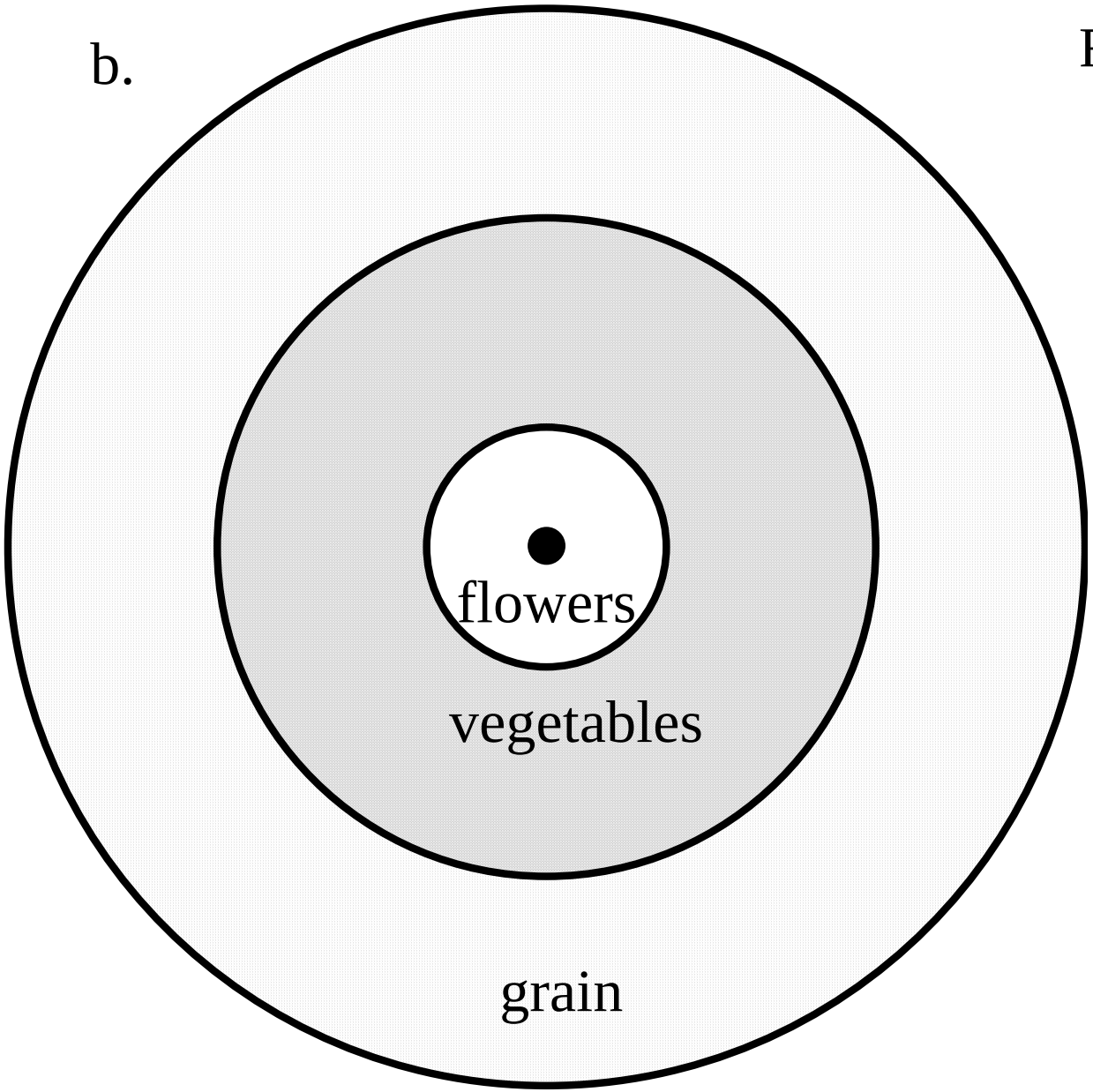
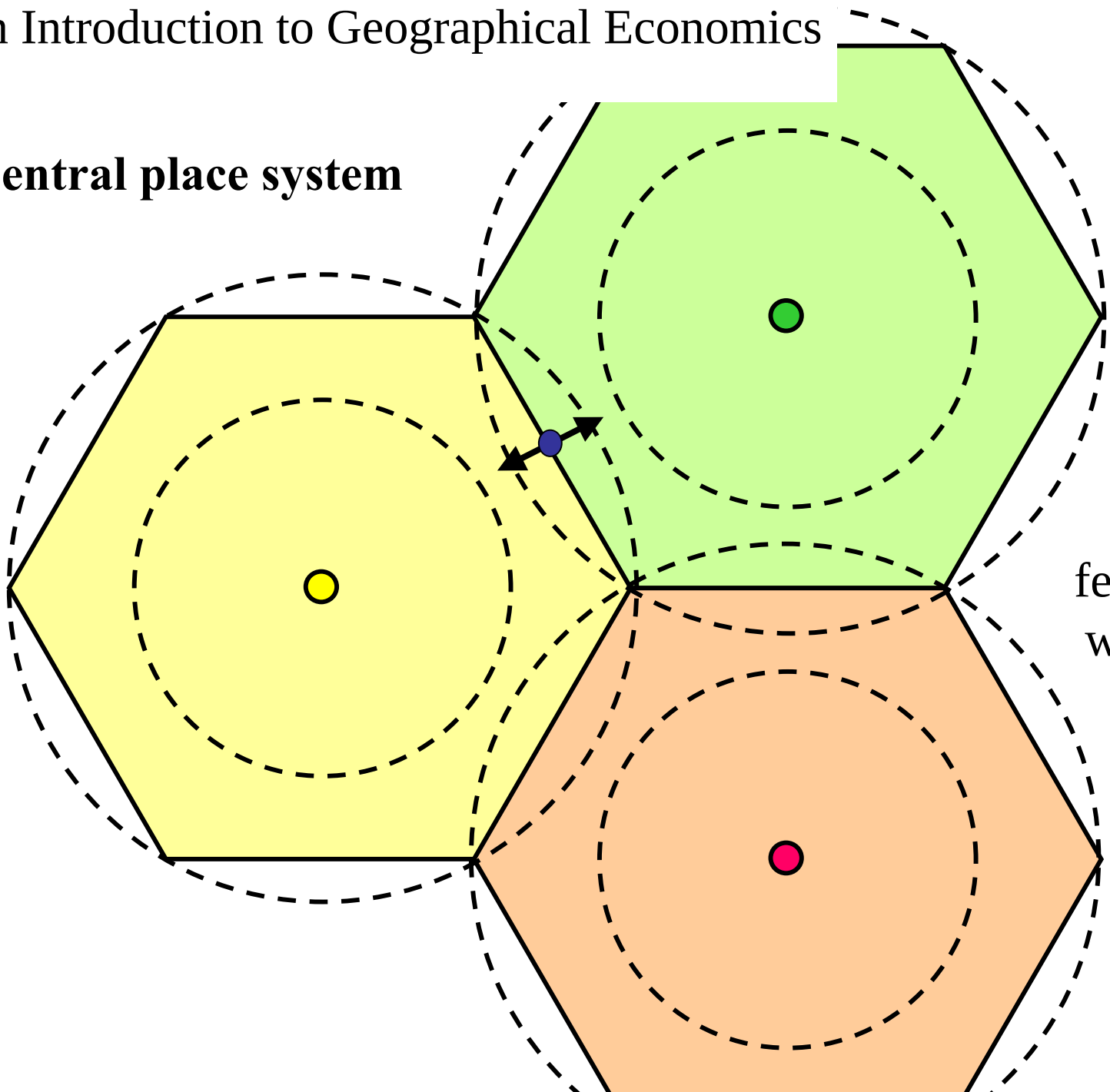


Figure 2.1 continued

Central place system



villages: where to go for your bread?

featureless plain with population

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villages, small cities, large cities

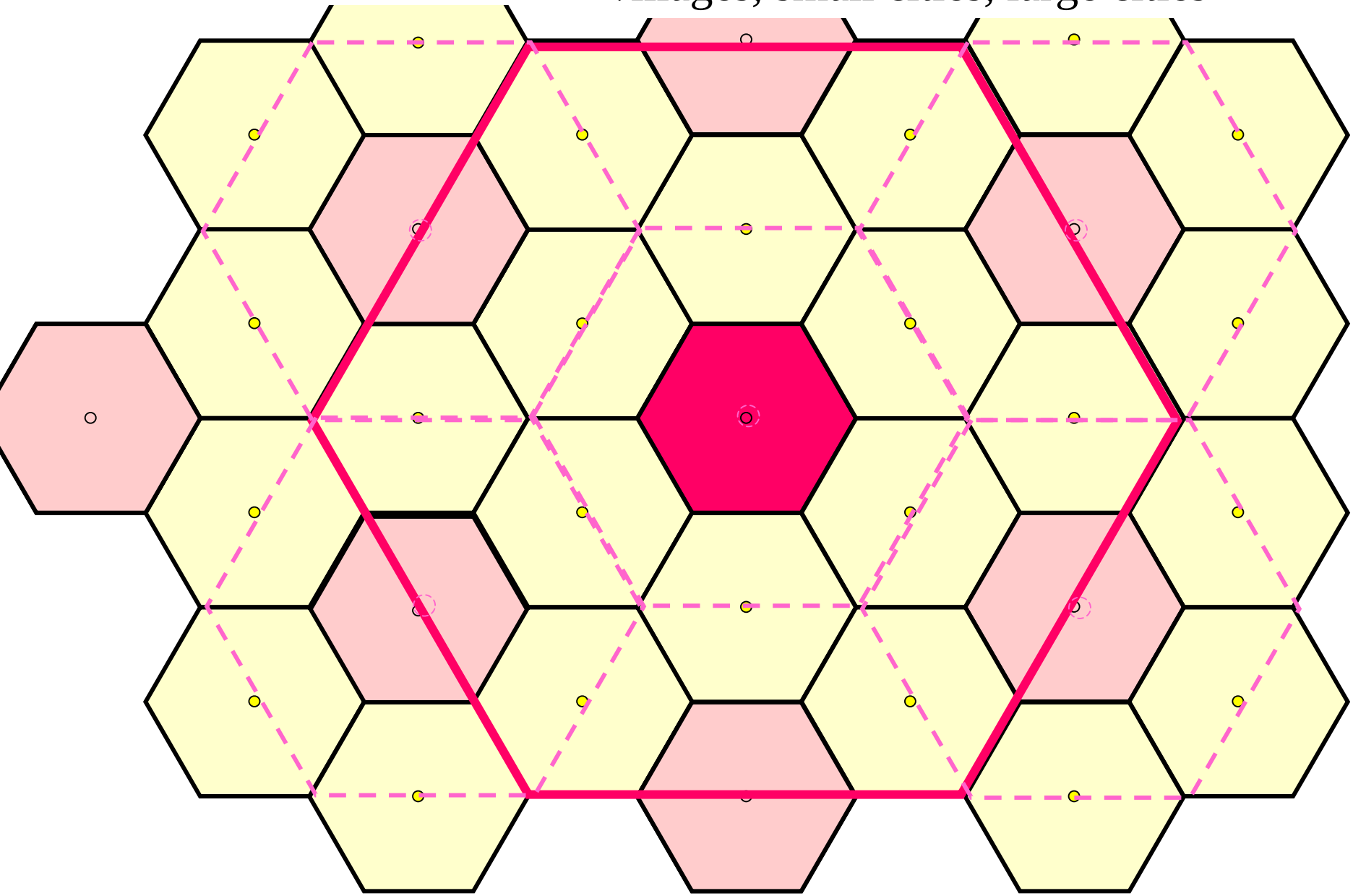

Figure 2.4 Central places in a Dutch polder

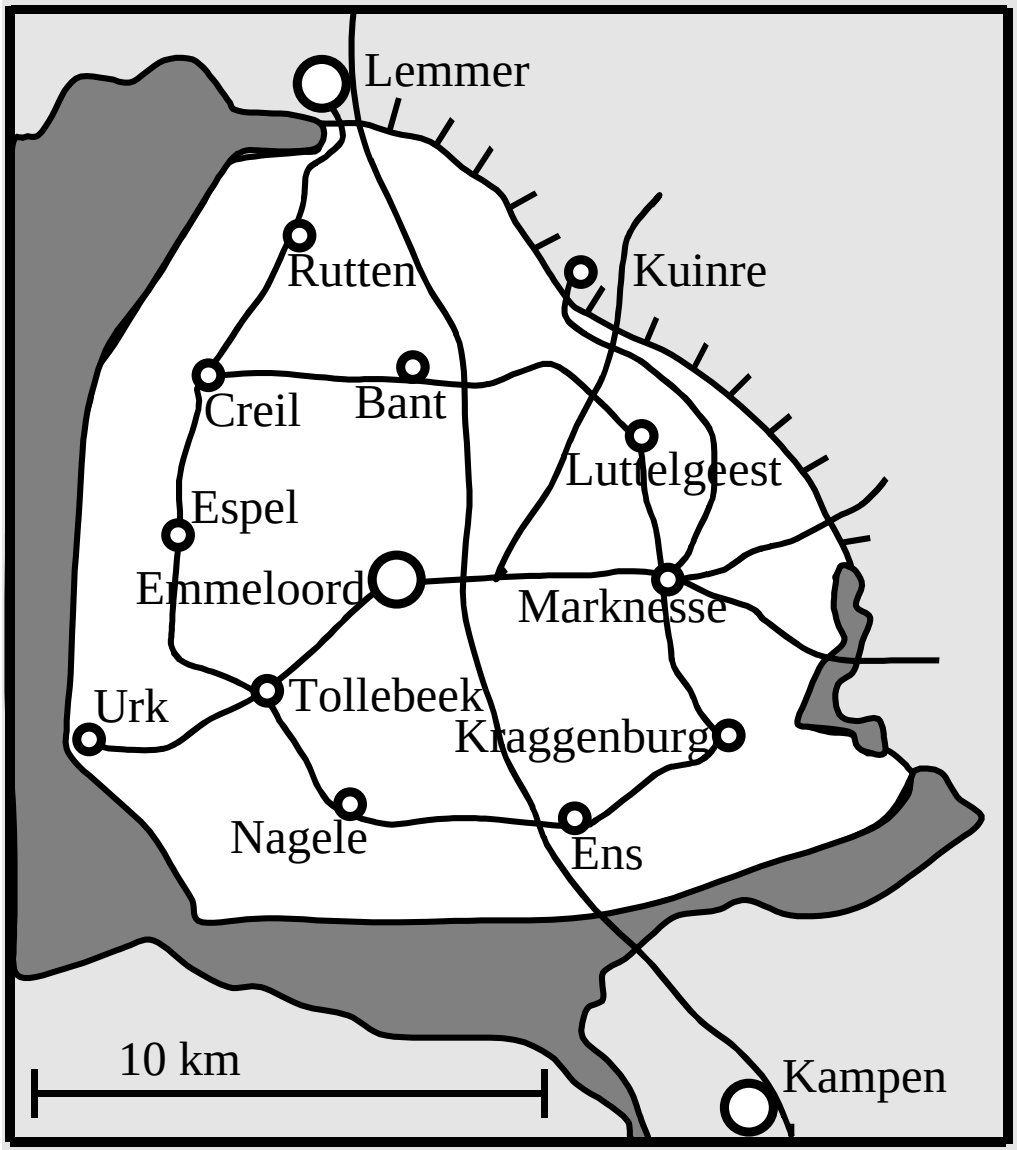

Table 2.1 Population of locations in the Noord-Oost Polder*

Location	Start	Planned population	Population in 1985
Emmeloord	1946	10,000	18,976
Marknesse	1946	2,000	2,194
Ens	1948	2,000	1,618
Kraggenburg	1948	2,000	655
Luttelgeest	1950	2,000	666
Bant	1951	2,000	651
Rutten	1952	2,000	620
Creil	1953	2,000	687
Nagele	1954	2,000	1,014
Espel	1956	2,000	714
Tollebeek	1956	2,000	579

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16 July **Introduction**

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- **Trade theory** no role for geography (except endowments)

Conclusions

Trade theory

Neo-classical

Emphasizes differences in relative factor intensity for the production of goods and services and differences in factor abundance for explaining the direction of trade flows

- perfect competition
- constant returns to scale

New trade

Emphasizes the importance of increasing returns to scale and the availability of many different varieties to explain (intra-industry) trade flows

- imperfect competition
- increasing returns to scale

The Neo-Classical Theory of Trade

Here is a production plant for **CDs** (in China)

The Neo-Classical Theory of Trade

This is the production **rice** (in Bangladesh)

The production of **CDs** is relatively **capital intensive** and the production of **rice** is relatively **labor intensive**

Neo-classical economics

International trade based on differences in endowments **results**

Factor price equalization (FPE)

Trade in goods (which equalizes final goods prices) leads to equalization of factor prices

Rybczynski theorem (Ryb)

An increase in the quantity of a factor of production at constant final goods prices leads to an increase in the production of the good using that factor intensively and a decreased production of the other good

Stolper-Samuelson theorem (St-Sa)

An increase in the price of a final good increases the reward to the factor used intensively in the production of that good and reduces the reward to the other factor

Heckscher-Ohlin theorem (H-O)

A country will export the final good which makes relatively intensive use of the relatively abundant factor of production

Problem: Intra Industry Trade

A method to measure IIIT is the **Grubel-Lloyd Index**:

The Grubel-Lloyd index measures the share of imports or exports (whichever is largest) that is 'covered' by exports or imports of similar types of goods (or services); for cars in Holland in 1996:

$$1-\frac{|E-M|}{E+M}=1-\frac{|13.5-21.1|}{13.5+21.1}=1-\frac{7.6}{34.6}=1-0.22=0.78$$

Thus, 78% of the Dutch car trade is intra-industry trade.

