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Measuring dynamic market selection: the case of EU business services

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Structure

- **European business services: large industry with a productivity problem**
  - ☐ **is deficient competition the cause?**

- **Quantifying dynamic selection in markets**
  - ☐ **market as moving firm distribution**
  - ☐ **without and with scale economies**

- **Environment factors that affect market selection**
  - ☐ **Regulation affecting entry/exit costs and firm growth**
  - ☐ **Market contestability (entry, imports)**

European business services as case study

- **Large industry**
  - ❑ fabulous employment growth between 1990-2005
  - ❑ now: employment share close to manufacturing or even larger
  - ❑ about 50% of employment is in knowledge-intensive sub-sectors
  - ❑ one of the largest providers of intermediary inputs for the rest of the economy

- **But: ... with stagnating productivity growth since 1980**
  - ❑ single largest contribution to the 1995-2007 gap in labour productivity growth between EU25 and the USA
  - ❑ knowledge-intensive business services did not perform better
  - ❑ country pattern is fairly similar in most countries, but some USA and UK performed better (positive productivity growth)
  - ❑ several sub-sectors with zero or negative TFP growth: may indicate <u>badly functioning markets</u>

Effectiveness of competitive selection

- **Market process itself is too complex to quantify**
  - ☐ constant turbulence: market reallocation, entry, exit
  - ☐ many dimensions of firm behaviour
  - ☐ actions by individual fims cannot or at best partly be observed
  - ☐ causality problems in behaviour: independent actions, reactions, anticipations, inertness
  - ☐ external shocks for the market (macroeconomics, regulation, globalisation, technology)

- **Better to focus on <u>outcomes</u> of the market process: characteristics of changes in firm distribution between t_0 and t_1**

- **Theory : average efficiency in effective markets should increase over time (perfect competition, monopolistic competition)**
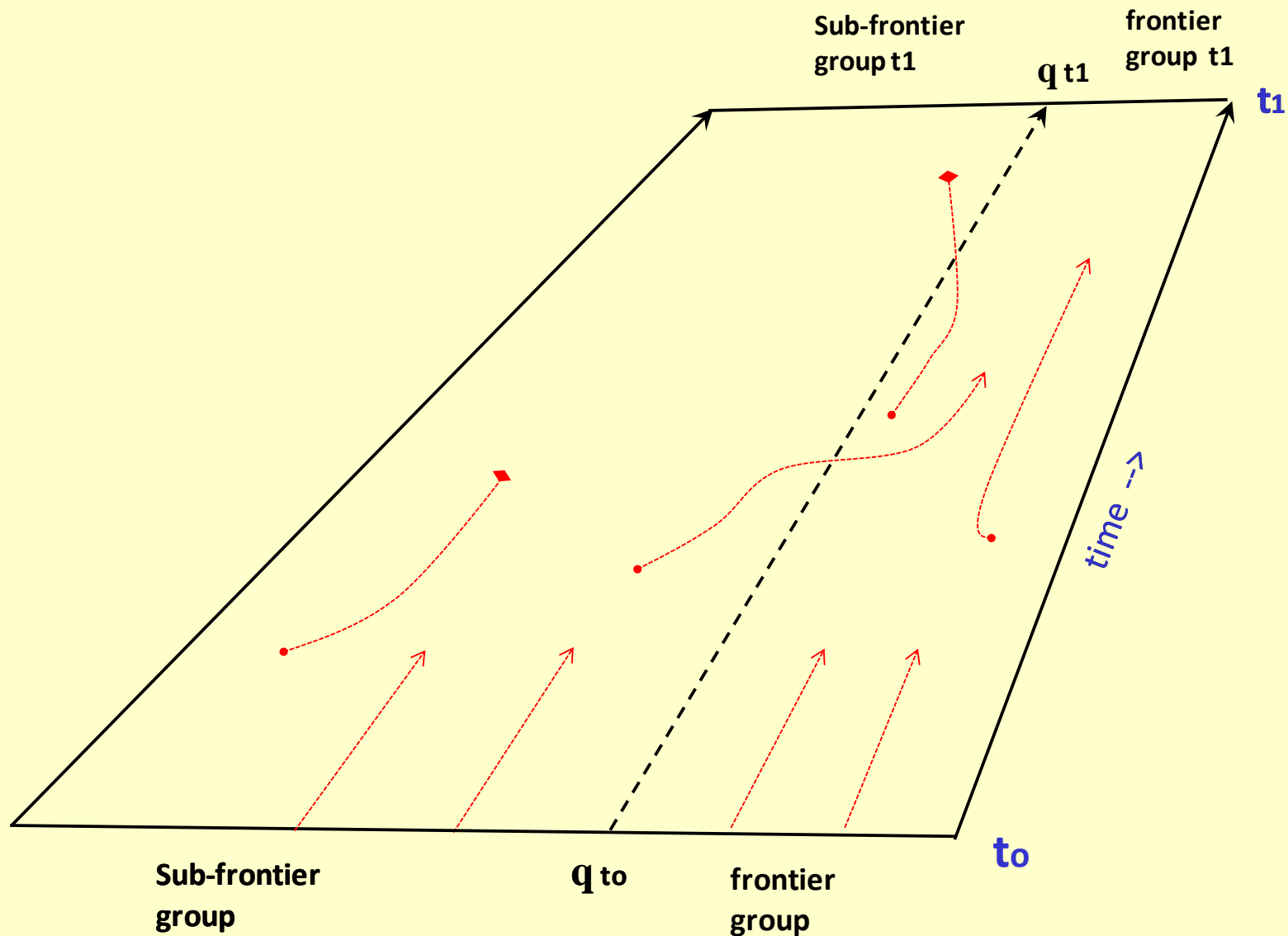
Mickey Mouse market model

- **Suppose the ONLY observables of firms in a market are:**
  - ☐ firm identity
  - ☐ an efficiency parameter of each firm (e.g. productivity, TFP) at t_0 and t_1

