



A digital divide convergence rate estimation methodology

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Outline

- How digital divide is estimated?
- When digital convergence is expected?
- Convergence methodology
- Evaluation results
- Conclusions and Future directions



The concept of Digital Divide

Digital Divide, established in 1990s,
describes perceived growing gap
between those who have access
and the skills to use ICT,
and those who have limited or no access.



Dataset

- Initially: 31 countries from European area
- Broadband penetration over households per quarter-term (qt)
- From September 2001 to June 2007 (24qt)
- Broadband services
 - DSL
 - Fiber to the Building (FttB)
 - Cable



Methodology (1)

Average penetration is calculated for the last quarter term

Based on the result countries are separated in two sub sets

First one consists of countries with penetration rate above AVG

Second one consists of countries with penetration rate below AVG





Methodology (2)

Historical data were sorted in decreasing order according to rank size rule

Data are normalized and expressed as a percentage of penetration of the leading country

The deviations are calculated

The resulting time series of the calculated Deviations is plotted against time (qt)

Results are approximated by a suitable function





Candidate Models...

$$\textit{Linear} = \alpha + \beta * x$$

$$\textit{Exponential} = \exp(\alpha + \beta * x)$$

$$\textit{Polynomial} = \frac{1}{\alpha + \beta * x}$$

$$\textit{Logarithmic} = \ln(\alpha + \beta * x)$$

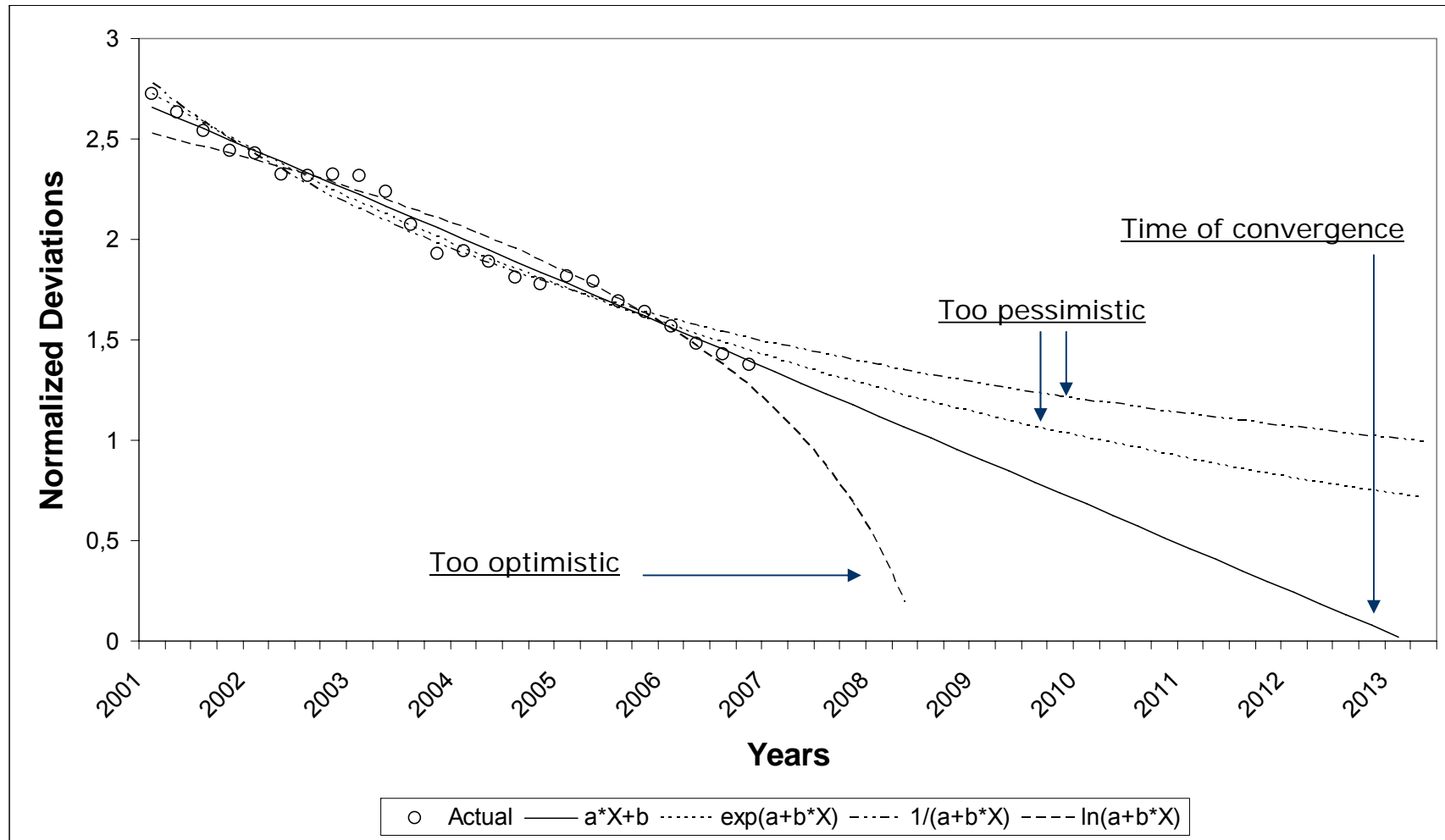


Statistical measures

Model	R-square	MSE
Above Average Penetration		
Linear	98.13%	0.0029
Exponential	97.89%	0.0032
Polynomial	96.43%	0.0054
Logarithmic	94.67%	0.0081
Below Average Penetration		
Linear	91.66%	0.015
Exponential	88.15%	0.021
Polynomial	84.45%	0.028
Logarithmic	98.47%	0.0027