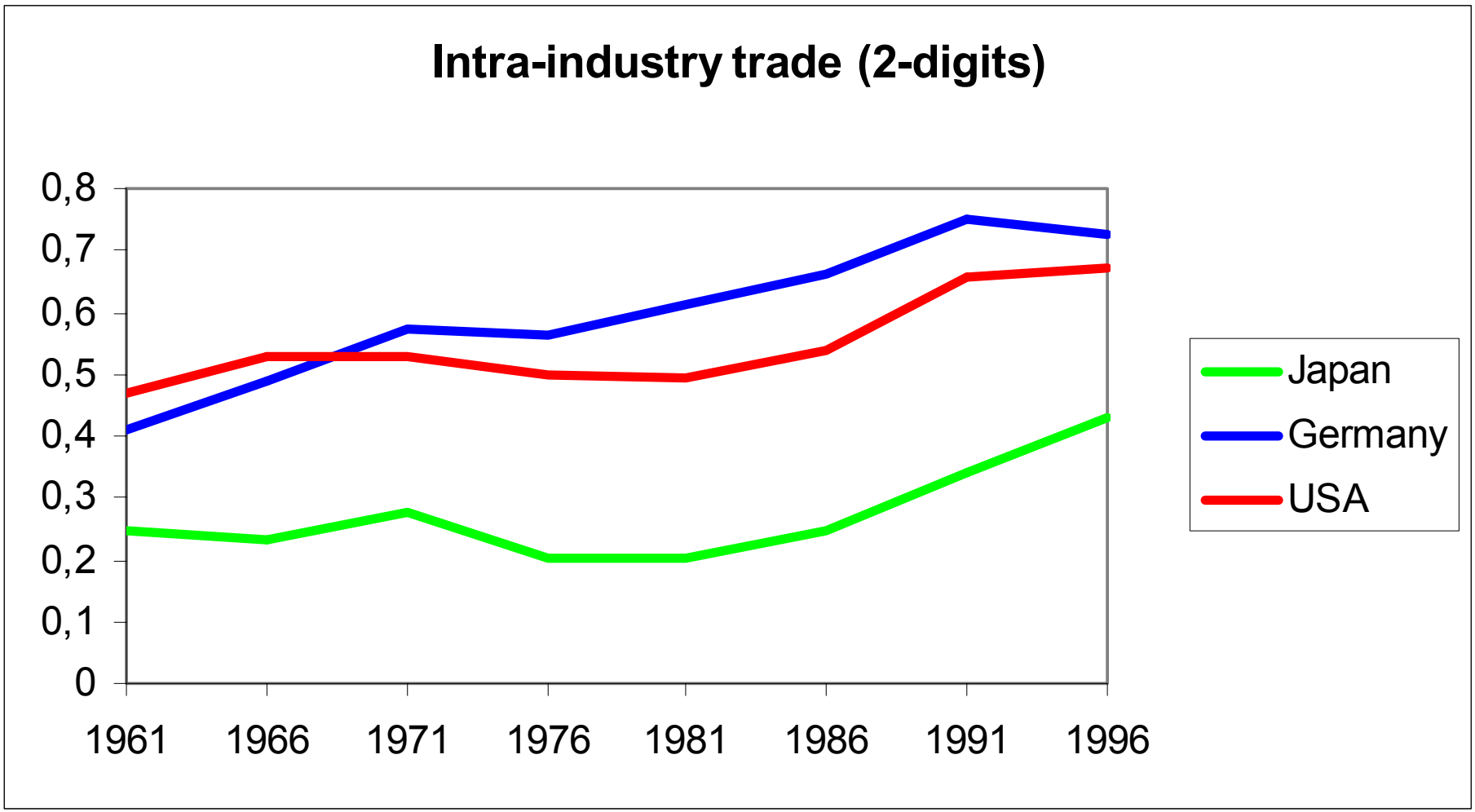
GL-index = 1; 100% Intra Industry Trade

GL-index = 0; 0% IIT / 100% Inter Industry Trade (and then: Ricardo and/or HOS)

Is Intra-Industry Trade relevant in our present-day economies?

Intra Industry Trade

If we calculate the Grubel-Lloyd index not just for the Dutch car trade but for **many sectors** in for example Japan, Germany & USA, weigh them appropriately, we get the following results:



Intra Industry Trade; Variety/Intermediate Goods

The basis for intra-industry trade is the **'love of variety'** characteristic in utility or production functions.

- Welfare has increased dramatically over the past 100 years

- We can consumer **more** of all the consumption goods than before

- But an even bigger change in welfare is due to the fact we can consume **more different** and **new** goods than before

Intra Industry Trade; Variety/Intermediate Goods

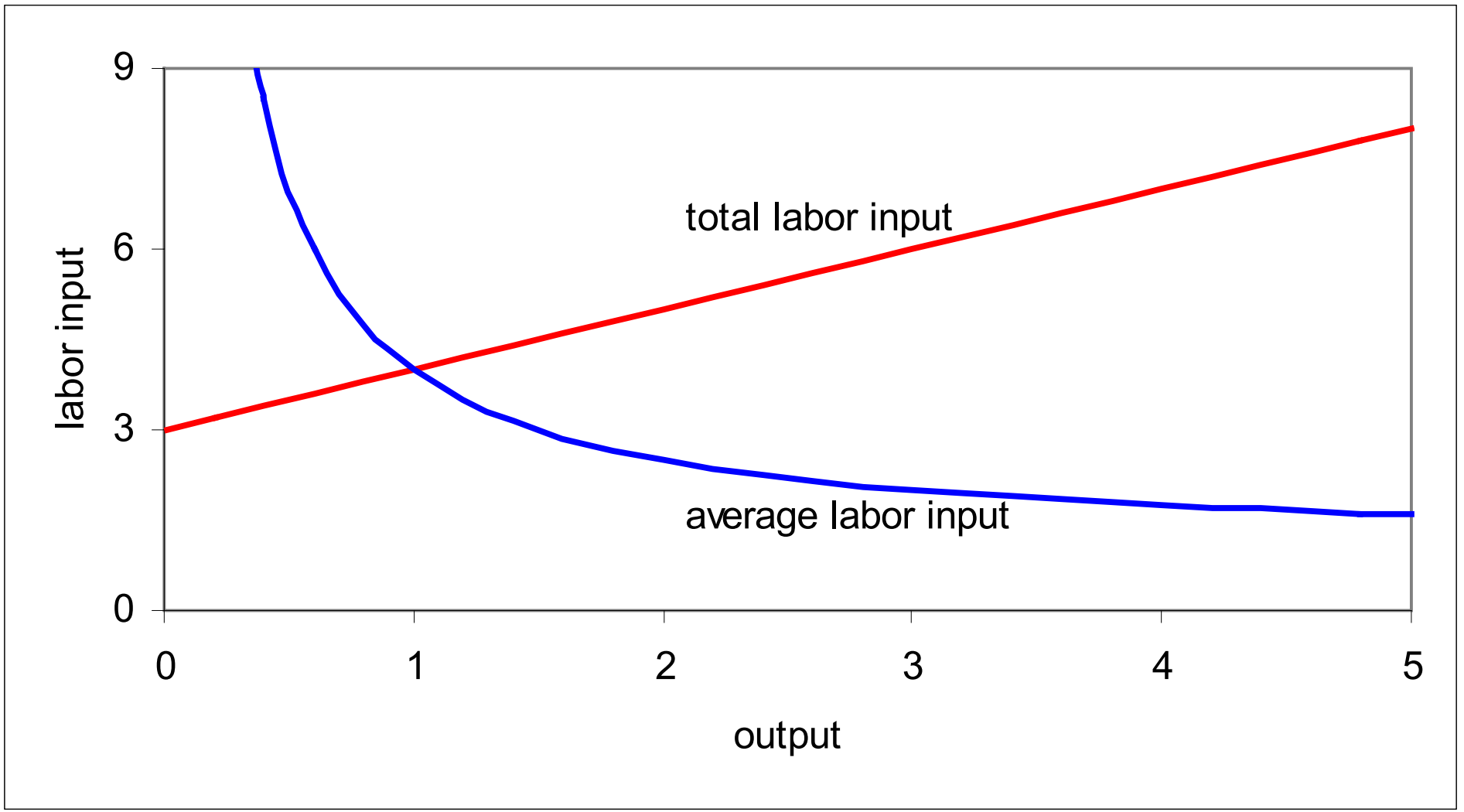
So how do we **model** this 'love of variety' effect in order to analyse the outcomes?

We can use an index of goods $i = 1,..,n$; the index indicates which goods have been invented and introduced at a particular time. An increase in the index n therefore indicates an increase in the number of goods (varieties) available.

Utility (Dixit/Stiglitz, 1977)	**Production (Ethier, 1981)**
$U = \left[\sum_{i=1}^{n} c_i^{\alpha} \right]^{\frac{1}{\alpha}} \quad 0 < \alpha < 1$	$Q = \left[\sum_{i=1}^{n} q_i^{\alpha} \right]^{\frac{1}{\alpha}} \quad 0 < \alpha < 1$
Increase of varieties (n) leads to an increase in welfare (utility) due to the love-of-variety-effect.	Increase of intermediate goods (n) leads to an increase in production due to positive production externalities.

Intra Industry Trade; Increasing Returns to Scale (IRS)

If the production function requires a fixed labor cost f before production starts at variable labor cost m there are IRS: $l_i = f + mx_i$



Intra Industry Trade; Variety/Intermediate Goods

If we now look at the Ethier-interpretation of IIT, what does that mean:

- We do **NOT** look at utility and consumption of different (increasing) numbers of varieties of final goods, but

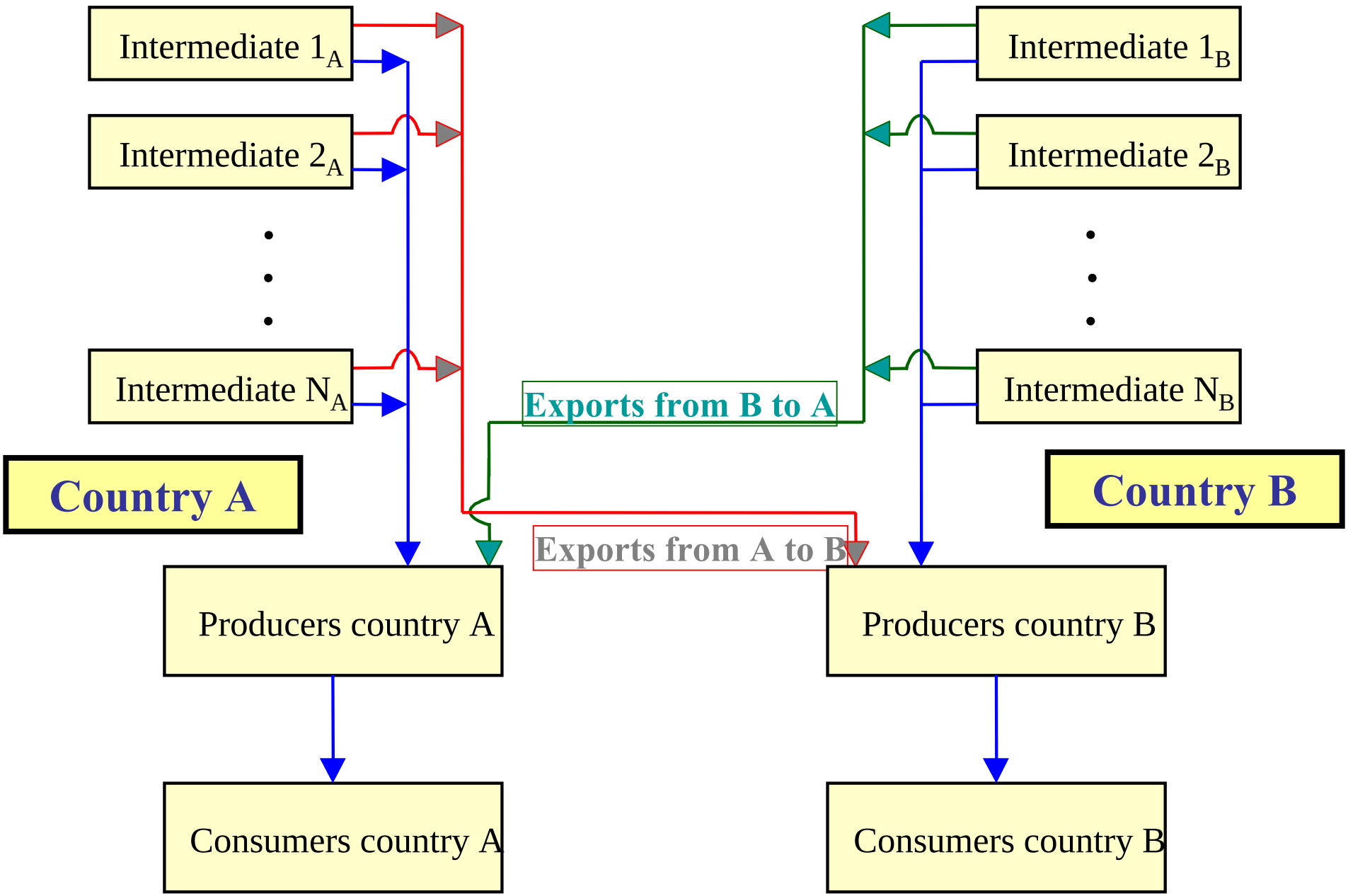
- We look at the **production of intermediate goods** that occur through IRTS (CES function as before)

Does international trade (IIT) follow from this?

Yes, it does and it goes hand-in-hand with **international production fragmentation**. (not new, but strongly increasing)

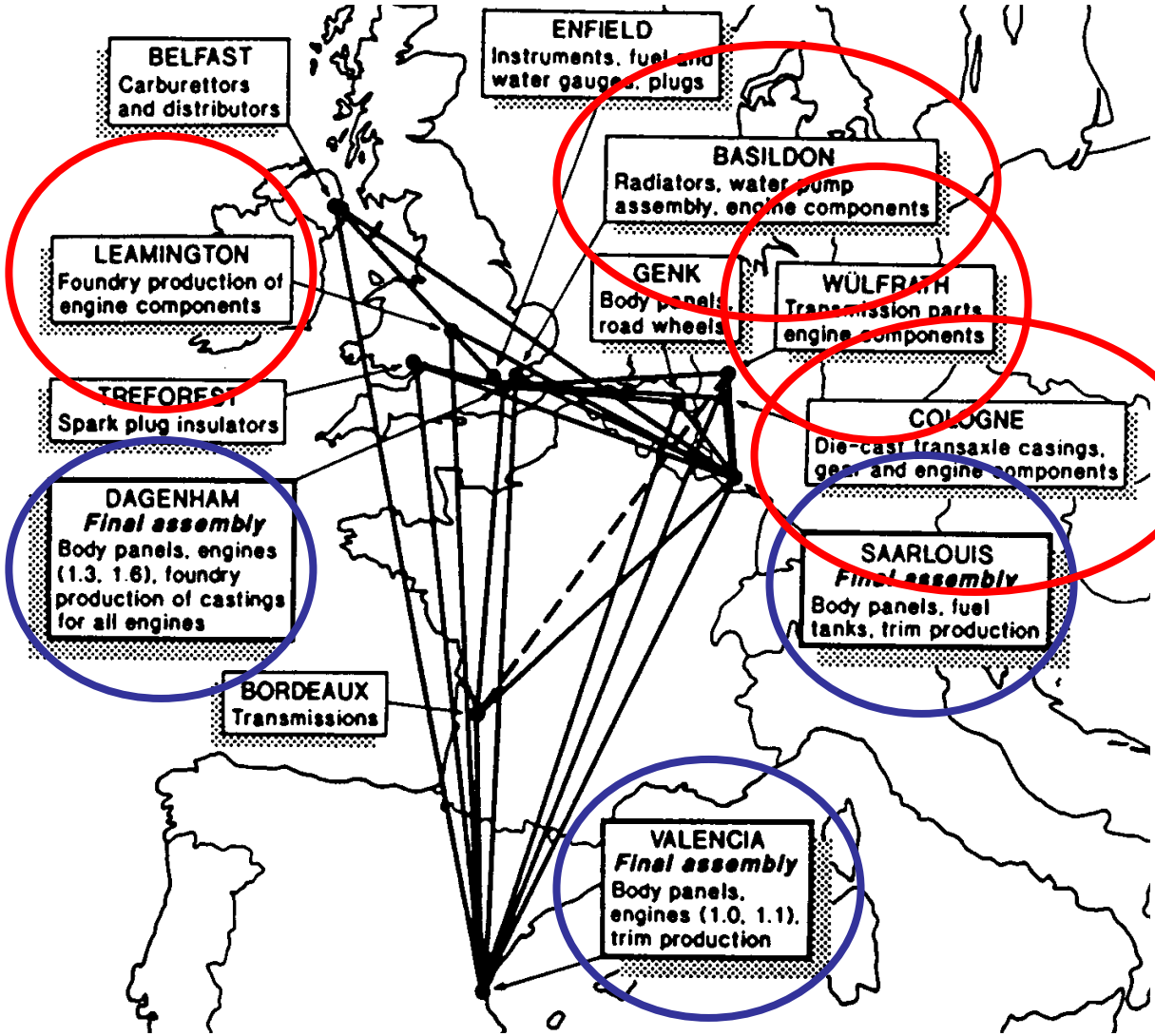
Because of IRTS in intermediate goods we see worldwide use of local comparative advantages to tap the advantages for international production (e.g. through Multinationals)