- **This allows:**
  1. **ranking of performance**
     - ☐ **frontier (frontier group, sub-frontier group)**
     - ☐ **size frontier gap**
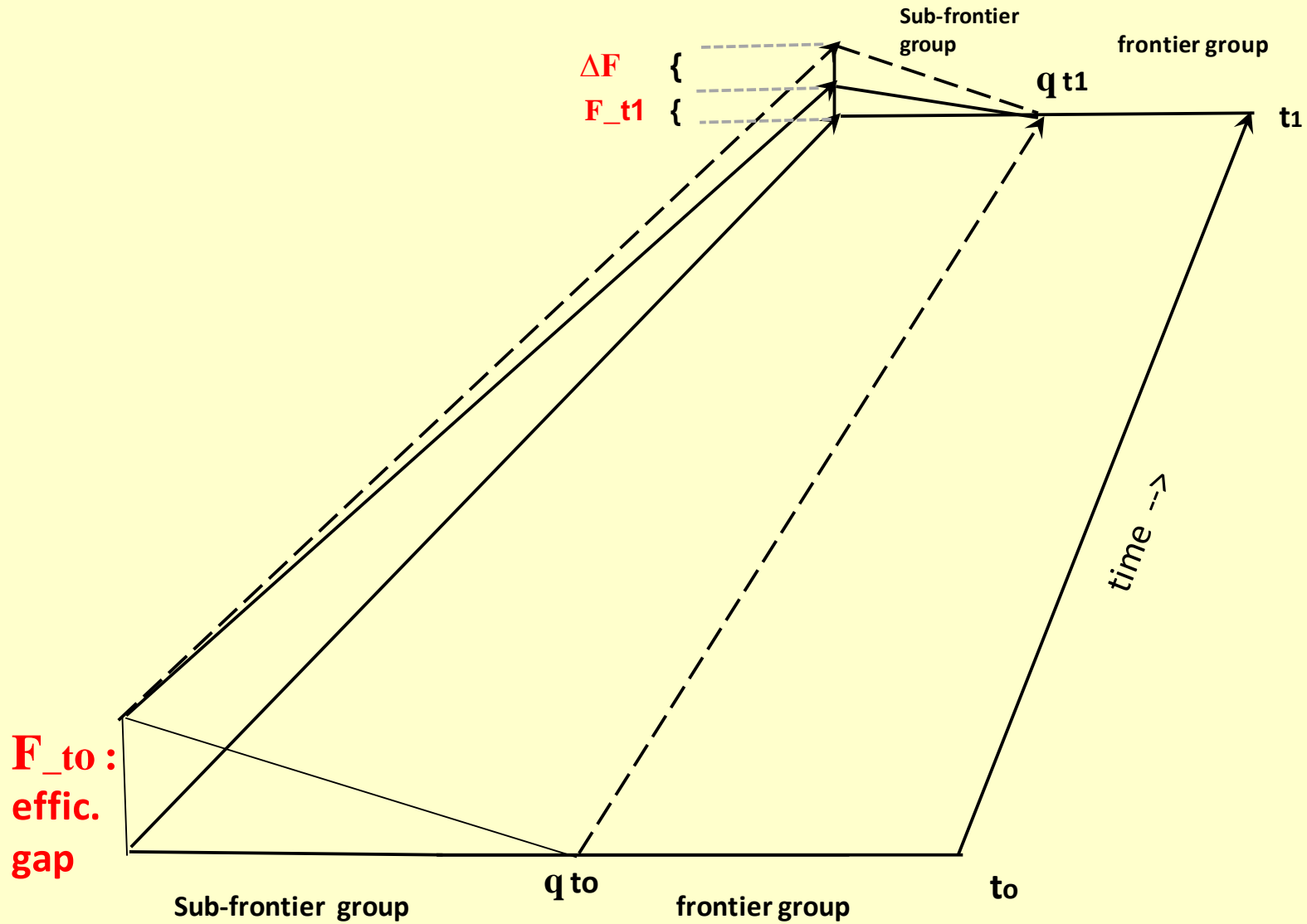 2. **comparing performance at t and t+1**