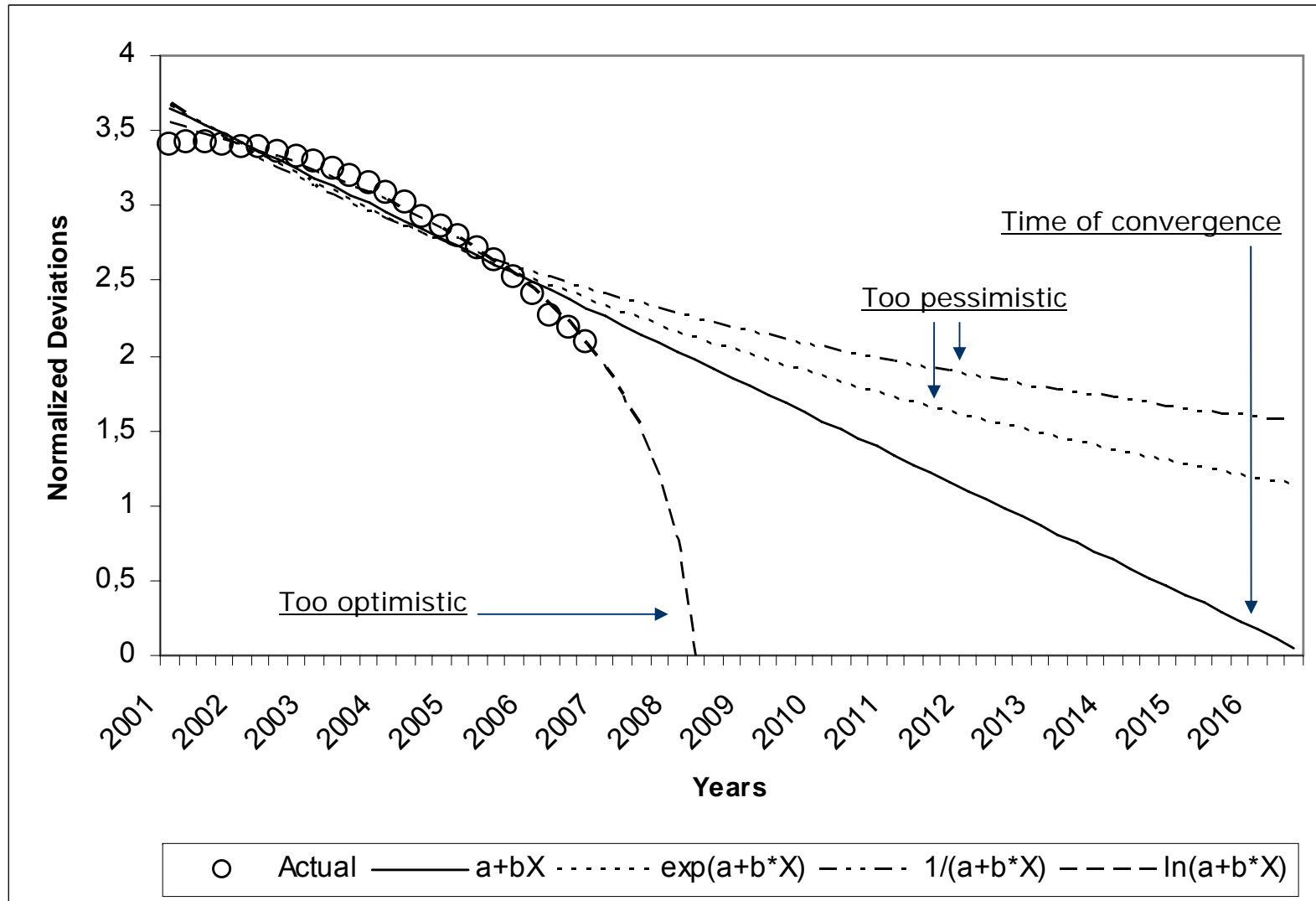


Above average penetration





Below average penetration





Conclusions

- The results presented correspond to the aggregate influence of a number of driving factors, without directly incorporating them in the estimation process.
- Linear function fits better.
- Convergence is expected in 2013 for the “mature” countries/markets.
- Convergence for the less “mature” countries/markets cannot be accurately forecasted.



Future directions

- Study of the process of digital convergence into a micro level, by estimating the influence of the driving factors (e.g. income, age, education, subsidization).
- Impact of each country's penetration rate to the total convergence process.
- New estimation methodology of digital convergence employing **concentration indices** for broadband diffusion.