Intra Industry Trade; Variety/Intermediate Goods



Intra Industry Trade; Variety/Intermediate Goods

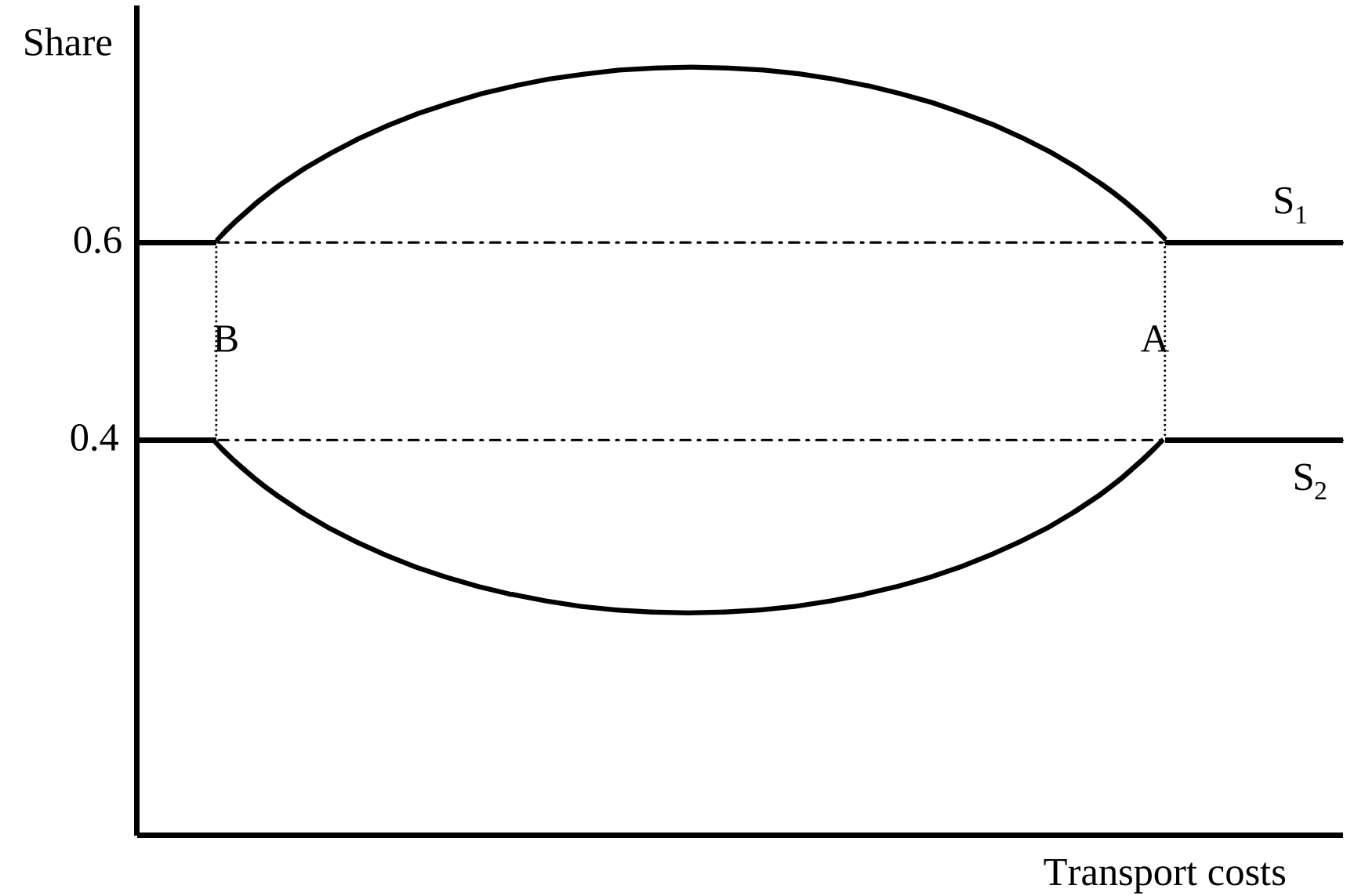
Example: Ford Fiesta Network



engine components

final assembly

Figure 2.6 Share of world production in manufactures



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Conclusions

- Uneven distribution at all levels (global, continental, country)
- Economic activity more unevenly distributed than population
- Regularity in distribution (Zipf's Law)
- Regularity in interaction (Gravity equation)

Objective: find common framework for understanding this

Building blocks (1990)

- economic geography/urban economics/regional science
  - existence and size of cities/regions is given
- international trade
  - no geography in core models
- economic growth and development
  - verbal analysis

first nature – second nature

3 The core NEG model

- **An example**
- Overview of general structure
- Demand
- Supply
- Equilibrium

4 Solutions and simulations

- Simulations and short-run equilibrium
- Structural change
- Normalization
- Intermezzo
- Sustain and break analysis
- Welfare
- Many locations

Useful elements fromRegional Economics

- Geometry, transport cost, but who is doing the optimizing?
- Physics of Location, gravity model identifies weights and pulleys of location (more on gravity model later)
- Cumulative causation, firms locate where markets are large, markets are large where firms locate, leds to multiple equilibria (not always optimal)
- Local externalities; technological, pecuniary (market size, thick labor market, etc)
- Economies of scale are important, what does

A simple example as introduction

- Two regions, production Man. Characterized by increasing returns to scale→location is important. Each firm produces a single product
- Production Man., and workers →mobile between regions
- Farmers immobile (always residual demand)
- Each firm sells 10 units-4 to workers, 6 to farmers(4 in region I, 2 in region II)
- Transportation costs; 1,-per unit
- Aim: minimize transportation costs

Table 3.1 Geography of sales

	Sales in North	Sales in South	Total Sales
All firms in North	4 + 4 = 8	0 + 2 = 2	10
All firms in South	0 + 4 = 4	4 + 2 = 6	10
25% firms in North 75% firms in South	1 + 4 = 5	3 + 2 = 5	10

Table 3.2 Transport costs

	If location in North	If location in South
All firms in North	0 + 2 = **2** (to farmers in South)	4 + 4 = 8 (to workers & farmers in North)
All firms in South	4 + 2 = 6 (to workers & farmers in South)	0 + 4 = **4** (to farmers in North)
25% firms in North 75% firms in South	3 + 2 = 5 (to workers & farmers in South	1 + 4 = 5 (to workers & farmers in North)

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Illustrated in the example:
- cumulative causation
- multiple equilibria
- stable – unstable
- non-optimality
- interaction between agglomeration and trade flows

but:
demand is given, no optimality decisions by individual agents, no determination of income, in short: no general equilbrium

3 The core model

- An example
- **Overview of general structure**
- Demand
- Supply
- Equilibrium

Chapter 4 Solutions and simulations

- Simulations and short-run equilibrium
- Structural change
- Normalization
- Intermezzo
- Sustain and break analysis
- Welfare
- Many locations

Core model? What core model?

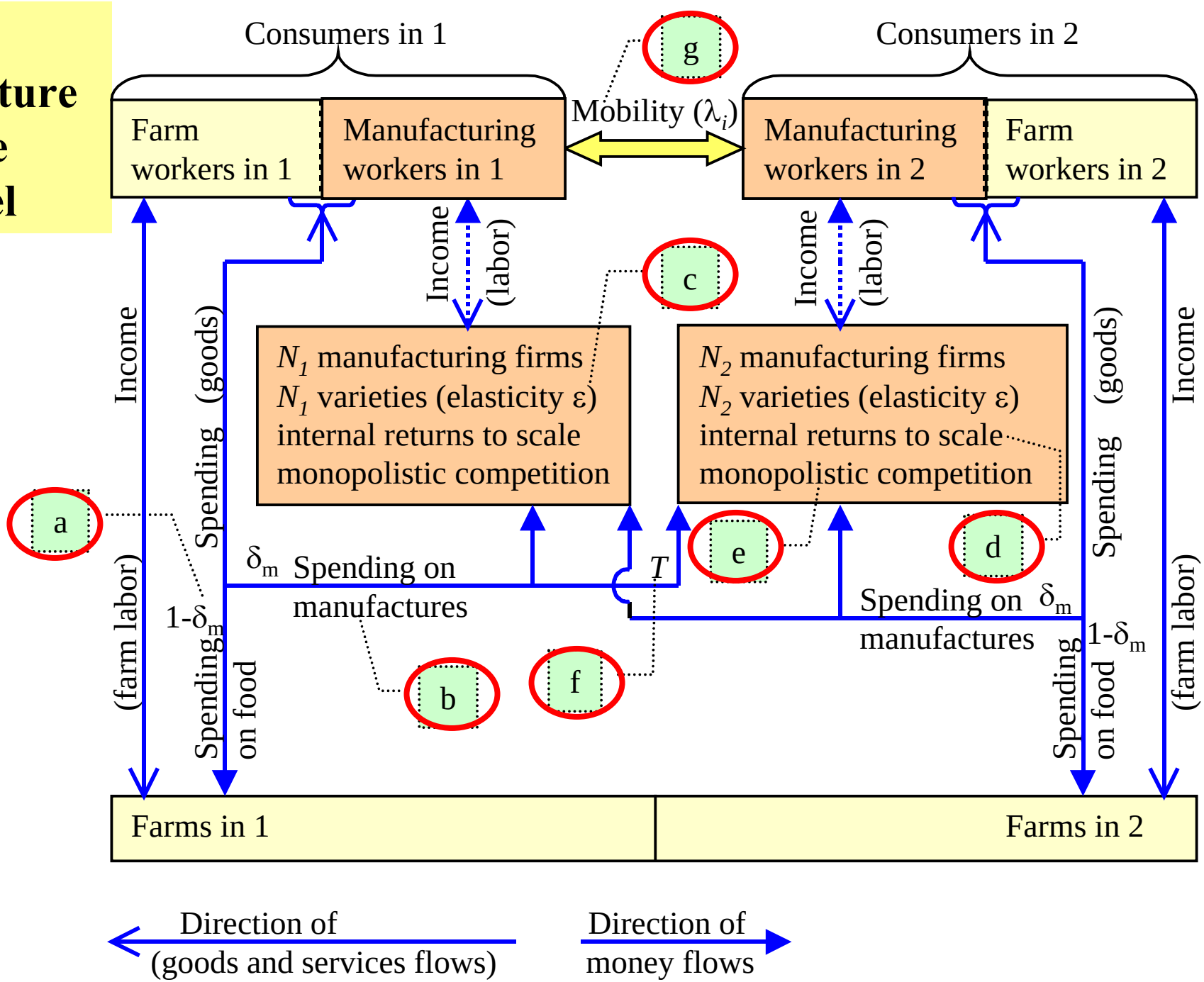
Krugman (1991); one factor of production, mobile labor

Krugman and Venables (1995); intermediate goods, no labor mobility

Forslid and Ottaviano (2001); two inputs, one input is mobile

Main implications are all the same!

The structure of the model



Chapter 3 The core model

- An example
- Overview of general structure
- **Demand**
- Supply
- Equilibrium

Chapter 4 Solutions and simulations

- Simulations and short-run equilibrium
- Structural change
- Normalization
- Intermezzo
- Sustain and break analysis
- Welfare
- Many locations

Demand

manufactures

- food

$$\max_{F,M} \quad F^{1-\delta}M^{\delta} \qquad s.t. \quad Y = F + IM$$

$$\Gamma = \quad F^{1-\delta}M^{\delta} + \kappa(Y - F - IM)$$

$$\left.\begin{array}{l} \delta F^{1-\delta}M^{\delta-1} = \kappa I \\ \hline (1-\delta)F^{-\delta}M^{\delta} = \kappa \end{array}\right\} \quad IM = \delta F/(1-\delta) \longrightarrow F = (1-\delta)Y$$

demand for manufacturing varieties

$$\max\left[\sum_{i=1}^{N} c_i^{\rho}\right]^{(1/\rho)} \qquad s.t. \quad \delta Y - \sum_{i=1}^{N} p_i c_i$$

$$U = \left(\sum_{i=1}^{N} c^{\rho}\right)^{1/\rho} = \left(Nc^{\rho}\right)^{1/\rho} = N^{1/\rho}c = N^{(1/\rho)-1}\left[Nc\right]$$

love–of–variety

claim on resources

$$\Gamma = \left[\sum_{i=1}^{N} c_i^{\rho}\right]^{(1/\rho)} + \kappa\left[\delta Y - \sum_{i=1}^{N} p_i c_i\right]$$

$$\left[\sum_{i=1}^{N} c_i^{\rho}\right]^{(1/\rho)-1} c_j^{\rho-1} = \kappa p_j, \qquad for \quad j = 1,..,N \qquad \varepsilon \equiv 1/(1-\rho)$$

$$\frac{c_j^{\rho-1}}{c_1^{\rho-1}} = \frac{p_j}{p_1} \qquad or \quad c_j = p_j^{-\varepsilon} p_1^{\varepsilon} c_1 \quad for \quad j = 1,..,N$$

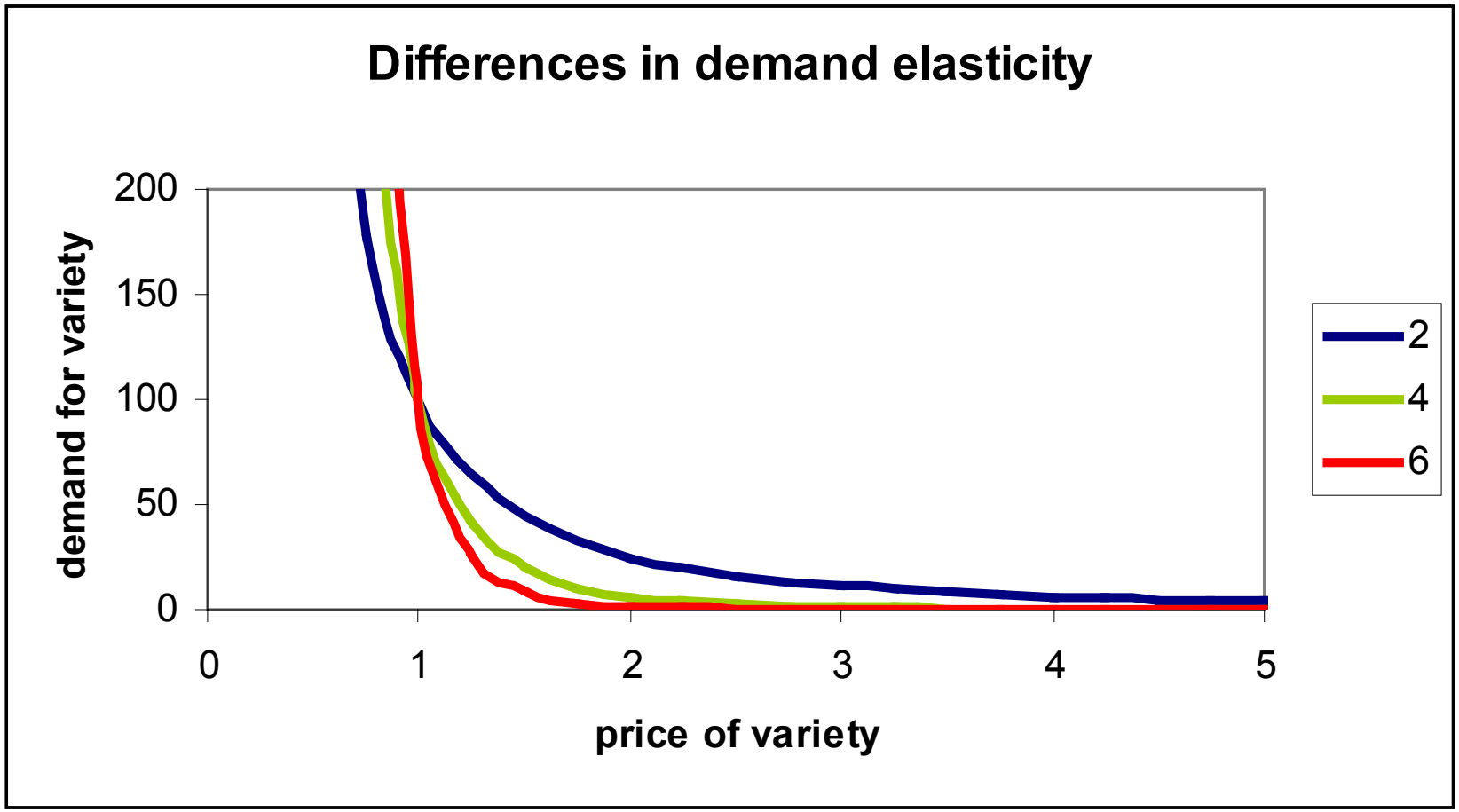
$$\sum_{j=1}^{N} p_j c_j = \sum_{j=1}^{N} p_j \left[p_j^{-\varepsilon} p_1^{\varepsilon} c_1\right] = p_1^{\varepsilon} c_1 \sum_{j=1}^{N} p_j^{1-\varepsilon} = p_1^{\varepsilon} c_1 I^{1-\varepsilon} = \delta Y, \quad or \quad c_1 = p_1^{-\varepsilon} I^{\varepsilon-1} \delta Y$$

$$c_j = p_j^{-\varepsilon}\left[I^{\varepsilon-1}\delta Y\right], \quad where \quad \varepsilon \equiv \frac{1}{1-\rho}, \quad I \equiv \left[\sum_{i=1}^{N} p_i^{1-\varepsilon}\right]^{1/(1-\varepsilon)}$$

Time for a Break?

As witnesses later recalled, two small dogs just waltzed into the place, grabbed the cat, and waltzed out.

Figure 3.2 Dependence of demand for a variety of manufactures on price and ε*



*Demand given by $c_1 = 100\, p_1^{-\varepsilon}$; ε varies (2, 4, and 6).