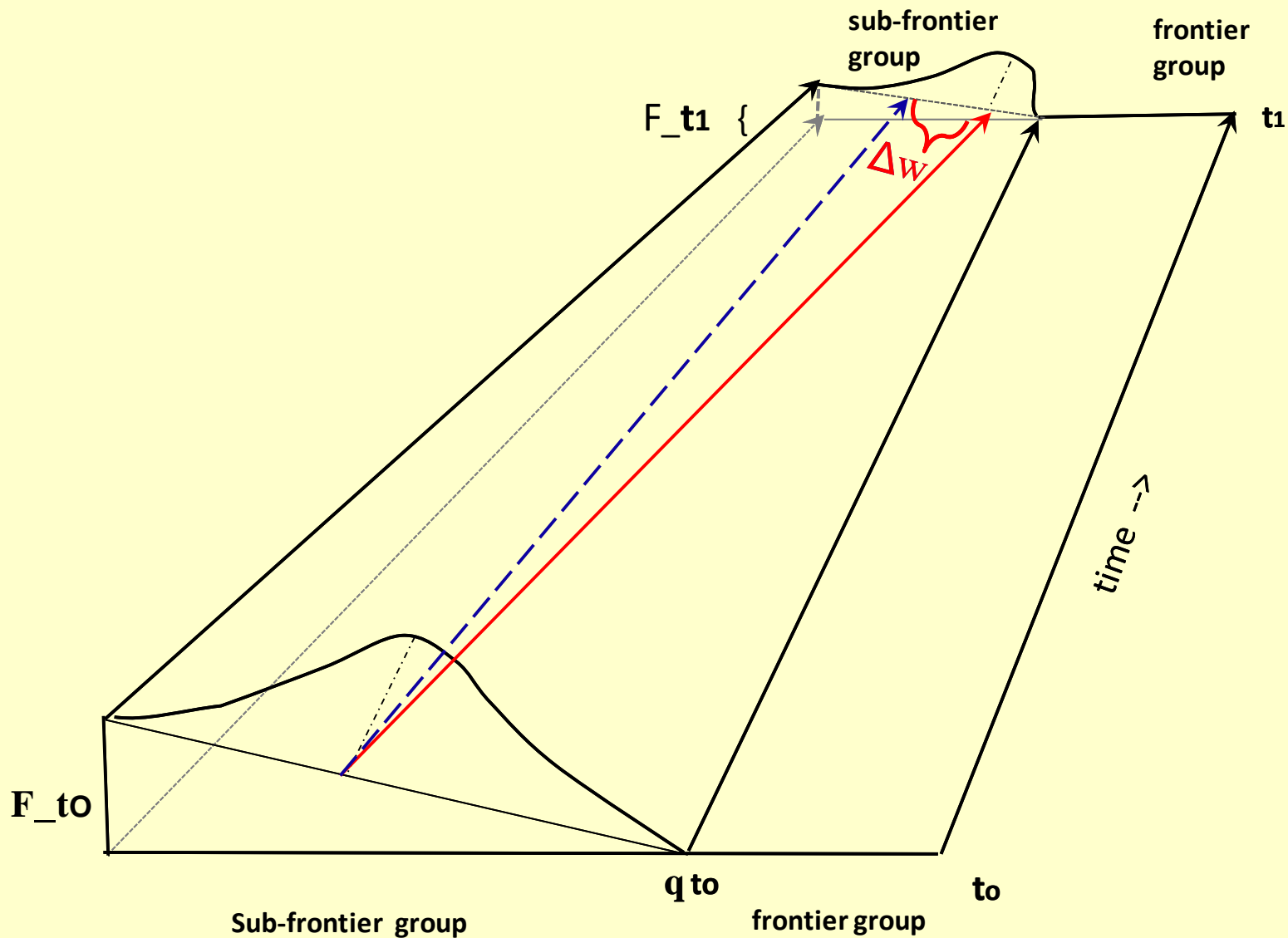
Market = firm distribution moving over time
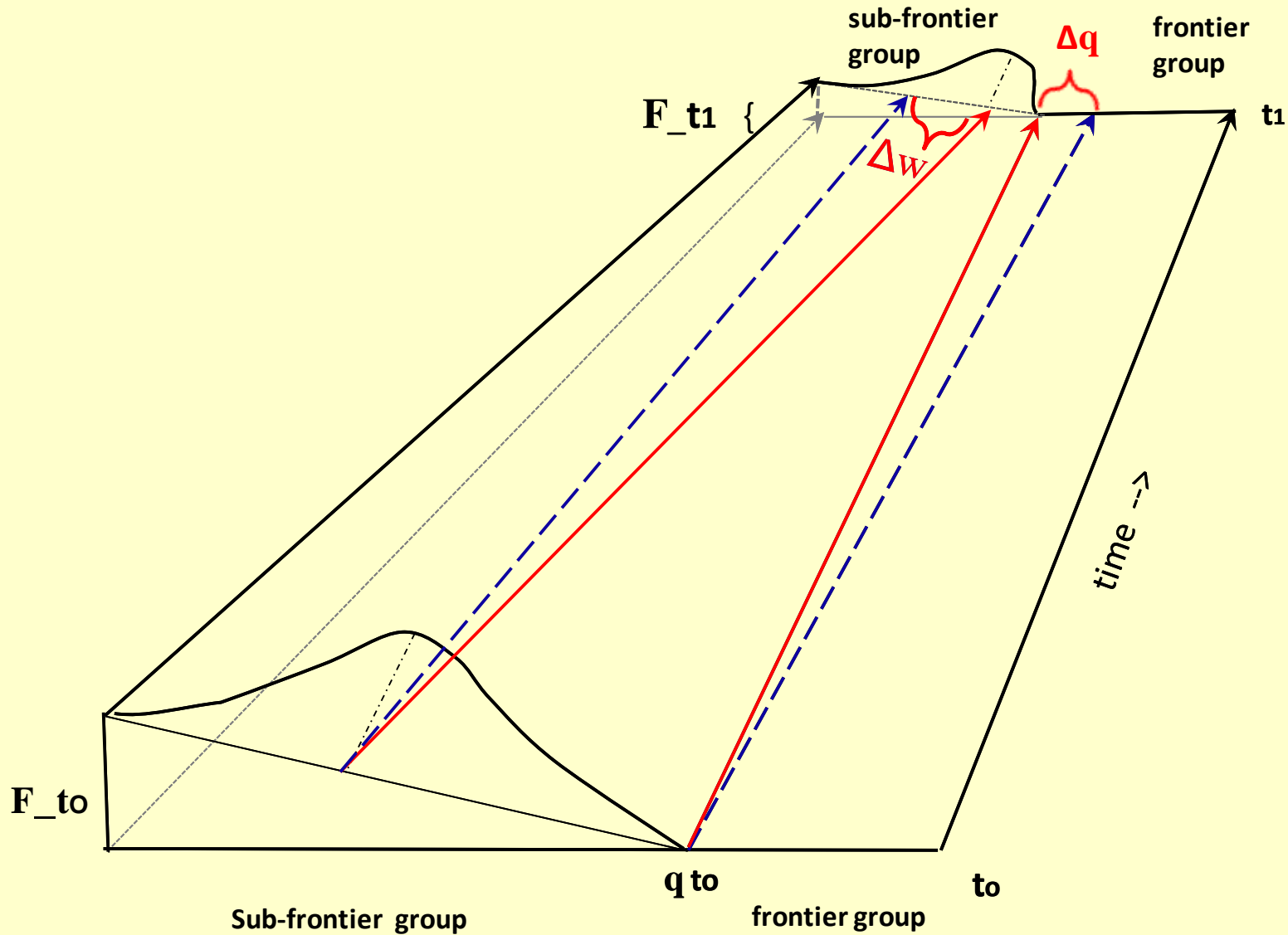
1ˢᵗ dynamic: shift in frontier group share
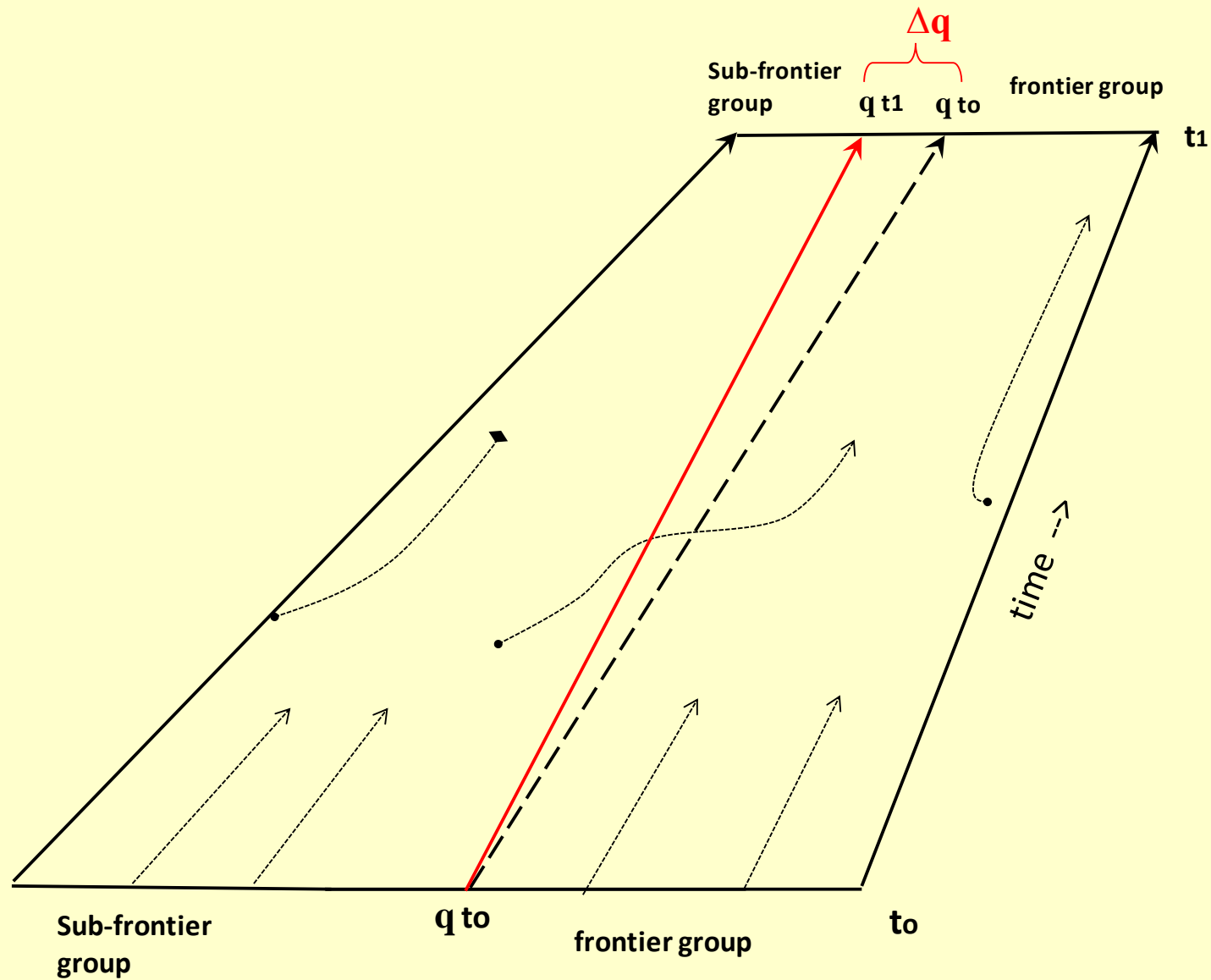
frontier gap change: additional dimension