The estimation of concentration indices in mobile technology

WG1

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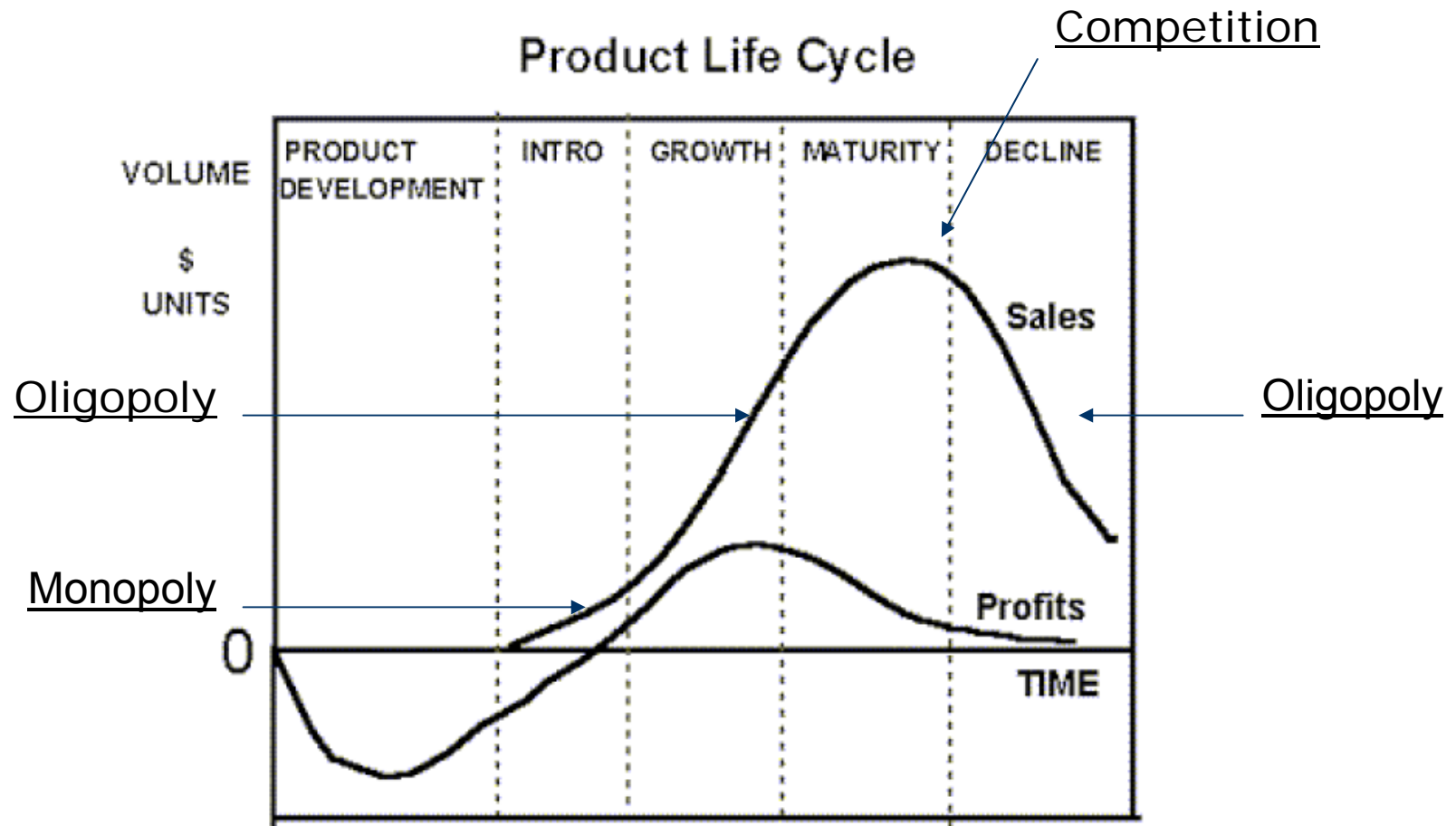


Outline

- What do **concentration indices** reveal?
- Why is the estimation of these indices useful?
- Is there any connection with the Product Life Cycle?



Product Life Cycle



Source: William D.



Objectives

- Development of a methodology in order to describe the evolution of a market, in terms of competition.
- Use the most appropriate index, or a set of indices, based on theoretical criteria.
- Develop a methodology and pertinent model in order to combine the demand process for a service with the values of concentration indices.



Concentration Indices I

- Simple estimation

$$SM = 1 / N$$

N= number of firms in the market

- Herfindahl- Hirschman (HHI)