Figure 3.3 Relationship between ρ and ε

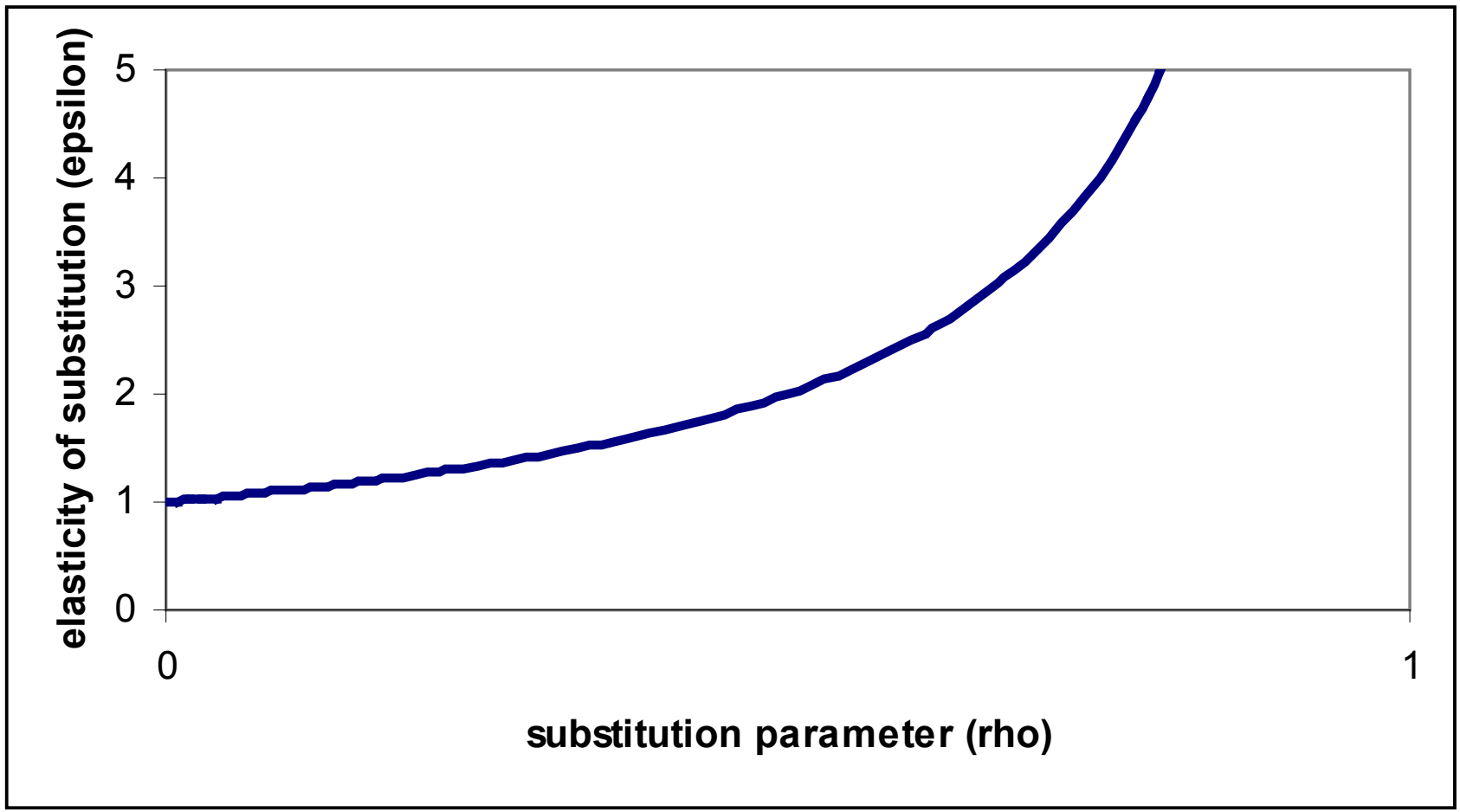


Figure 3.4 Deviation between assumed demand and reality

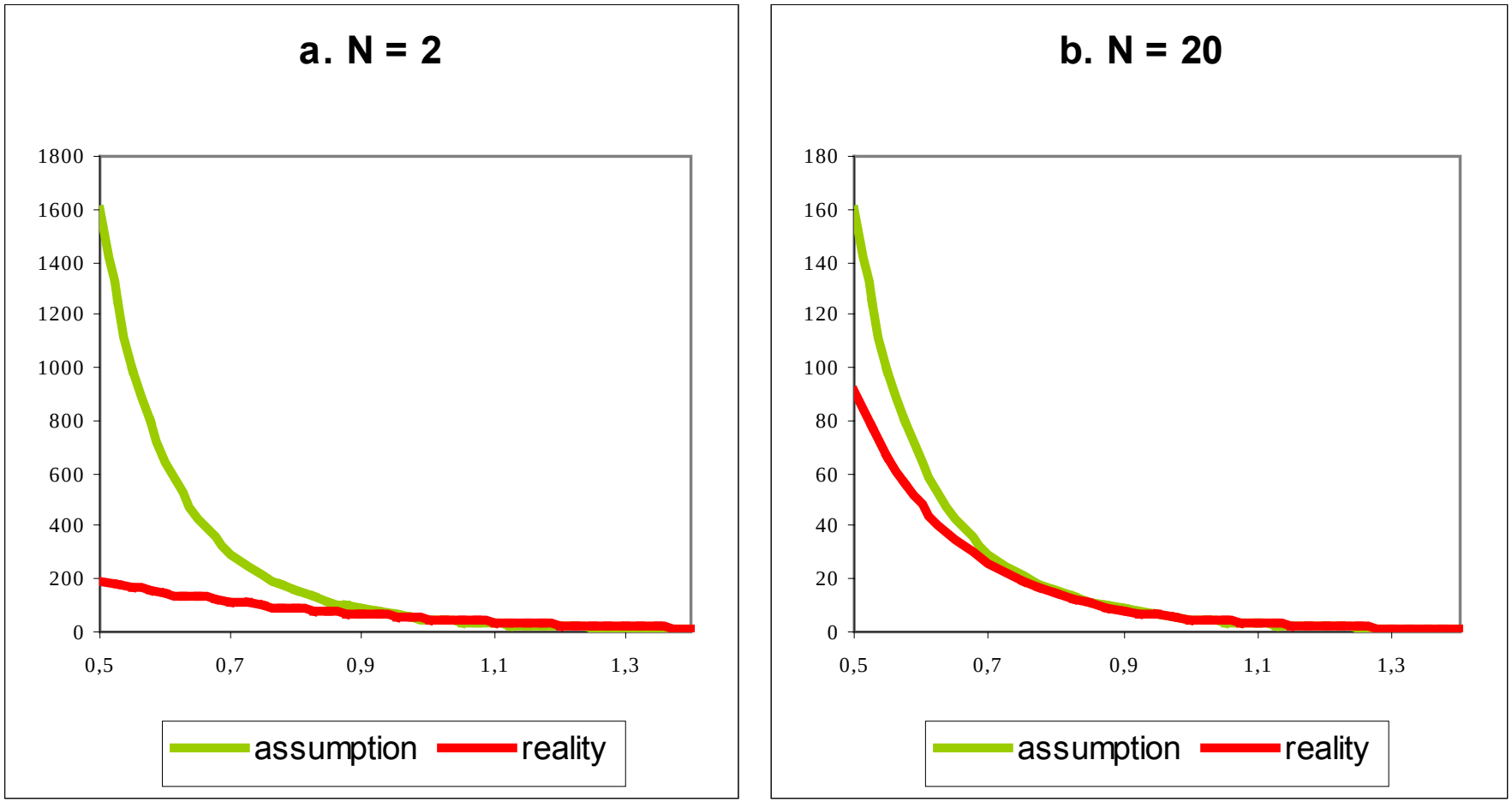
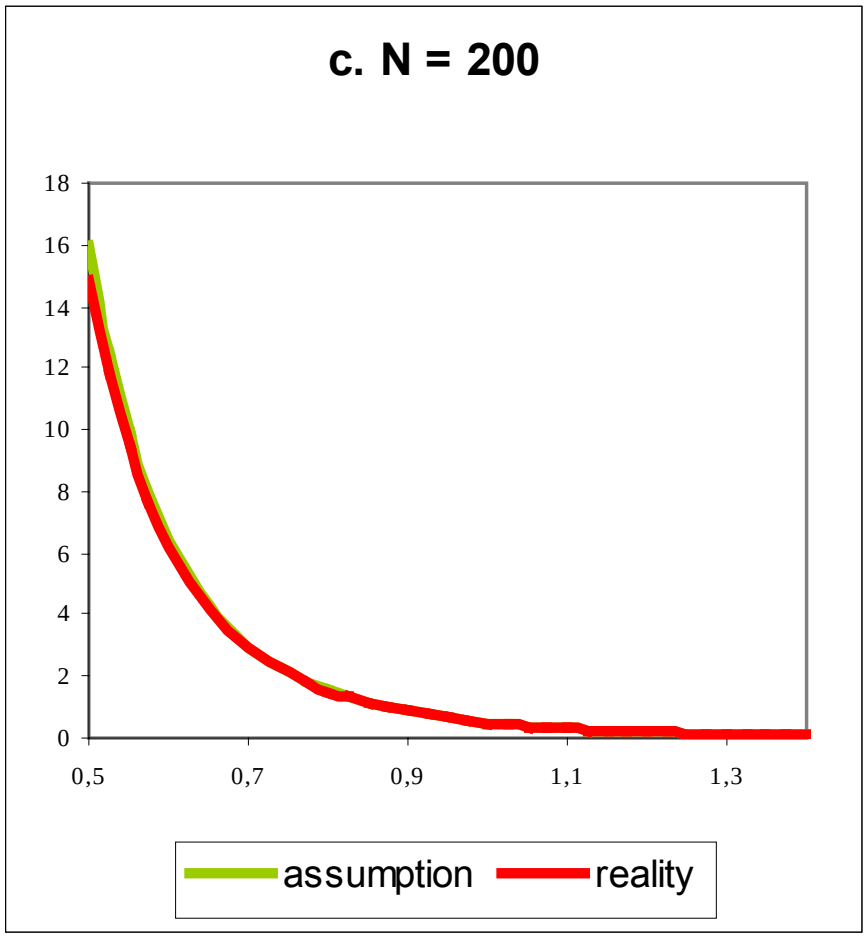
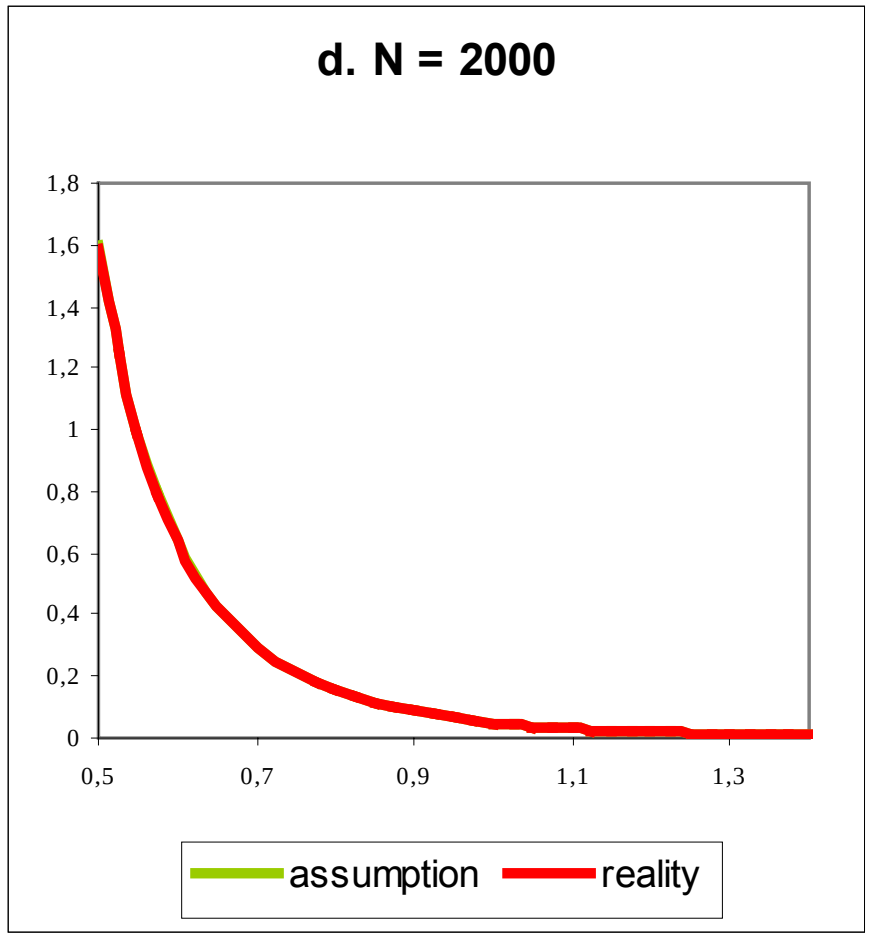


Figure 3.4 continued





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Supply

Food: labor as input, constant returns to scale, by choice of units

$$F = (1-\gamma)L; \qquad 0 < \gamma < 1$$

Manufactures: different varieties, produced using only labor, internal increasing retursn to scale (1 – variety = 1 – firm); alpha, beta

$$l_{ir} = \left(\alpha + \beta x_{ir}\right)$$

maximize profits $$\pi_r = p_r x_r - W_r(\alpha + \beta x_r)$$

optimal price setting: constant mark-up over marginal cost

$$p_r(1-1/\varepsilon) = \beta W_r \qquad (or \quad p_r = \beta W_r / \rho \quad)$$

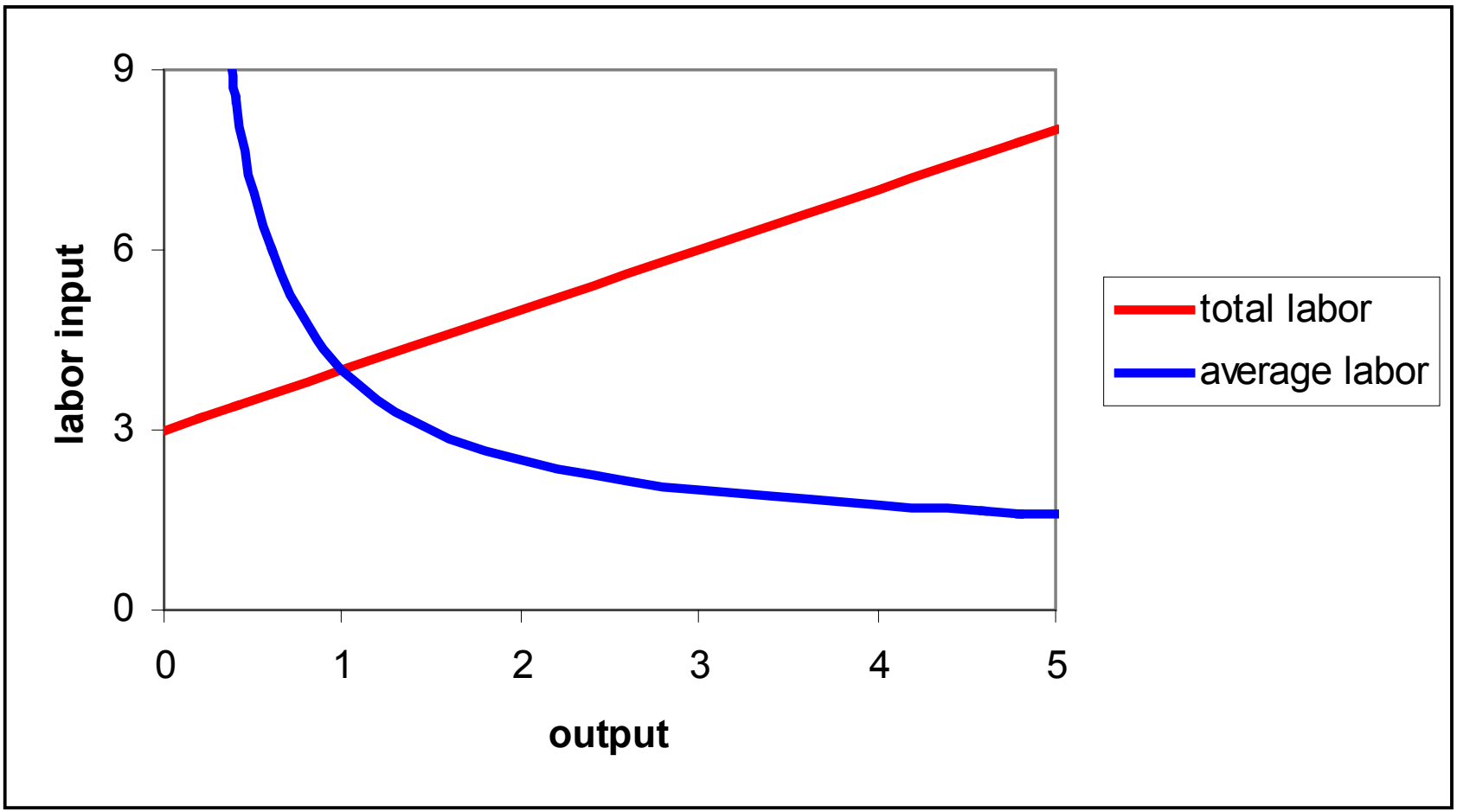
$$p_r x_r - W_r(\alpha + \beta x_r) = 0; \qquad p_r x_r = W_r(\alpha + \beta x_r)$$

exit or entry until zero profits

$$\frac{\varepsilon}{\varepsilon - 1}\beta W_r = W_r(\alpha + \beta x_r); \qquad x_r = \frac{\alpha(\varepsilon - 1)}{\beta} \equiv x$$

$$l_{ir} = \left(\alpha + \beta x\right) = \left(\alpha + \beta \frac{\alpha(\varepsilon - 1)}{\beta}\right) = \alpha\varepsilon$$

Figure 3.5 Production function for a variety of manufactures*



*Fixed labor requirement $\alpha = 3$, marginal labor requirement $\beta = 1$.