2nd dynamic: change in frontier gap distribution

Both dynamics combined: EMSI (indicator)

Quantifying competitive selection

- **Effective competitive selection in a market should increase general efficiency performance through:**
    1. Larger groups of firms at the efficiency frontier, and/or
    2. Smaller median frontier gap of non-frontier firms, and/or
    3. Upward shift of frontier itself (possibly effect of competition)

- **EMSI is a simple measure for effectiveness of market selection between t0 and t1 :**

$$EMSI = q_{t0}.\,\Delta q \; + \; (1 - q_{t0})\,(-\,\Delta w)$$

with initial frontier group share q_t0 as a plausible weight

☐ correction for frontier shift is necessary if Δt is large

Data

- **Microdata for international comparative research**
    - ☐ **always a problem**
    - ☐ **mostly : no good representation of small firms (often 90-95%)**

- **Use Eurostat panel data by data cell**

    {*country* x *industry* x *sizeclass* x *year*}

    includes sales, value added, depreciation, employment, number of firms per cell
    - ☐ **13 EU countries, 1999-2005**
    - ☐ **5 size classes, 8 industries (homogenised)**
    - ☐ **(n = 2696)**

- **allows to calculate representative firms by data cell**
    - ☐ **but also tells something about <u>intra-cell distribution</u> using finding that Zipf distribution characteristics apply (cf. Axtell 2001)**