$$HHI = \sum_{i=1}^N s_i^2$$

s_i =market share of each firm

- Hannah – Kay

$$HK(\theta) = \left(\sum_{i=1}^N s_i^\theta \right)^{1/(1-\theta)}$$

s_i =market share of each firm and θ =constant



Concentration Indices II

- Entropy

$$E = -\sum_i^N s_i \log s_i$$

s_i =market share of each firm

- Rosenbluth

$$R = \frac{1}{2 \sum i s_i - 1}$$

i =the order of each firm based on market share

s_i =market share of each firm

- Comprehensive Concentration Index-CCI

$$CCI = s_1 + \sum_{i=2}^N s_i^2 (2 - s_i)$$

s_i =market share of each firm and s_1 =market share of the biggest firm

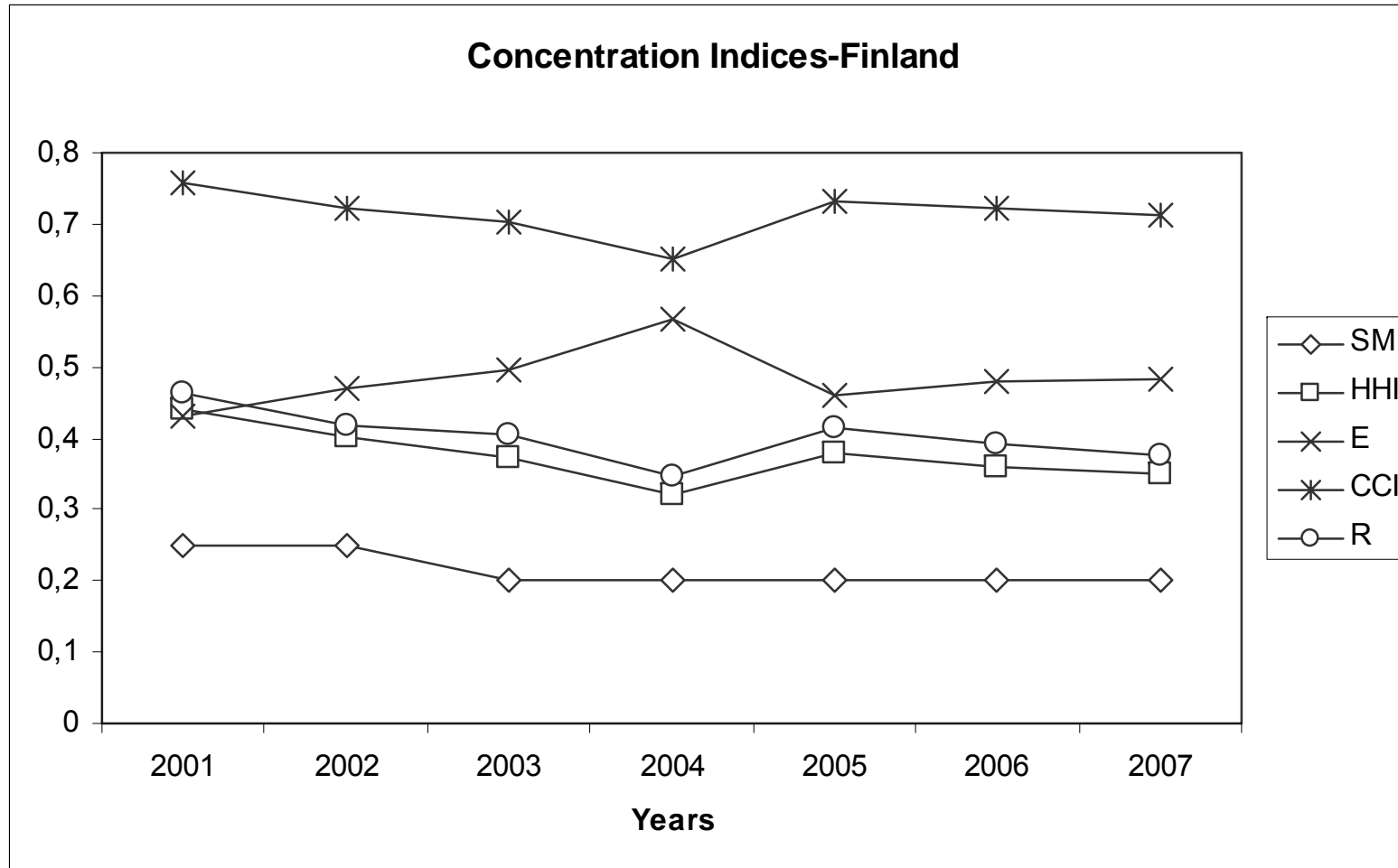


Important dates

	New Entry	Liberalization	100% Penetration over Population	Exit	Other
Finland	Saunalahti (2003)	1994	2005	Telia Finland (2003)	
Poland	MVNOs (2006) - P4 (2007)	2003	2007		
Greece	Cosmote (1998) - Q-Telecom (2002)	2001	2004	Q-Telecom merged with TIM (2007)	Tim became WIND (2006)