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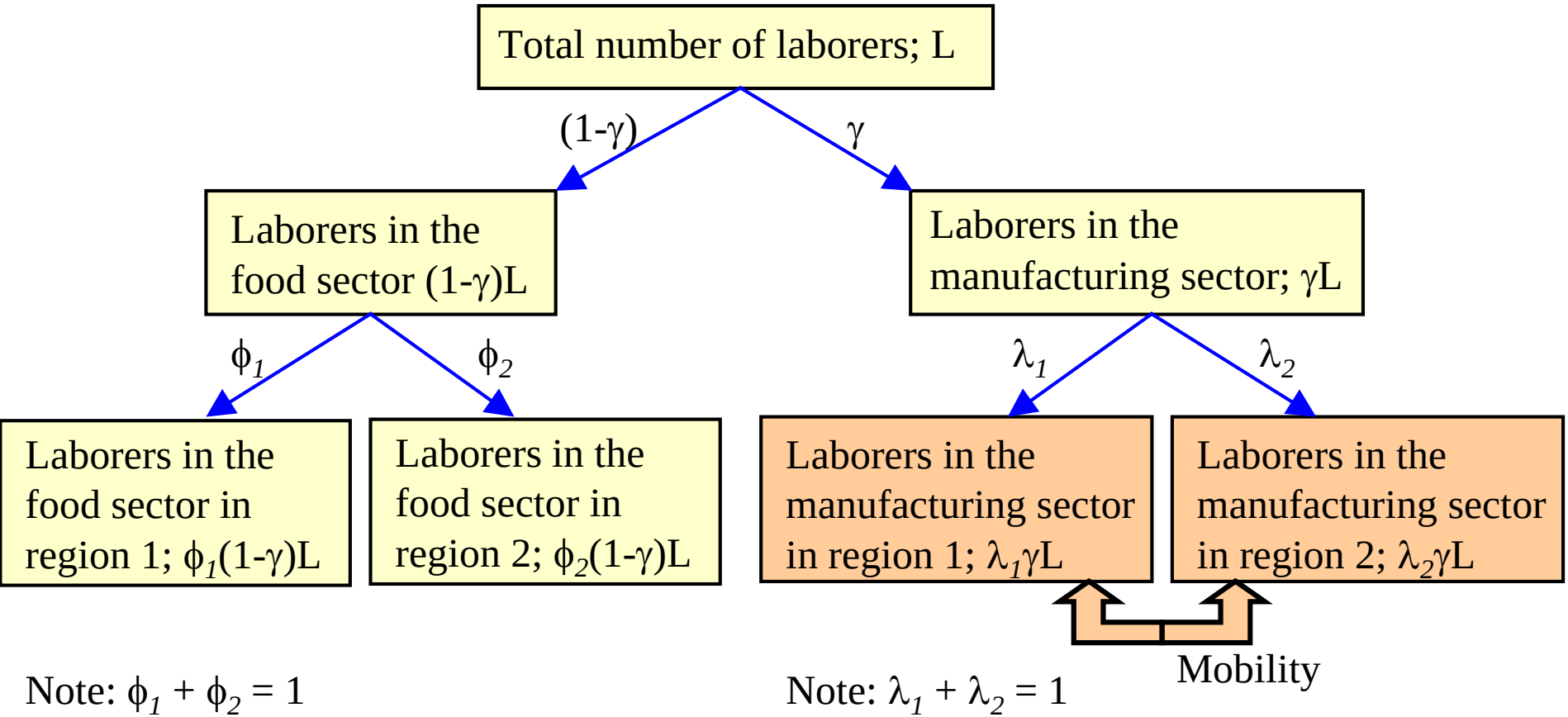
Multiple locations and equilibrium



Iceberg trade costs for manufactures; if $T > 1$ are sent 1 unit of distance only 1 unit arrives (technology)

Proportional to distance: if distance is 2, then T^2 have to be sent to ensure 1 unit arrives (all sorts of distance impacts)

Table 3.3 CIF/FOB ratio's, 1965-1990 (%)

Country	CIF/FOB ratio	Country	CIF/FOB ratio
Australia	10.3	New Zealand	11.5
Austria	4.1	Norway	2.7
Canada	2.7	Philippines	7.6
Denmark	4.5	Portugal	10.3
France	4.2	Singapore	6.1
West-Germany	3.0	Spain	6.4
Greece	13.0	Sweden	3.5
Ireland	5.0	Switzerland	1.8
Italy	7.1	Thailand	11.0
Japan	9.0	United Kingdom	6.0
Netherlands	5.6	United States	4.9

Source: Radelet and Sachs (1998).

Multiple locations and equilibrium (idem country 2)

Short-run equilibrium; *given* the distribution of manufacturing labour

Price index equation

$$I_1 = \left[\lambda_1 W_1^{1-\varepsilon} + \lambda_2 T^{1-\varepsilon} W_2^{1-\varepsilon} \right]^{1/(1-\varepsilon)}$$

locally produced — *imported*

Income equation

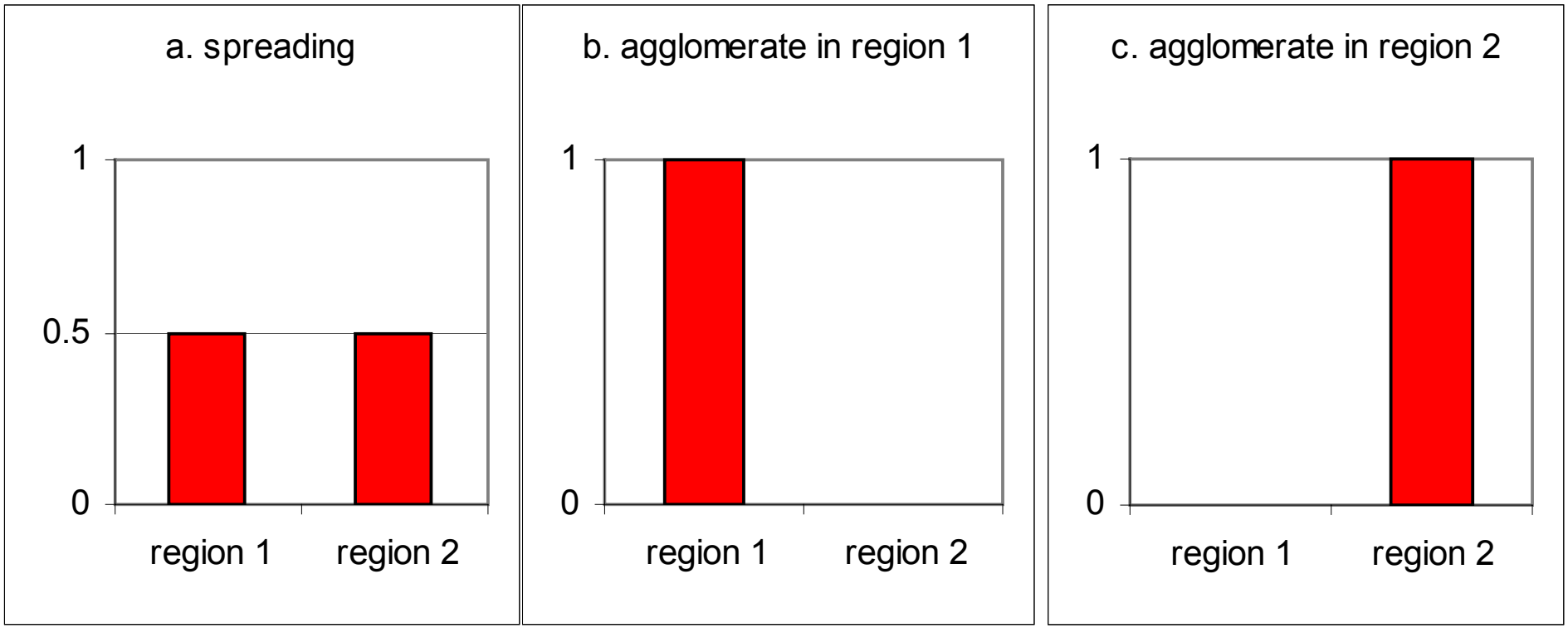
$$Y_1 = \lambda_1 \gamma W_1 + \phi_1 (1-\gamma)$$

manufacturing income — *food income*

Wage equation (from demand = supply in manufactures sector

$$W_1 = \left[Y_1 I_1^{\varepsilon-1} + Y_2 T^{1-\varepsilon} I_2^{\varepsilon-1} \right]^{1/\varepsilon}$$

Multiple locations and equilibrium



Three examples

Multiple locations and equilibrium

Manufacturing labour force adjustment

$$\frac{d\lambda_1}{\lambda_1} = \eta\,(w_1 - \overline{w}); \qquad where \quad \overline{w} = \lambda_1 w_1 + \lambda_2 w_2$$

change labor in 1 | *adj. speed* | *wage difference* | *average real wage*

Table 14.2 When is a long-run equilibrium reached?

Possibility 1	Possibility 2	Possibility 3
If the real wage for manufacturing workers in region 1 is the same as the real wage for manufacturing workers in region 2.	All manufacturing workers are located in region 1 (agglomeration in region 1)	All manufacturing workers are located in region 2 (agglomeration in region 2)

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$$Y_i = \lambda_i W_i \gamma L + \phi_i (1-\gamma) L$$

$$I_r = \left(\frac{\beta}{\rho}\right)\left(\frac{\gamma L}{\alpha\varepsilon}\right)^{\frac{1}{(1-\varepsilon)}}\left[\sum_{s=1}^{R} \lambda_s W_s^{1-\varepsilon} T_{rs}^{1-\varepsilon}\right]^{1/(1-\varepsilon)}$$

$$W_s = \rho\beta^{-\rho}\left(\frac{\delta}{(\varepsilon-1)\alpha}\right)^{1/\varepsilon}\left[\sum_{r=1}^{R} Y_r T_{rs}^{1-\varepsilon} I_r^{\varepsilon-1}\right]^{1/\varepsilon}$$

Table 4.1 Base-scenario parameter configuration, 2 regions

δ = 0.4	γ = 0.4	L = 1
ρ = 0.8	β = 0.8	$\phi_1 = \phi_2$ = 0.5
T = 1.7	α = 0.08	σ = 0.0001

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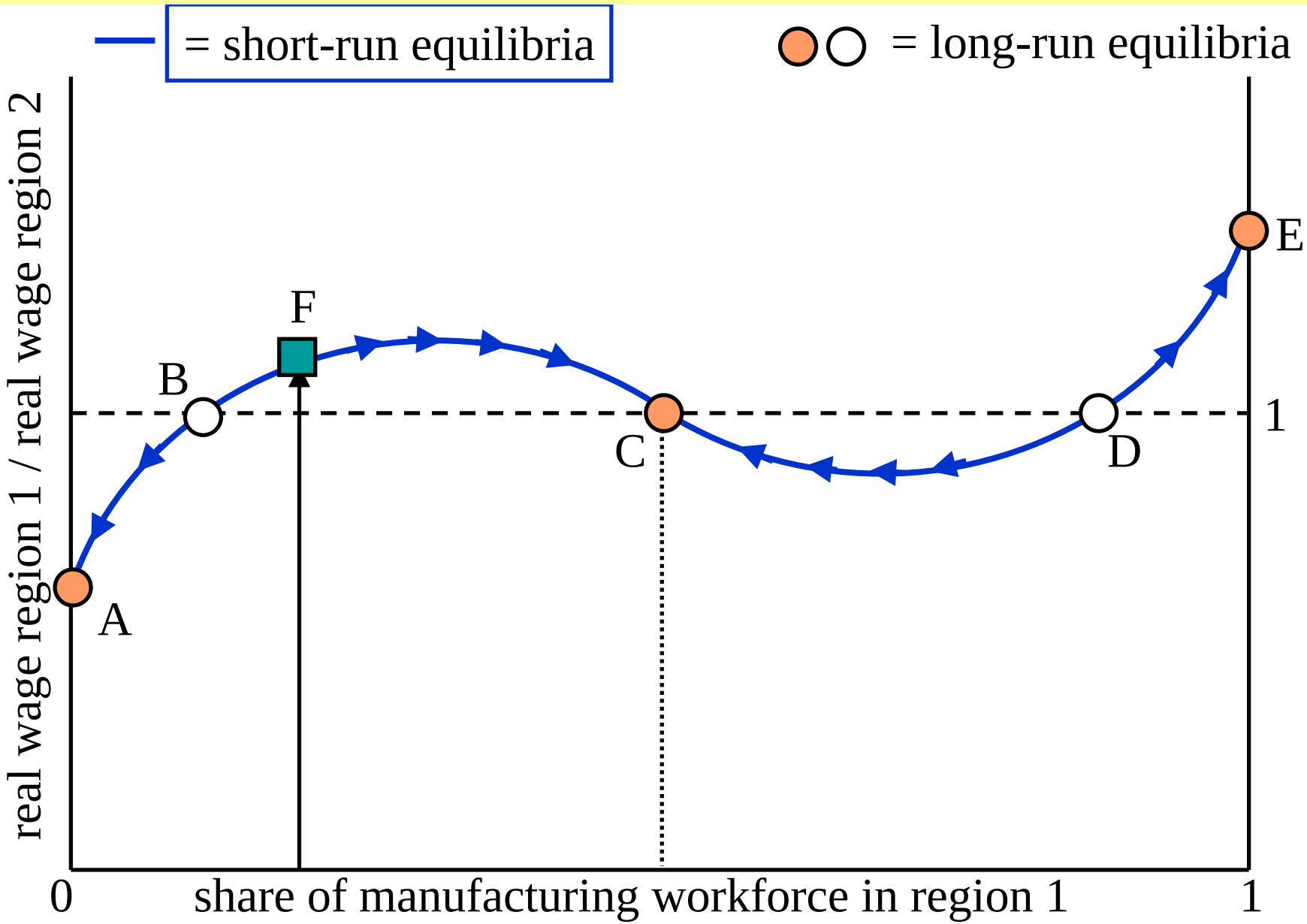
Usefulness of computer simulations

- allows us to do things we cannot do analytically
- allows us to get a 'feel' for the model
- gives us suggestions we can try to prove analytically
- enables us to prove something does not hold: counter-example

Computer simulations: how? Write down short version of model and

- determine endogenous variables (= # equations)
- specify the values of parameters
- determine a solution method; we use sequential iterations:
    - guess initial wage rates for 1 and 2
    - using this calculate income and price index for 1 and 2
    - use these to calculate possible new value for wage rates 1 and 2
    - repeat the above until a solution is found
- specify a 'stopping criterion'
- choose a programming language and write a program to do the above

Chapter 4 tool: computer simulations



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- **Structural change; T, rho, delta, gamma, alpha, beta, L, phi**
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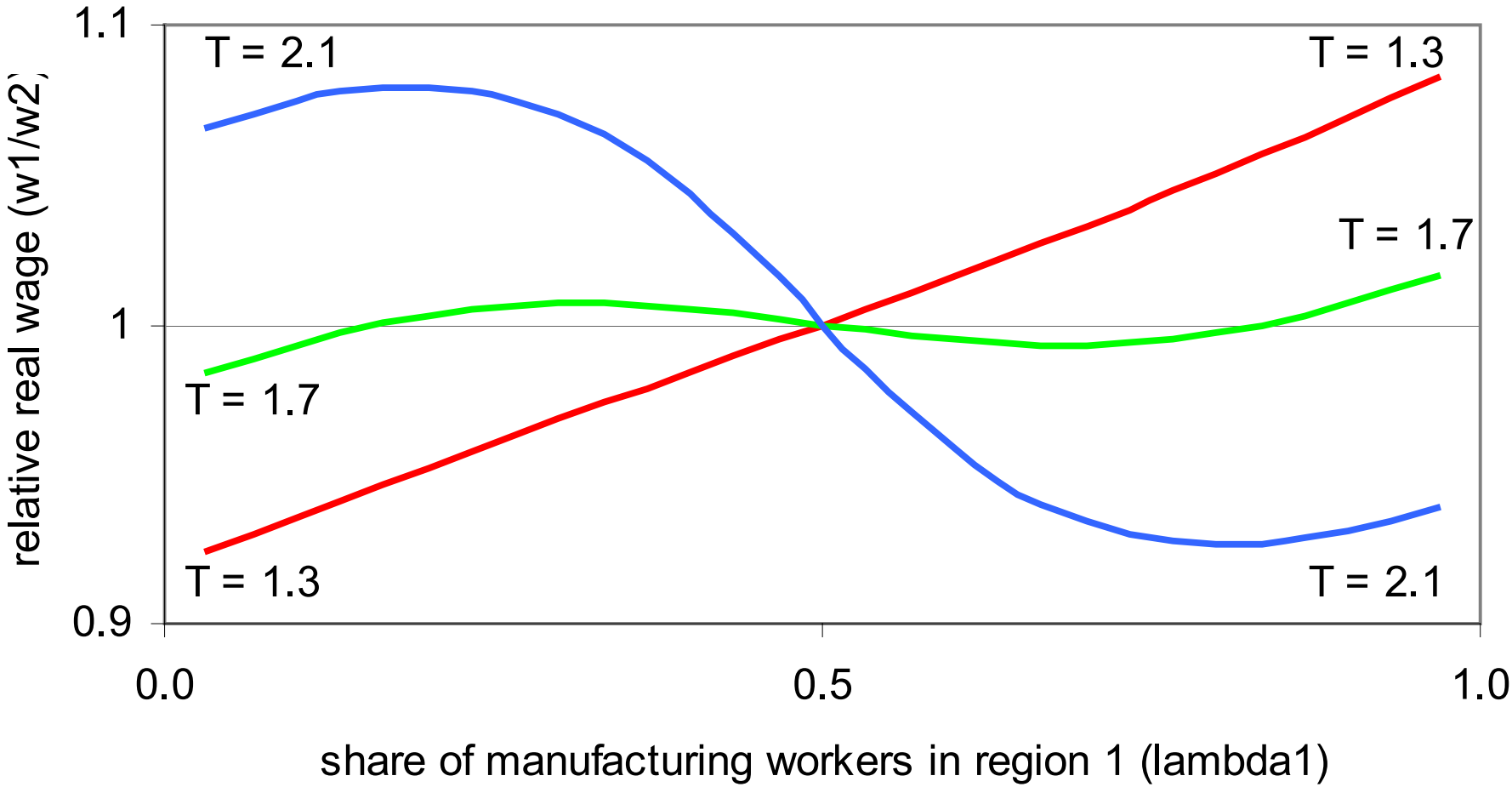
Chapter 4 tool: computer simulations



Krugman (1991): "it .. assumes that w1/w2 is a monotonic function .. or at least that it crosses one only once. In principle this need not be the case ... I have not been able to rule this out analytically."