'Zipf'-like size distribution of BS firms in EU, 1999 (size measured by employed persons, log-log scale)

$$y = 13.98 - 1.055\,x$$
$$R^2 = 0.9496$$

log frequency

log firm size EU business services 1999
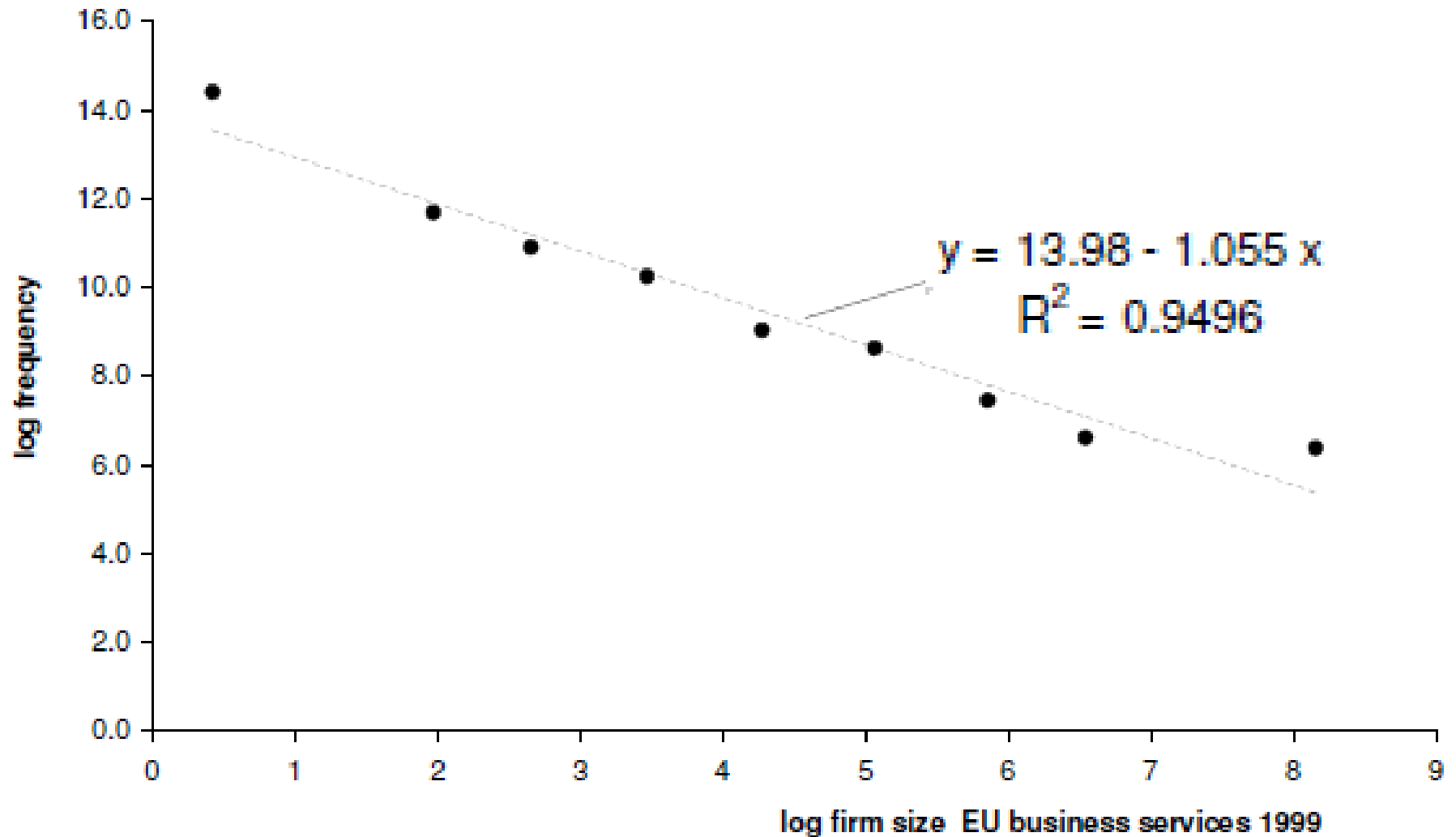
EMSI calculated for EU business services
13 countries, 8 sub-sectors (3-digit), 1999-2005

| Industry	share frontier group in 1999	Δ share frontier group	Δ median frontier gap	EMSI for period 1999-2005
Computer/IT services	**0.036**	**+0.018**	**−0.069**	**+0.067**
Legal, auditing, accounting, consultancy	**0.077**	**−0.015**	**+0.134**	**−0.125**
Architectural, engineering, technical services	**0.092**	**−0.046**	**+0.200**	**−0.186**
Marketing services	**0.035**	**+0.035**	**−0.037**	**+0.037**
Labour recruitment	**0.077**	**+0.046**	**−0.072**	**+0.070**
Industrial cleaning	**0.095**	**−0.016**	**−0.037**	**+0.032**
Security services	**0.154**	**−0.031**	**−0.065**	**+0.050**
Miscellaneous bus. services	**0.031**	**+0.047**	**−0.166**	**+0.162**

First results on competion effectiveness

- **EMSI indicates largest problems in sub-sectors**
  - ☐ **K741 (legal, administrative, accounting, consulting)**
  - ☐ **K742-2 (architects, engineering services)**
  - ☐ **Both are also sub-sectors with worst productivity growth performance**