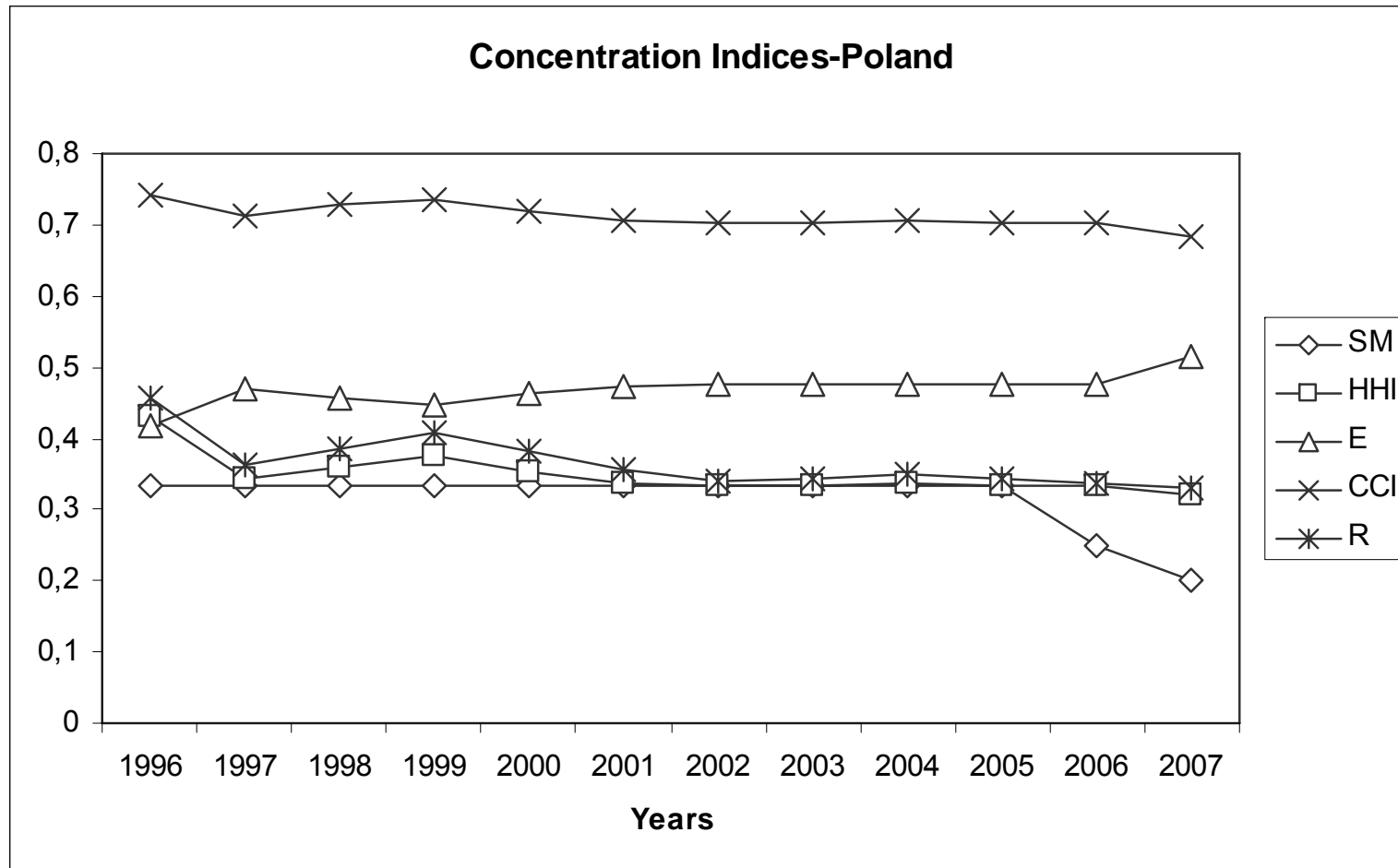


Results from Finland



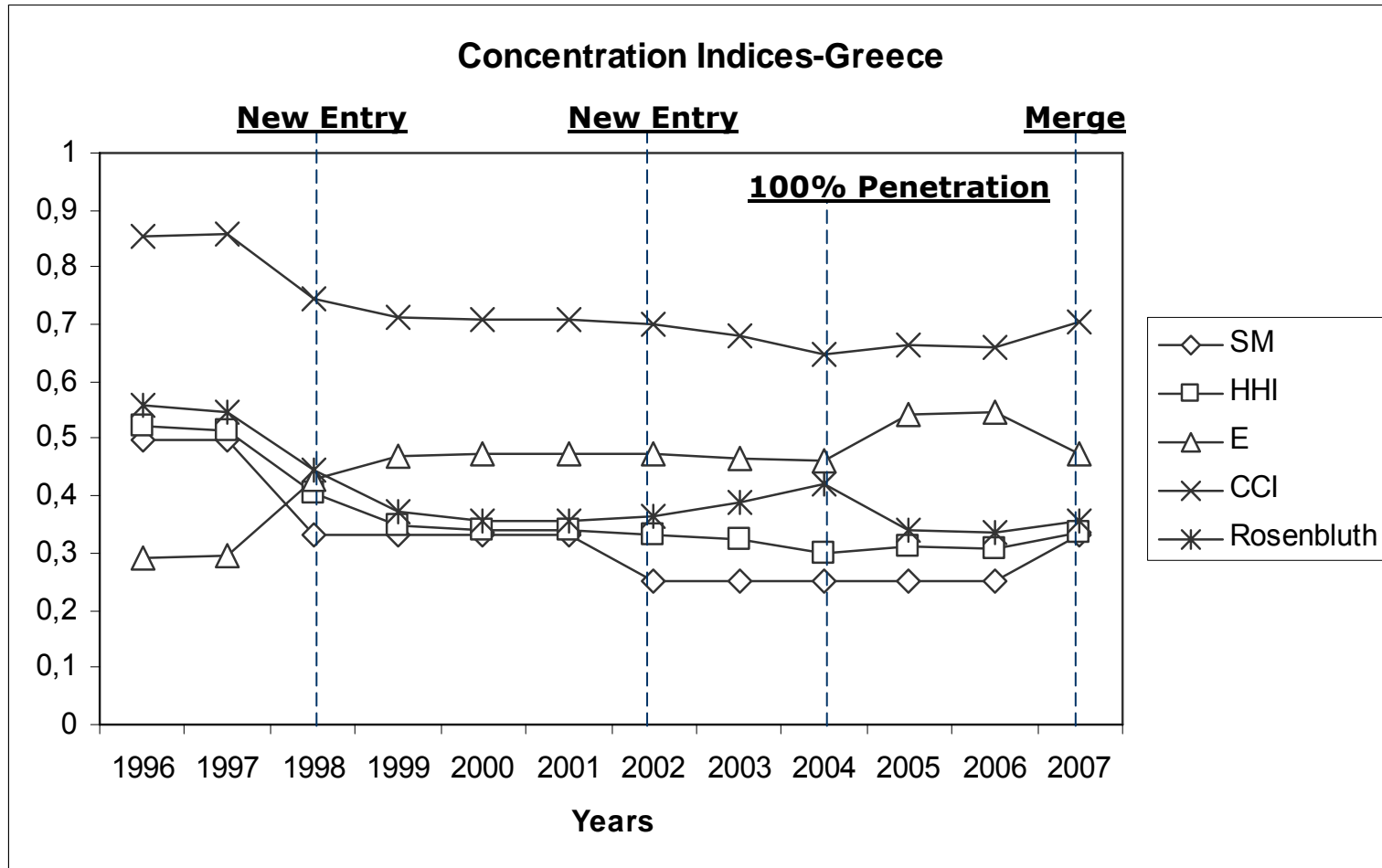


Results from Poland



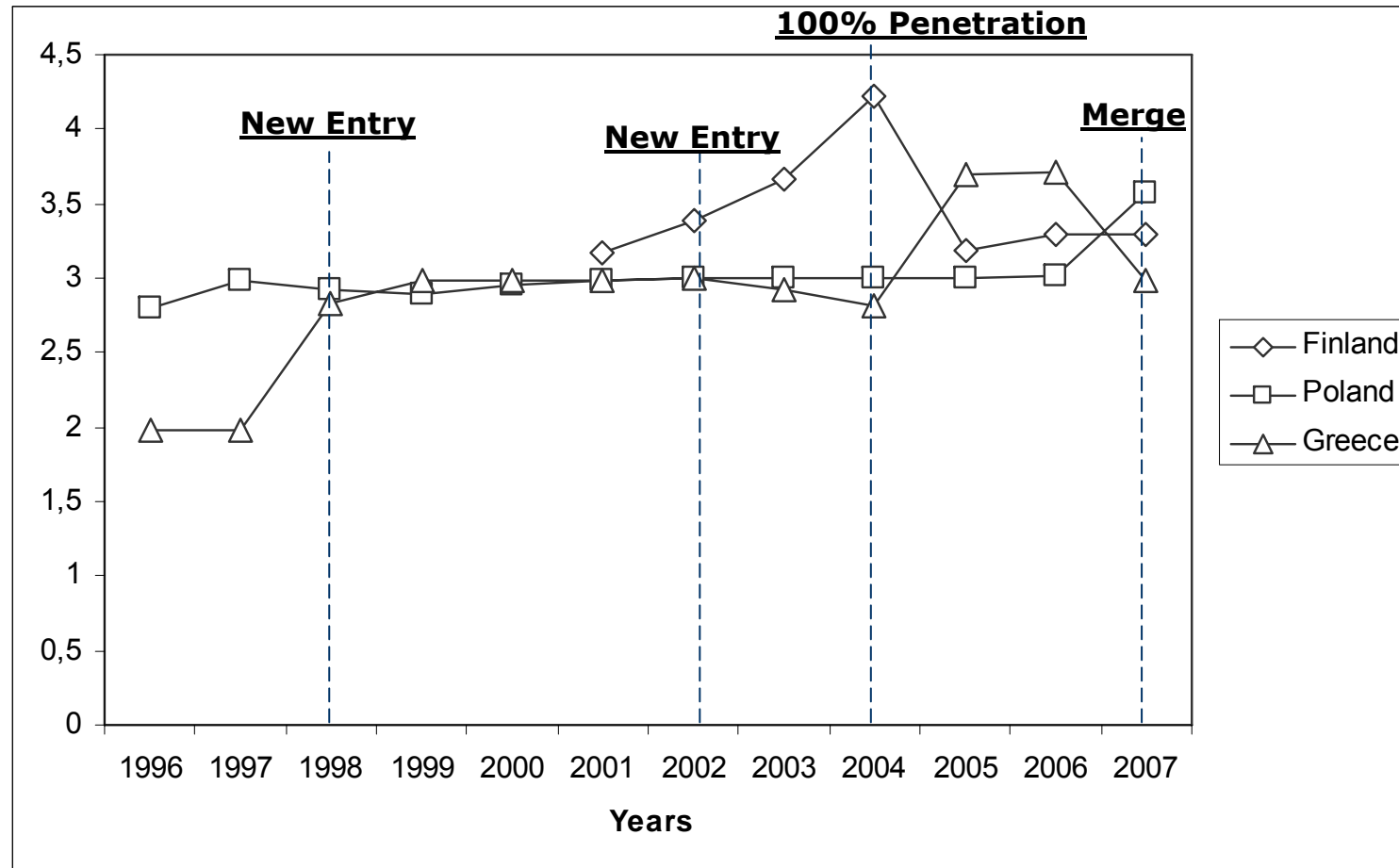


Results from Greece





Hannah-Kay Index ($\theta=0,5$)





Conclusions

- All three countries are characterized by a small number of mobile operators (max 5).
- There is small differentiation among results in the last year of observation.
- Concentration is shrinking but not fast.
- Limited competition in Mobile market.



Future directions

- Mobile market is traditionally an oligopoly.
- Life cycle is shorter due to the technological changes.
- Concentration Indices are used in competitive markets.
- Find more appropriate Indices for telecommunication markets.
- Give an explanation and put limits to the results.



References

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Thank you!!!!.....Any Questions?



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