Figure 4.2 The impact of transport costs

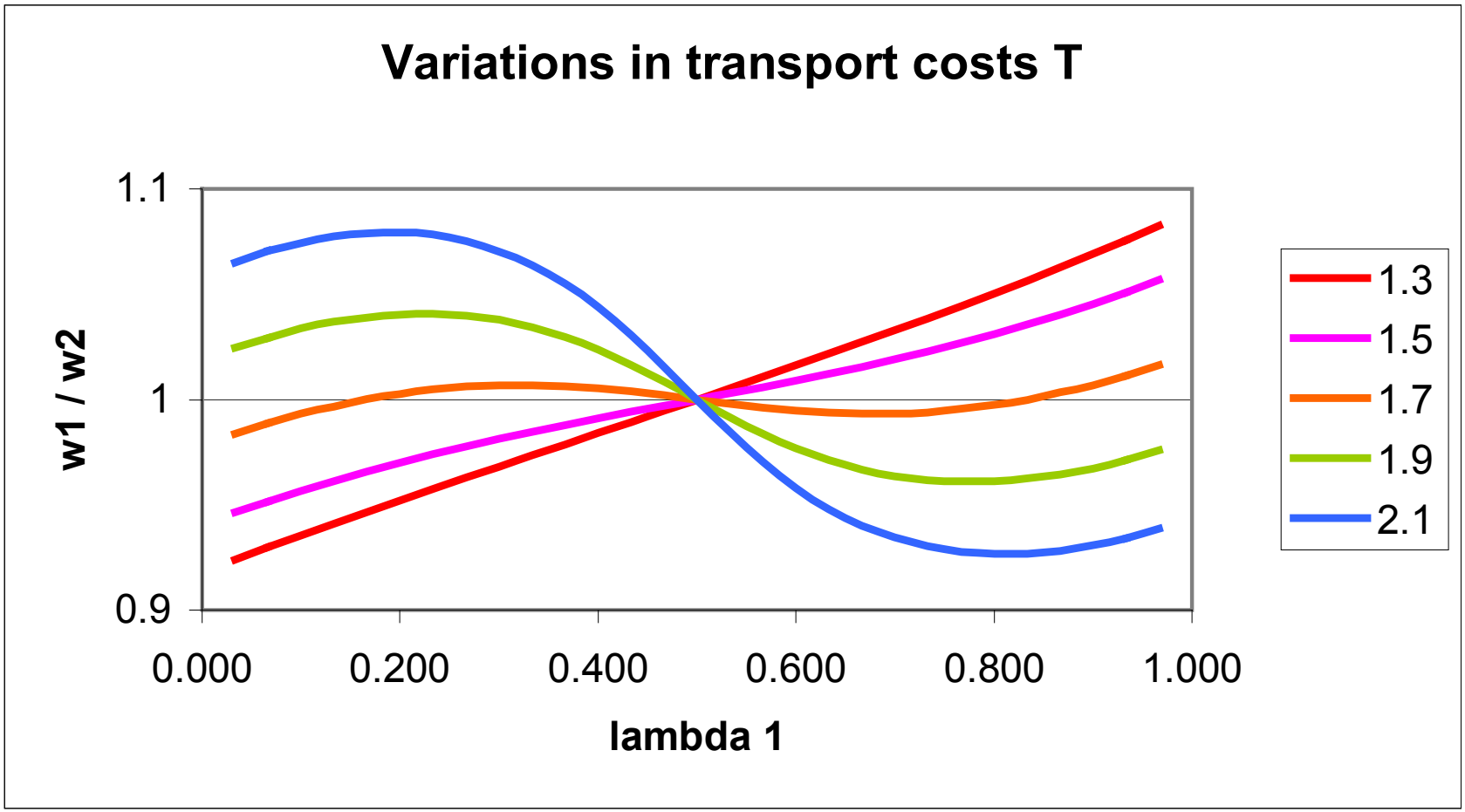


Figure 4.3 The impact of some parameters

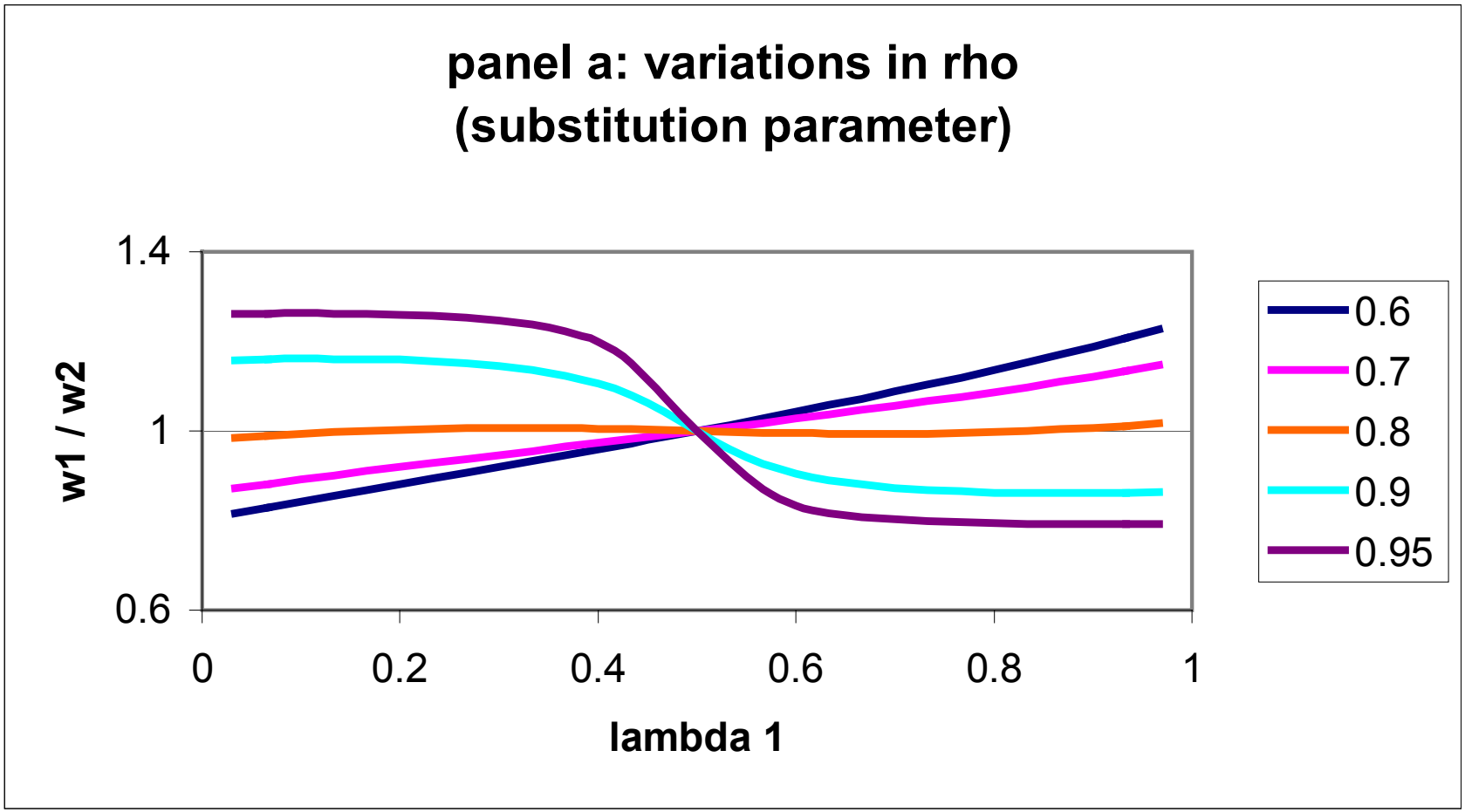


Figure 4.3 continued

Support site for the book:
http://www.few.eur.nl/few/people/vanmarrewijk/geography
link to Forslid simulation

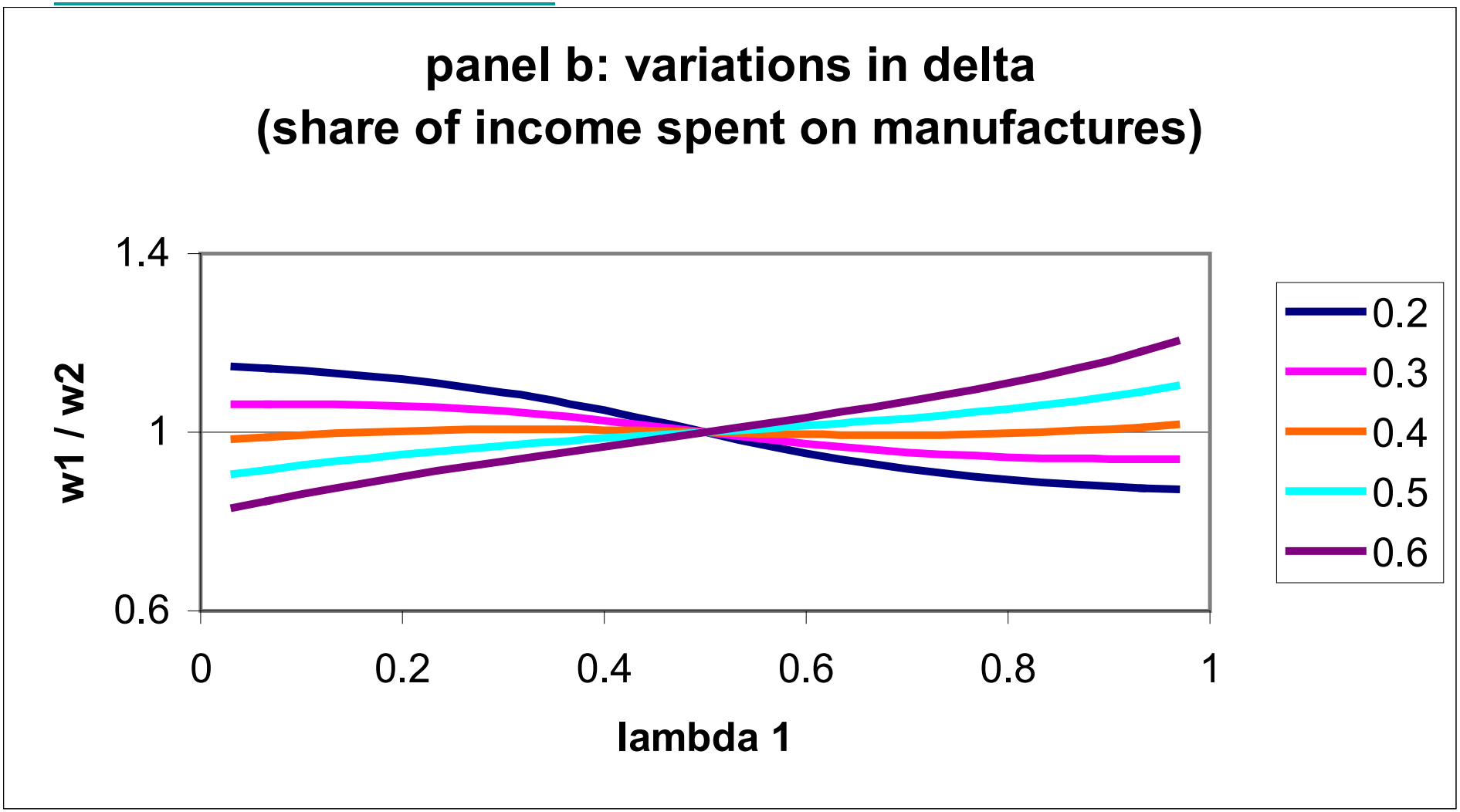
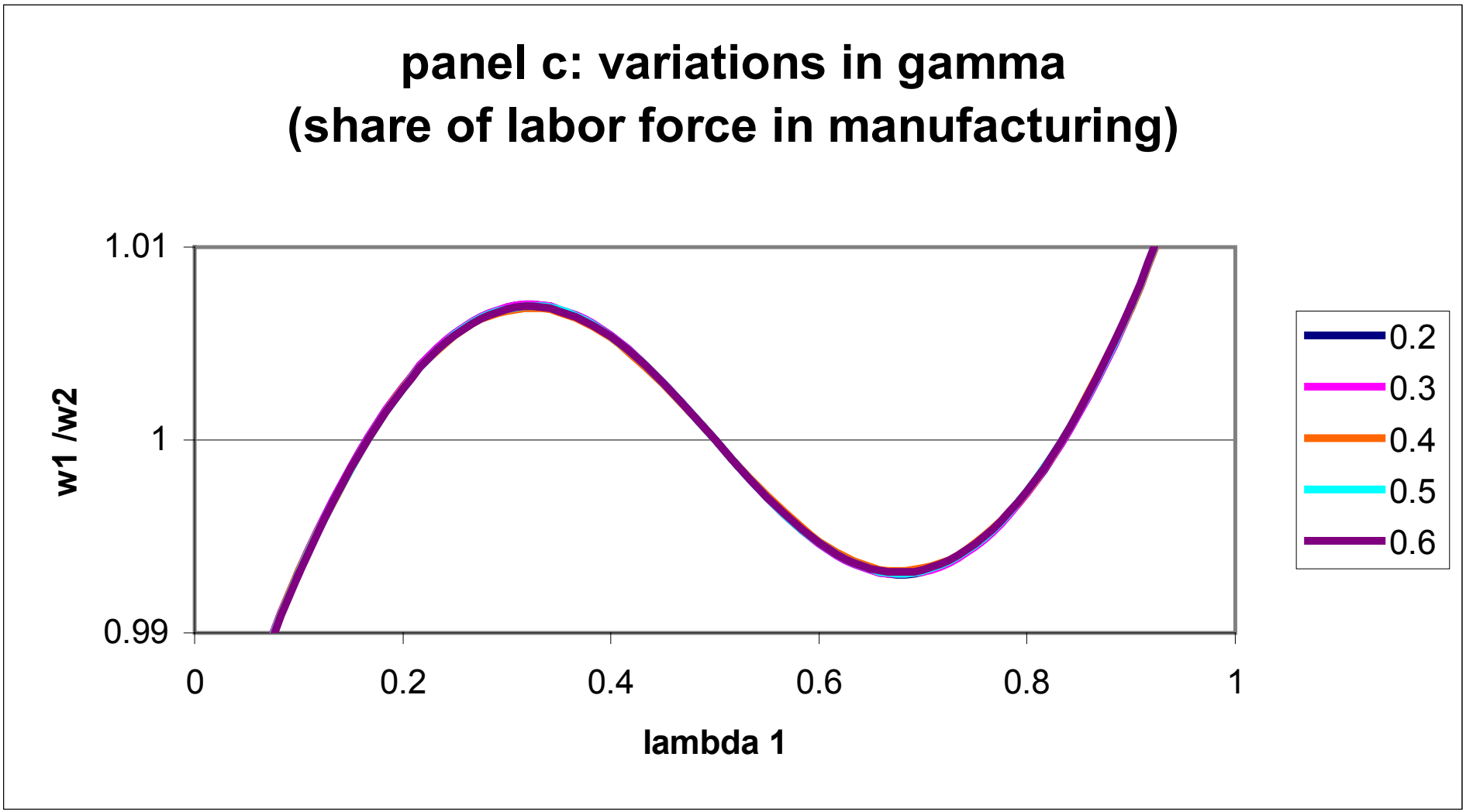


Figure 4.3 continued



alpha, beta, L: nothing happens in the figure; suggestion for analysis

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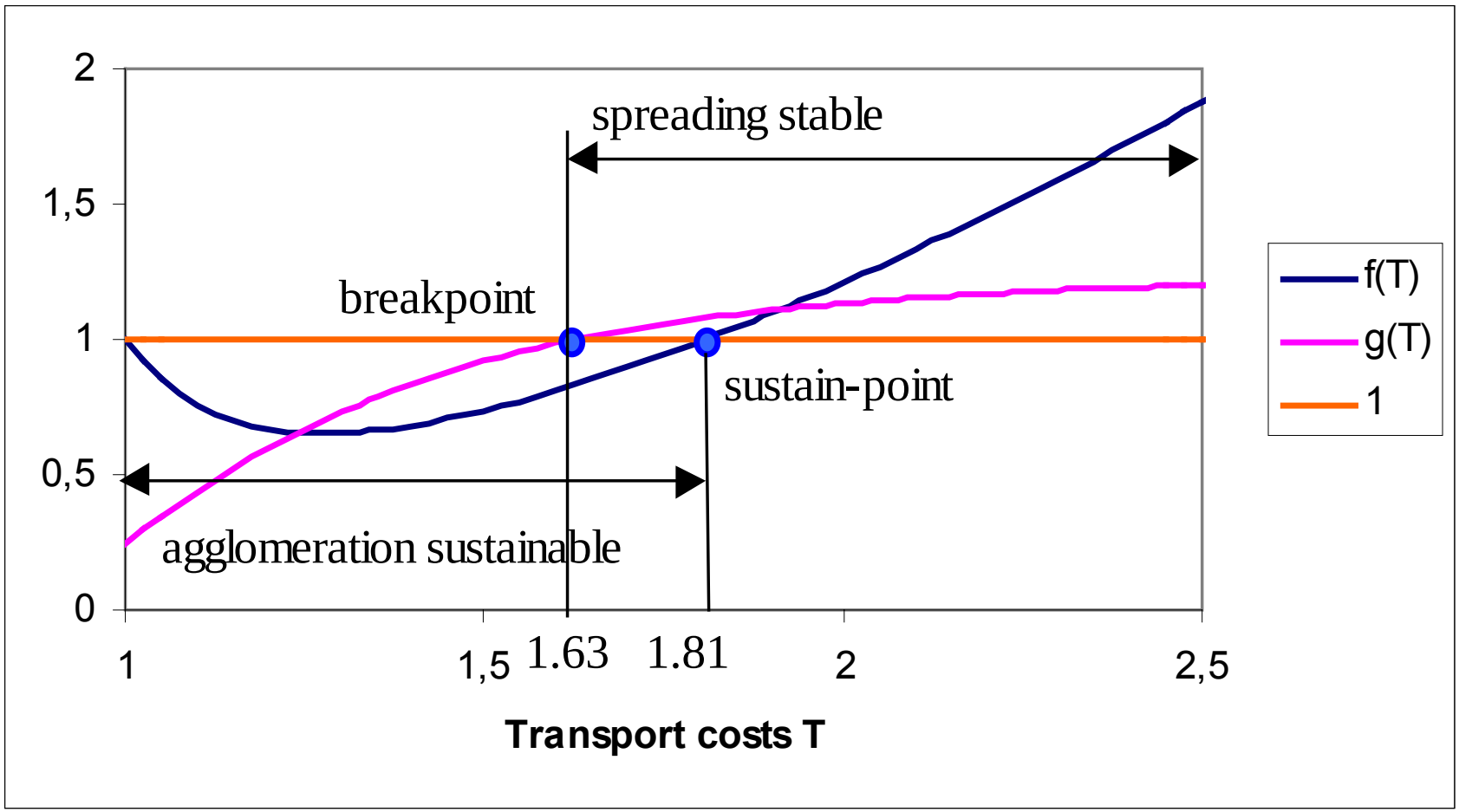
Important: ask the right questions

• The **sustainpoint** is that configuration of structural parameters for which agglomeration of economic activity ceases to be a stable equilibrium.
- Variables at agglomeration can be calculated. Determine implied real wage in periphery. Determine when this implied real wage is lower than in core. If so, sustainable. If not, not sustainable.
- no-black-hole condition (rho > delta)

• The **breakpoint** is that configuration of structural parameters for which spreading of economic activity ceases to be a stable equilibrium.
- Variables at spreading can be calculated. Suppose infinitesimal increase in lambda 1 (= infinitesimal decrease in lambda 2). Determine all changes (advantage: changes in 1 are exact opposite to changes in 2). Determine if real wage in 1 increases. If so, unstable. If not, stable.