- **Requires further investigation:**
  - ☐ **refined market demarcation (e.g. 5-digit) : *no data......!!***
  - ☐ **possible role for scale effects :**
    - o non-homogeneous technology across size classes?
    - o role growth barriers between size classes?
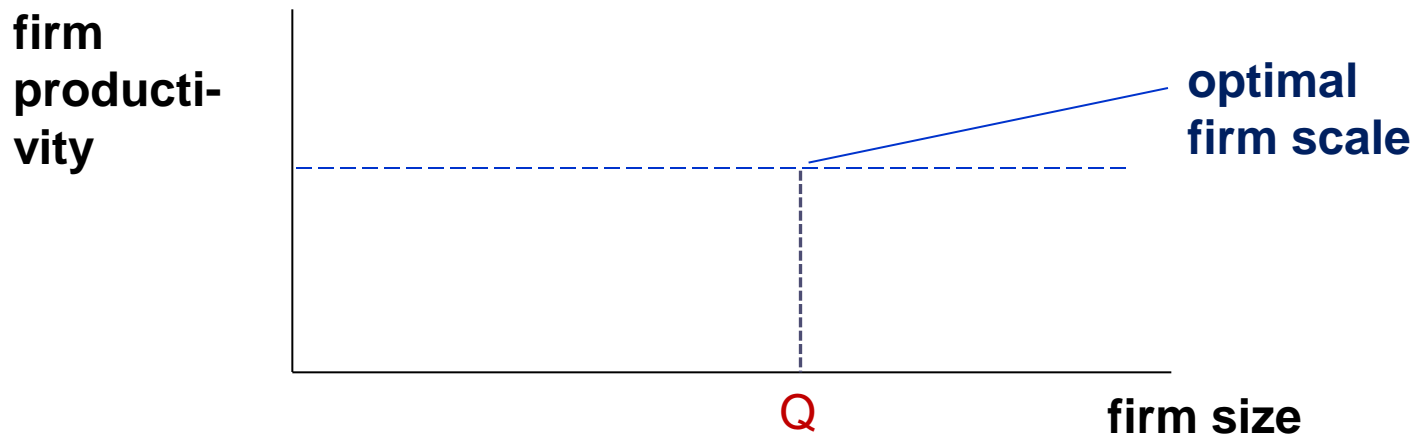
- **Focus on scale effects**
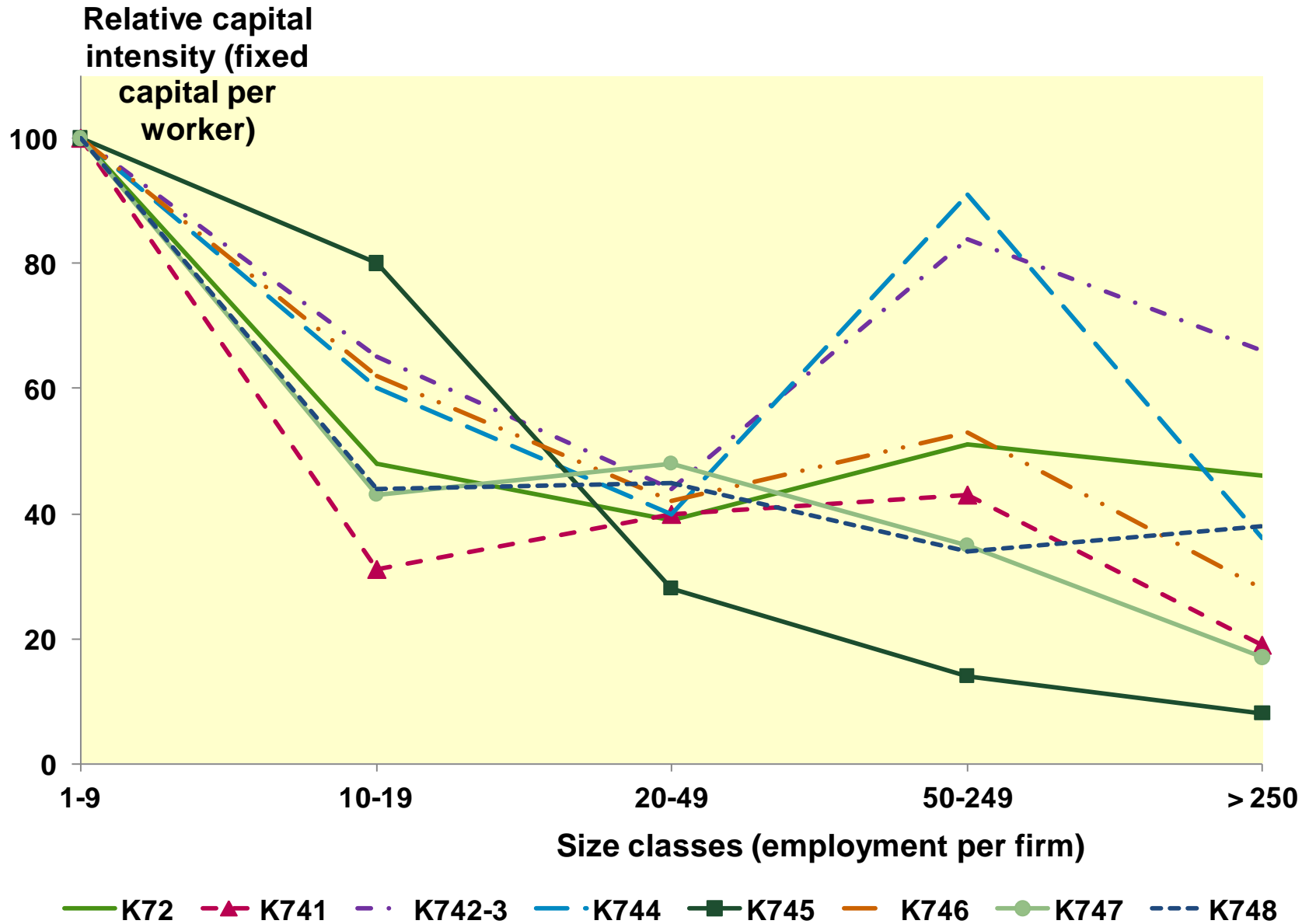
Time persistence of scale inefficiencies (I)