Figure 4.4 Sustain-point and break-point I*



*For the parameters δ and ρ: see Table 4.1. Other parameters normalized, see Table 4.2. Note that the agglomeration equilibrium is sustainable if $f(T) < 1$, see equation (4.5), while the spreading equilibrium is stable if $g(T) > 1$, see equation (4.6).

Summary and hysteresis

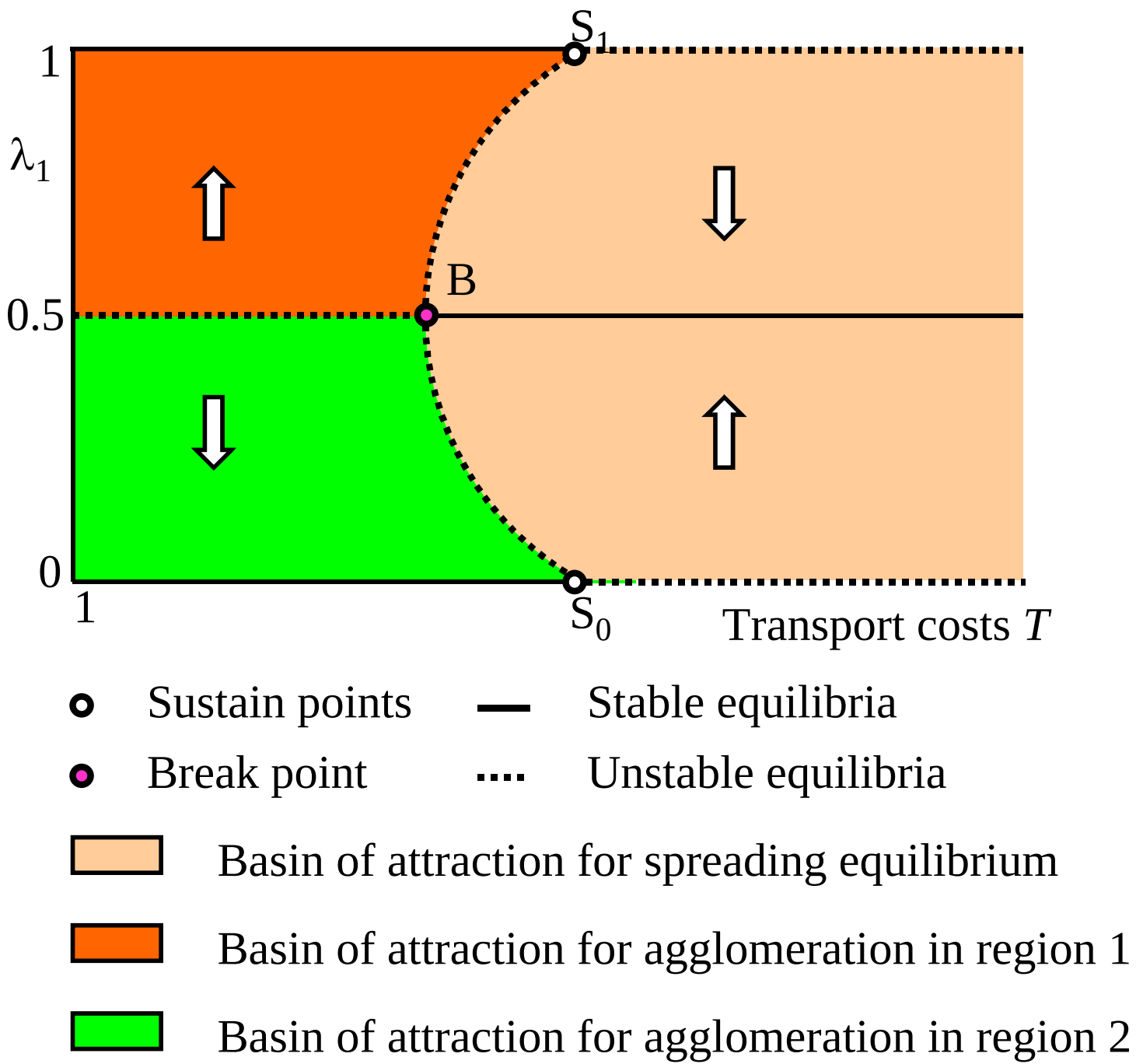


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Figure 4.6

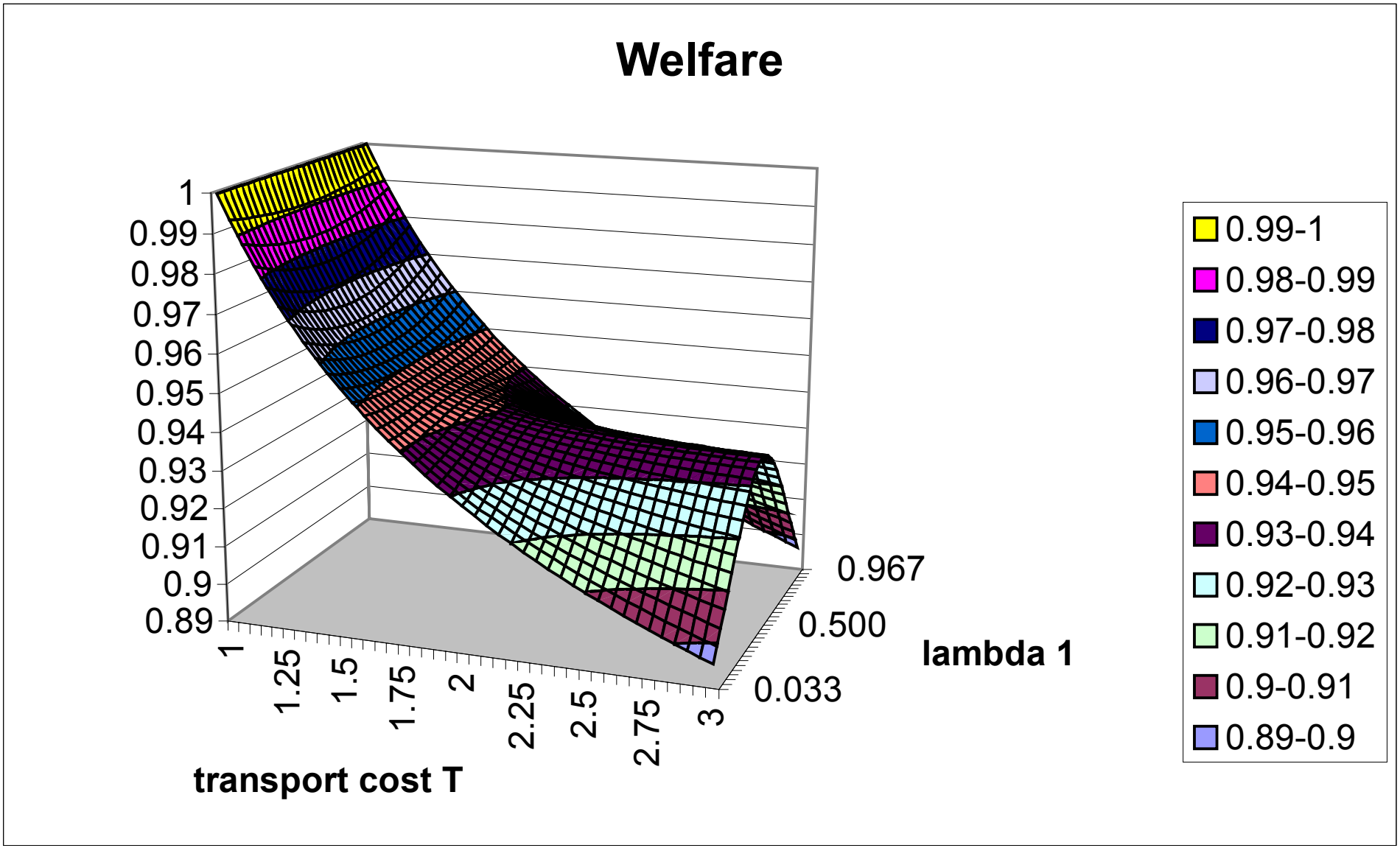
Welfare
1
0.99
0.98
0.97
0.96
0.95
0.94
0.93
0.92
0.91
0.9
0.89
1
1.25
1.5
1.75
2
2.25
2.5
2.75
3
transport cost T
0.967
0.500
0.033
lambda 1
0.99-1
0.98-0.99
0.97-0.98
0.96-0.97
0.95-0.96
0.94-0.95
0.93-0.94
0.92-0.93
0.91-0.92
0.9-0.91
0.89-0.9

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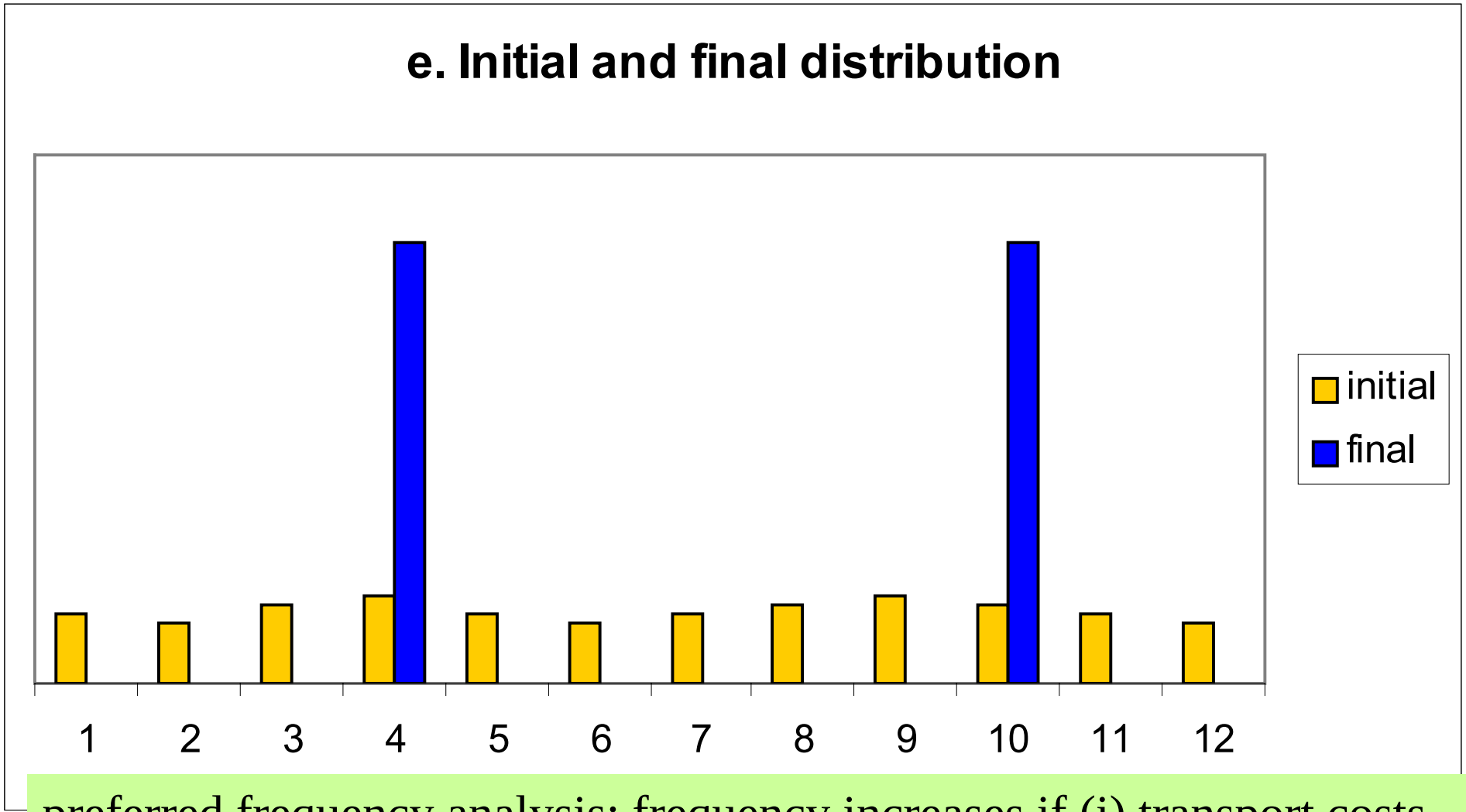
Figure 4.10 continued



preferred frequency analysis; frequency increases if (i) transport costs increase (ii) share of income spent on manufactures decreases, (iii) the elasticity of substitution increases.

Conclusions

Combining various international economic theories with factor mobility provides a simple theory of location and agglomeration.

Distinction short-run equilibrium (given distribution of the manufacturing labour force) and long-run equilibrium (endogenously determined by equality of real wages).

Distinction stable equilibrium and unstable equilibrium.

Using computer simulations:

- high transport costs lead to spreading of economic activity
- low transport costs lead to agglomeration of economic activity
- intermediate transport costs lead to multiple long-run equilibria

Extensions of the basic model can explain empirical regularities, such as Zipf's Law and the Gravity Equation and economic viability of small industrial centers.

Empirical Evidence NEG

- Why testing is so difficult
- Example of estimating a NEG model
- An actual test: the Strategic Bombing of German cities during WW II

Empirical research NEG

Three Examples

- Agglomeration and factor prices (spatial wage structure)
- Trade costs and agglomeration
- Large shocks and stability of equilbria
- [Policy Implications]

Puga 1999 model

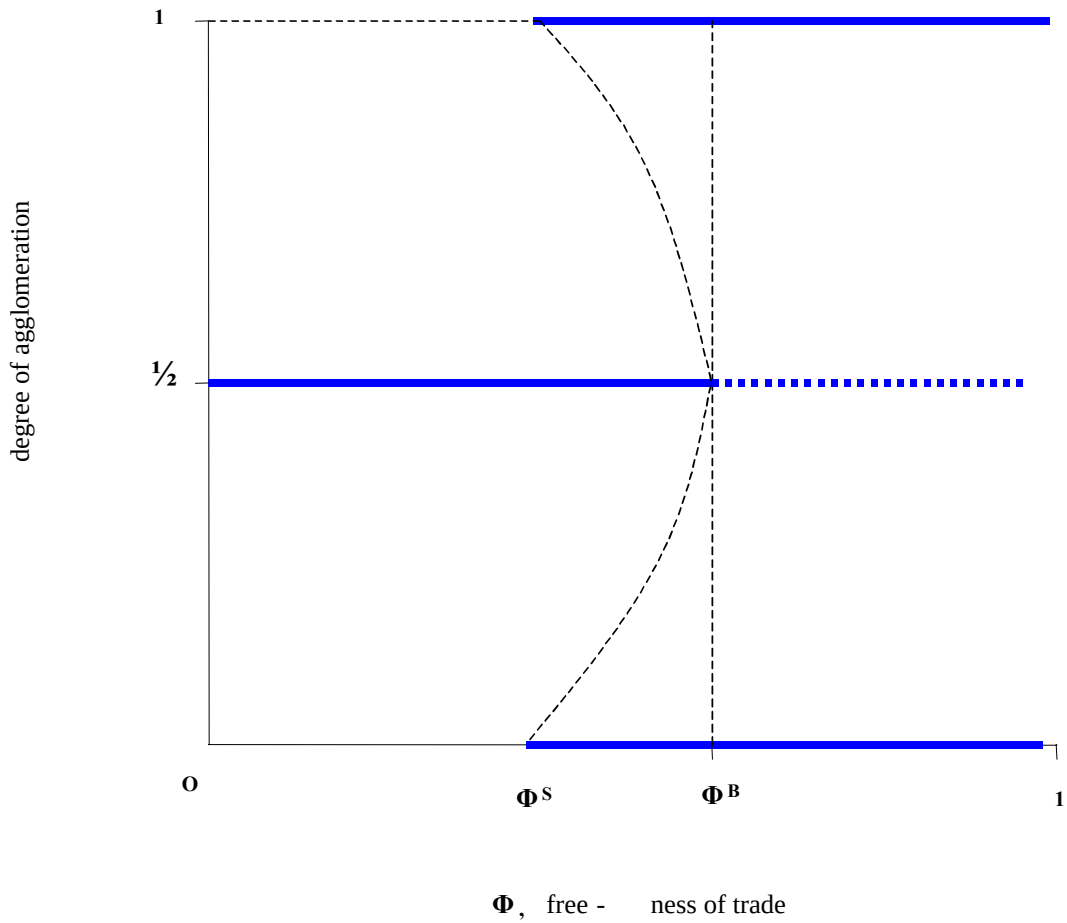
- Crucial : interregional labor mobility?
- Imperfectly elastic intraregional labor supply
- Equilibr. wage equation (**looks familiar!)**