1. **Thought experiment: consider steady state in a competitive industry with a homogeneous product and scale economies:**
    - ❑ **firms grow or shrink until they reach optimal scale Q**
    - ❑ **result of selection: only firms close to the optimal scale Q will survive (this is our benchmark)**
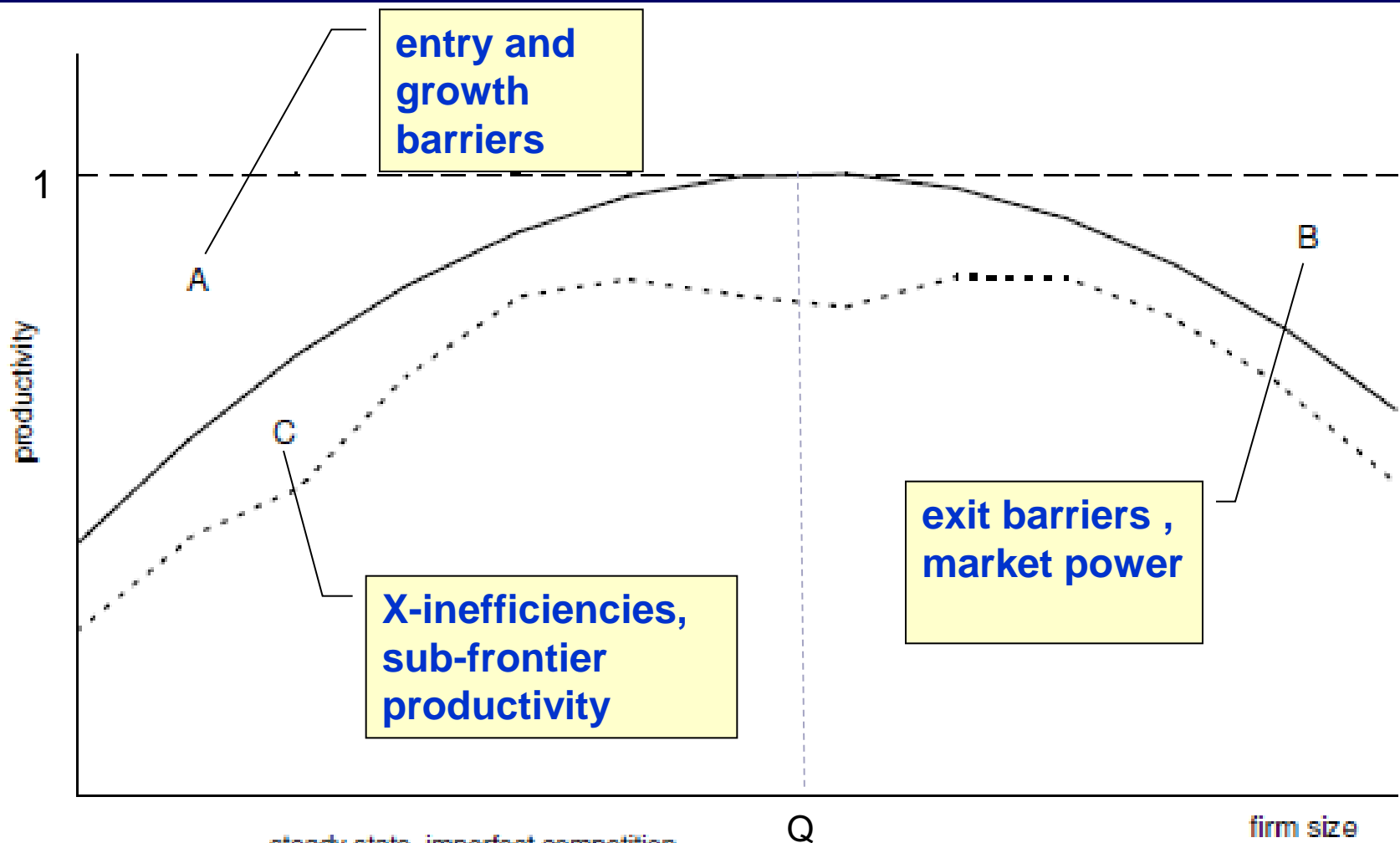
Time persistence of scale inefficiencies (II)

2. **Now consider the same market if barriers to market selection are operative:**

   - ❑ **not all firms achieve minimal optimal scale: many will remain too small**
   - ❑ **other firms will remain too large despite having diseconomies of bureaucracy / weak internal efficiency**
   - ❑ <u>result</u>**: persistence of scale diseconomies between size classes**

3. <u>X-inefficiency</u>**: due to shielded sub-markets, some firms always operate below efficiency frontier of own size class**

Decomposing the relation between size and productivity in an industry with scale economies: frontier / actual   >

entry and growth barriers

exit barriers , market power

X-inefficiencies, sub-frontier productivity

A

B

C

1

productivity

Q

firm size

———— steady state, imperfect competition

– – – steady state, competitive market

• • • • imperfect competition, possible lower threshold of actual distribution

==>

Empirical strategy

1. **Assess per industy the persistence of:**
   - ☐ **scale-inefficiency (<u>between</u> size classes)**
   - ☐ **X-inefficiency (efficiency gaps <u>within</u> size classes)**

2. **Use DEA to construct *X-efficiency* and *scale-efficiency* indicators**
   - ❏ **inefficiencies are implied**

Average <u>scale efficiency scores</u> by size class, across sectors, countries and years (13 EU countries, 1999-2005)

Size class	Scale efficiency scores (frontier = 1)
1. (1-9 employees)	0.49 !!
2. (10-19 employees)	0.93
3. (20-49 employees)	0.97
4. (50-249 employees)	0.99
5. (≥ 250 employees)	0.98

Note: scale-efficiency gap between size class 4 (frontier) and size class 1 is >50%! Small firms must have a huge cost disadvantage
==> *weak competitive selection or market segmentation?*

Average **X-efficiency scores** by size class, across sectors, countries and years (13 EU countries, 1999-2005)

Size class	X-efficiency scores (frontier = 1)
1. (1-9 employees)	**0.93** ! !
2. (10-19 employees)	**0.61**
3. (20-49 employees)	**0.62**
4. (50-249 employees)	**0.66**
5. (≥ 250 employees)	**0.81**

The high X-efficiency in the smallest size class indicates strong competition <u>within</u> this size class (among smallest firms)

Finding: inefficiencies persistant and growing

1. **Scale efficiency deteriorated in most BS industries, in almost all countries and in almost all size classes**

2. **Average efficiency gap between best- and worst-performing size classes became wider in most countries**

    ==> no convergence to an optimal firm size

    ==> weak competitive selection between size classes

3. **X-efficiency diminished in half of the BS industries. Similar for the average size of the gap.**

    ==> weak competitive selection within size classes

Role of external shocks

- **Policies** may hamper market selection:
  - ❑ creating entry barriers (e.g. start-up costs new firms)
  - ❑ creating <u>exit</u> barriers (e.g. bankruptcy laws, labour protection)
  - ❑ obstacles for <u>post-entry growth and shrinking</u> of firms (like size-related legal and administrative burdens, size-related tax breaks or subsidies)
  - ❑ Policy-related obstacles to <u>import competition</u> (e.g. policies that create sunk entry costs for foreign firms, VAT differences)

- **Non-contestability**: market power incumbents not enough challenged
  - ❑ by imports
  - ❑ by domestic start-ups and innovating firms

Quantifying role of shocks

- **Indicators regulatory environment (World Bank)**
  - ☐ **WB Cost of starting a business (entry costs);**
  - ☐ **WB Cost of closing a business (exit costs)**
  - ☐ **WB Costs of changing employment contracts (costs of growth / shrink)**

- **Indicators market contestability:**
  - ☐ **import share in domestic use of business services (net of exports) : calculated from national IO-tables**
  - ☐ **firm entry-exit ratios (per industry and country, EUKLEMS)**

- **Estimated with RE Tobit panel model**
  - ☐ **bootstrapped SE (cope with non-normal distributed SE)**
  - ☐ **fixed effects by country and industry**

Factors that explain scale-related efficiencies

A 10% increase in the following variables	gives a ..% effect on scale-efficiency	gives a ..% effect on X-efficiency
regulatory start-up costs (entry)	–	–0.8%
regulation-caused labour inflexibility (growth-shrink costs)	–0.5%	–1.3%
regulatory exit costs	–1.5%	–3.1%
import penetration	–	+1.0%
domestic firm start-up ratio	–	–

(with controls for industry and size class, bootstrapped SE, n=2063,

Conclusions

- **EMSI indicates weak market selection in some large sub-sectors of EU busines services**

- **Accounting for scale effects shows a persistence of scale-inefficiencies and - to a lesser extent - also a persistence of X-inefficiencies y**

- **Policy shocks (entry/exit, labour contract inflexibility) and weak market contestability (imports) significantly explains the persistnce of inefficiencies over time**

Thanks for your attention

paper online in *Economic Dynamics and Structural Change*

Average scale-efficiency scores for Architectural, Engineering and Technical Services (K742-3)
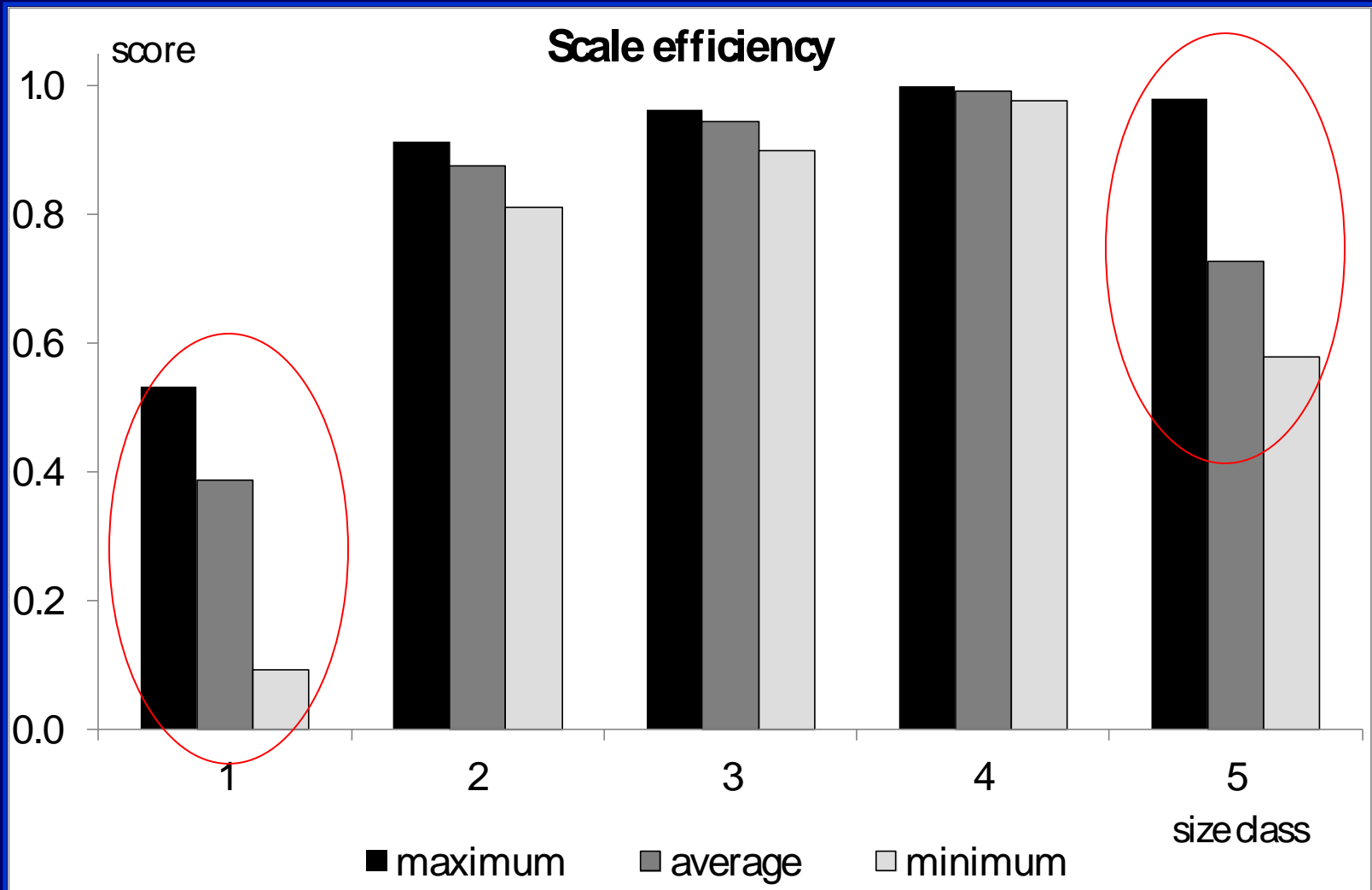
Average X-efficiency scores for Architectural, Engineering and Technical Services (K742-3) , 13 EU countries, 1999-2005