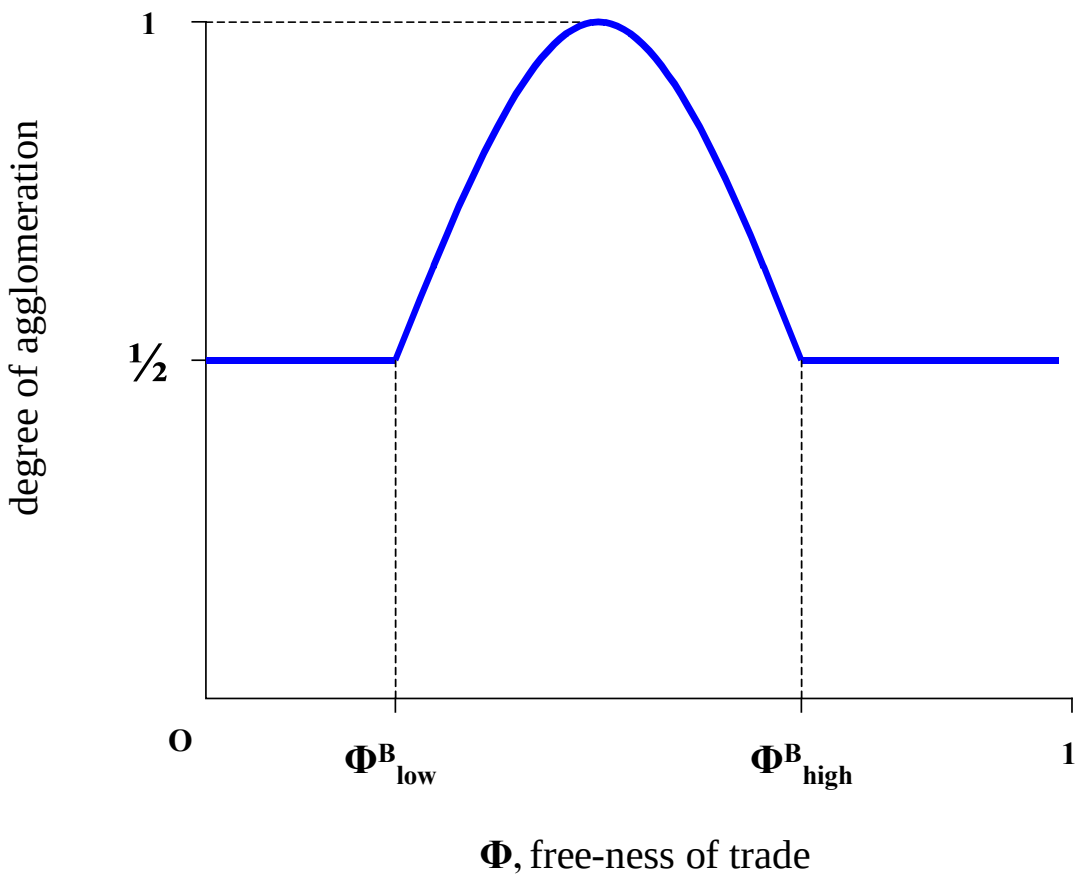
$$W_r = Const\left\{I_r\right\}^{-\mu/(1-\mu)}\left[\sum_s Y_s I_s^{\varepsilon-1} T_{rs}^{(1-\varepsilon)}\right]^{1/\varepsilon(1-\mu)}$$

agglomeration

- a)Interregional labor mobility: Tomahawk
- b) No interregional labor mobility: possibility of Bell Shaped Curve
- Ad b) Crux: spreading force independent from level of φ
- a+b: analytical expression break points

$\phi_{rs} = \tau_{rs}^{1-\varepsilon}$

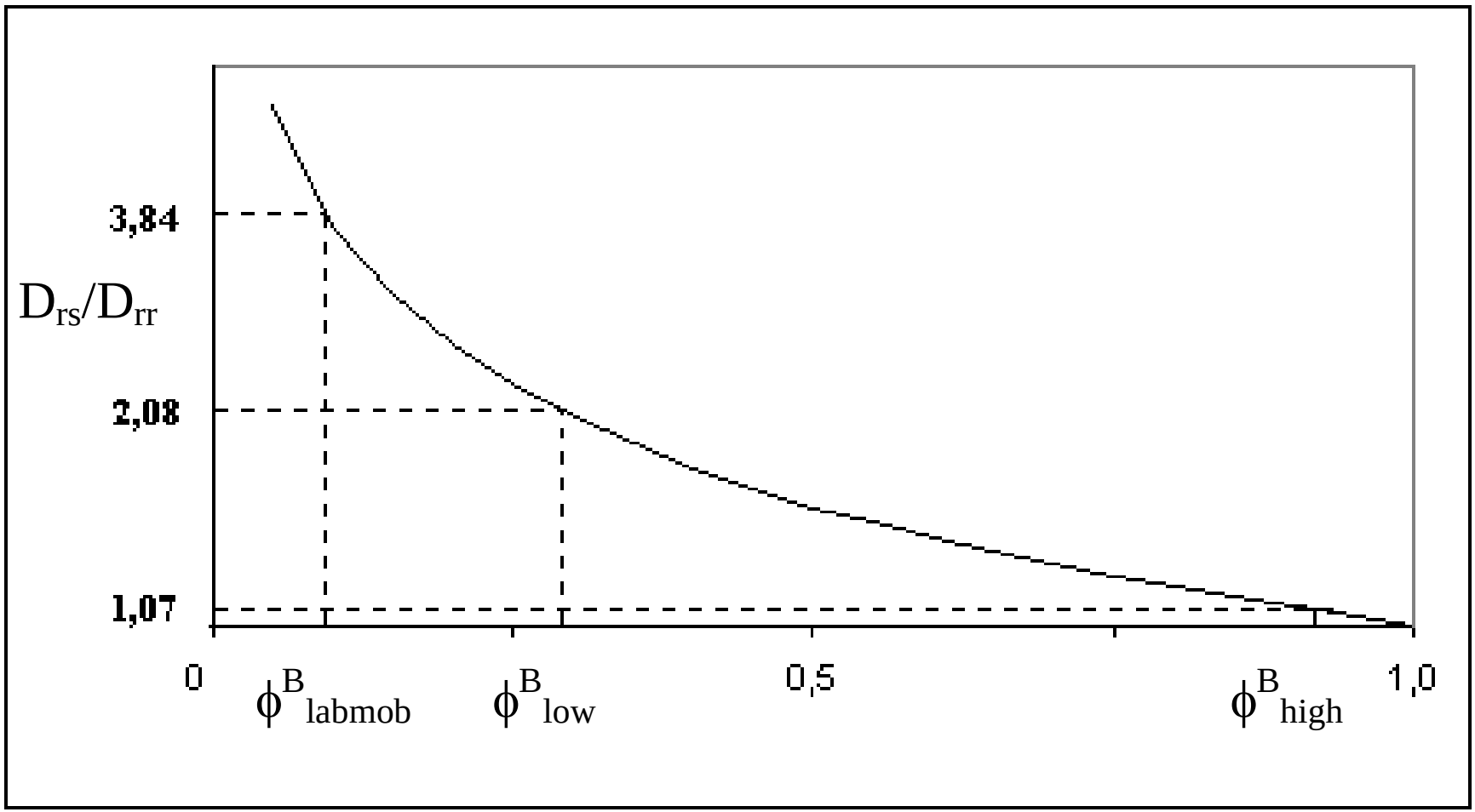

1
½
O
Φ S
Φ B
1
degree of agglomeration
Φ , free - ness of trade

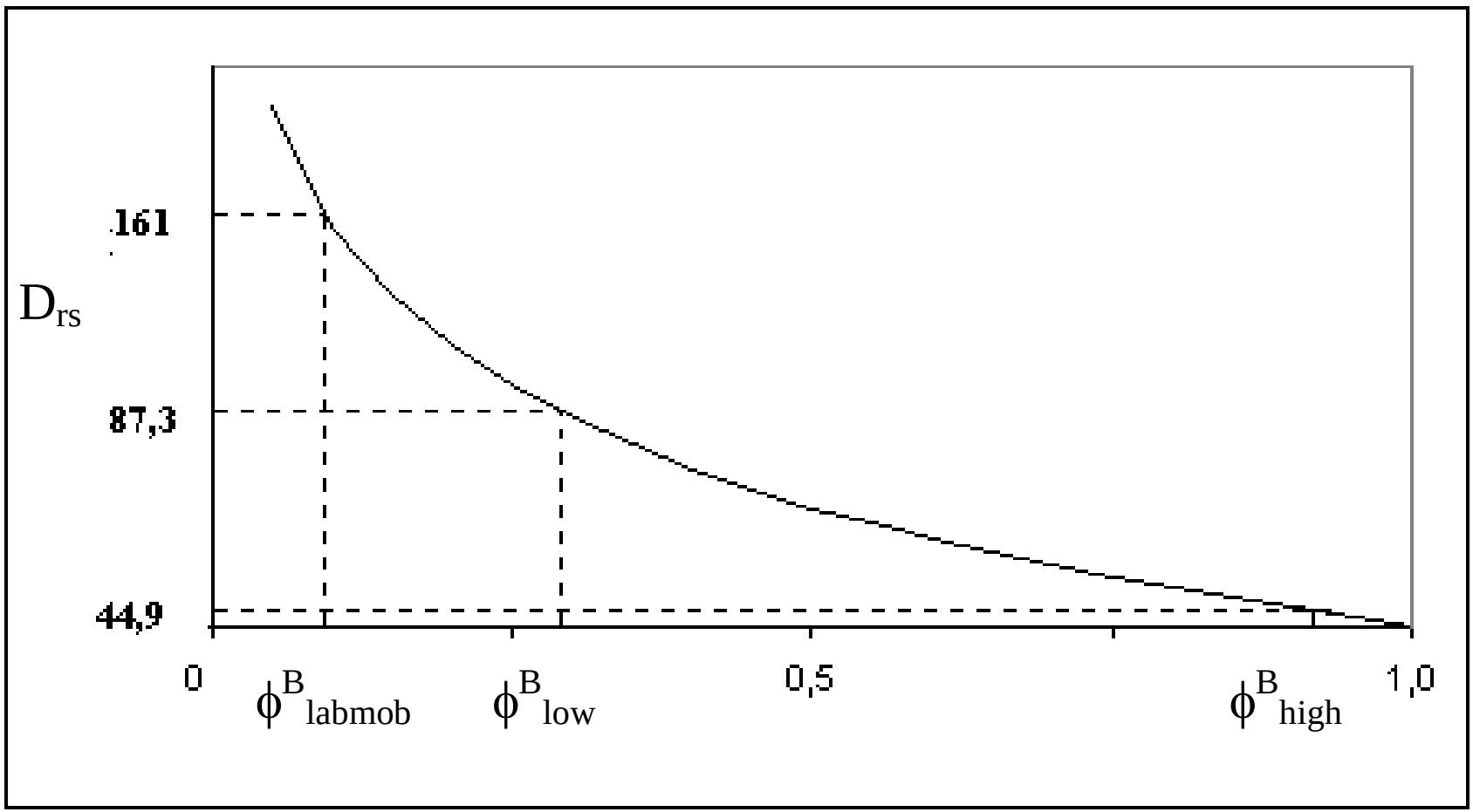

1
½
degree of agglomeration
O
Φ^B_{low}
Φ^B_{high}
1
Φ, free-ness of trade

	Levels, WLS 2 SLS
Variable: ε	9,53 (16.9)
Variable: γ	0.19 (22.1)

Estimated φ meets φ-break

- -Given ε,γ and Drr: φ falls quickly when Drs↑
- -Break points: 1) do not depend on distance specification ; 2) only function of model parametrs: ε η μ δ
- -*Given value of φ-break and our estimates: what are corresponding threshold distances??*


3,84
D_{rs}/D_{rr}
2,08
1,07
0
ϕ^{B}_{labmob}
ϕ^{B}_{low}
0,5
ϕ^{B}_{high}
1,0


161
87,3
44,9
D_{rs}
0
ϕ^B_{labmob}
ϕ^B_{low}
0,5
ϕ^B_{high}
1,0

Interpretation of results

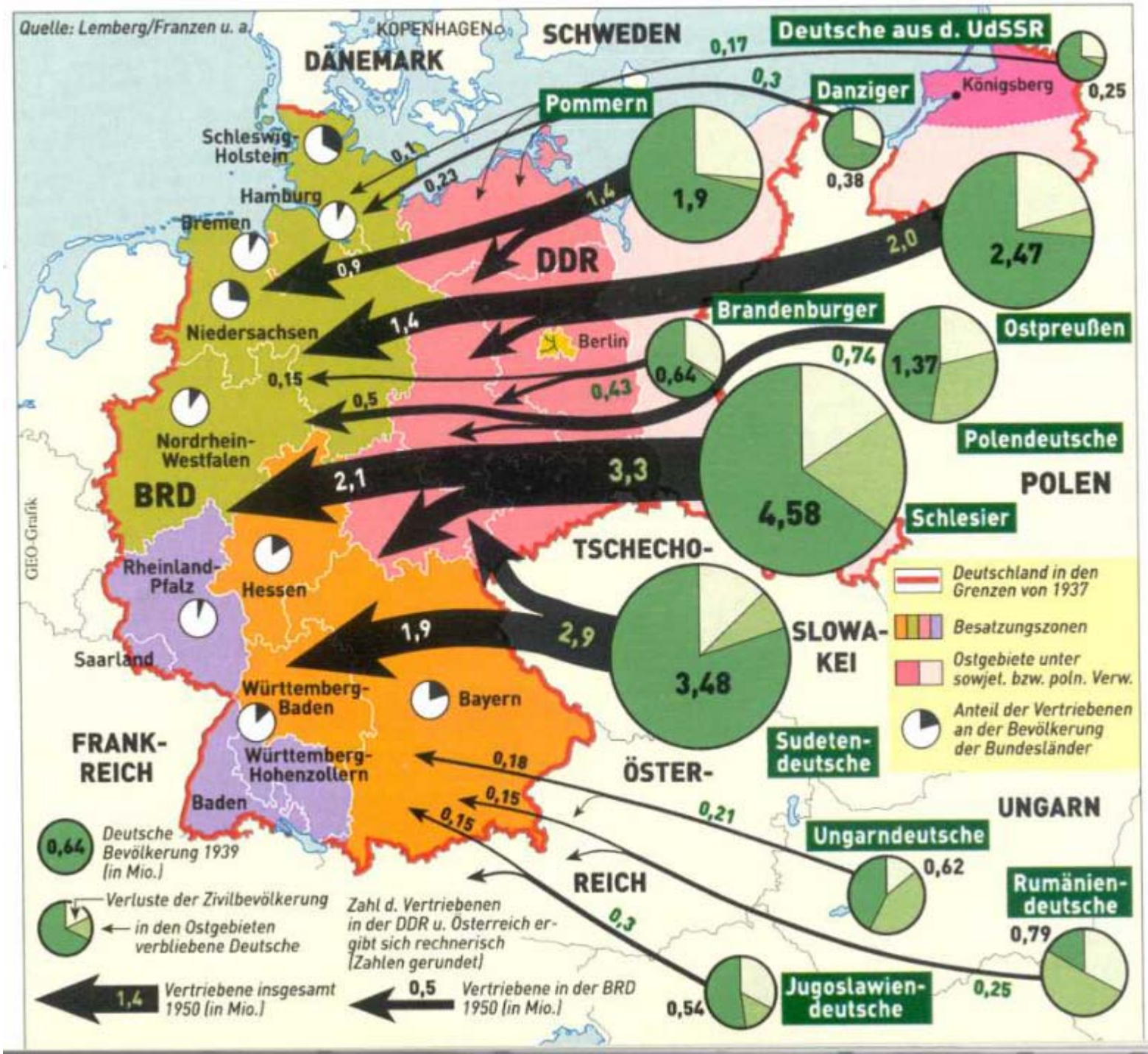
- -Compare threshold distances to “real world” distances: *agglomeration forces are localized*
- - What do other studies find?

- Recall: Puga model is 2 region model!!

Conclusion

- Agglomeration forces appear to be localized
- How to proceed?
- Better models……..
- Better testing…….
- An Example: The Strategic Bombing of German Cities during WW II

WHAT IS THE RELEVANCE OF NEG? AN EXPERIMENT


Quelle: Lemberg/Franzen u. a.
KOPENHAGEN
DÄNEMARK
SCHWEDEN
Deutsche aus d. UdSSR
0,17
0,25
Königsberg
Danziger
0,3
0,38
Pommern
1,9
Schleswig-Holstein
0,1
0,23
Hamburg
Bremen
1,4
0,9
DDR
2,0
2,47
Brandenburger
Ostpreußen
Niedersachsen
1,4
Berlin
0,64
0,74
1,37
0,15
0,43
0,5
Nordrhein-Westfalen
Polendeutsche
3,3
POLEN
BRD
2,1
4,58
Schlesier
TSCHECHO-
Rheinland-Pfalz
Hessen
1,9
2,9
SLOWA-KEI
3,48
Saarland
Württemberg-Baden
Bayern
FRANK-REICH
Württemberg-Hohenzollern
0,18
0,15
0,15
ÖSTER-
Sudeten-deutsche
0,21
UNGARN
Ungarndeutsche
0,62
Baden
REICH
0,3
Rumänien-deutsche
0,79
0,25
0,54
Jugoslawien-deutsche
GEO-Grafik
Deutschland in den Grenzen von 1937
Besatzungszonen
Ostgebiete unter sowjet. bzw. poln. Verw.
Anteil der Vertriebenen an der Bevölkerung der Bundesländer
0,64
Deutsche Bevölkerung 1939 (in Mio.)
Verluste der Zivilbevölkerung
in den Ostgebieten verbliebene Deutsche
Zahl d. Vertriebenen in der DDR u. Österreich ergibt sich rechnerisch (Zahlen gerundet)
1,4
Vertriebene insgesamt 1950 (in Mio.)
0,5
Vertriebene in der BRD 1950 (in Mio.)

$$s_{i,1946+t} - s_{i,1946} = \alpha(s_{i,1946} - s_{i,1939}) + \beta_0 + error_i$$

α = -1, indicates a war effect,

α = 0, indicates a random walk

	α	β_0	Adj. R^2
West, t=4	-0.42 (-4.03)	0.01 (0.35)	0.20
West, t=17	**-0.52 (-5.47)**	0.05 (1.87)	0.40
East, t=4	0.05 (0.88)	0.007 (0.48)	<0
East, t=18	**0.003 (0.02)**	0.11 (2.53)	<0
East+West t=18	**-0.40 (-4.91)**	0.07 (2.91)	0.13

CONCLUSION: For West, a temporary effect=>?