Global Takeoff of New Products

Role of Economics, Culture, & Country Innovativeness

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References

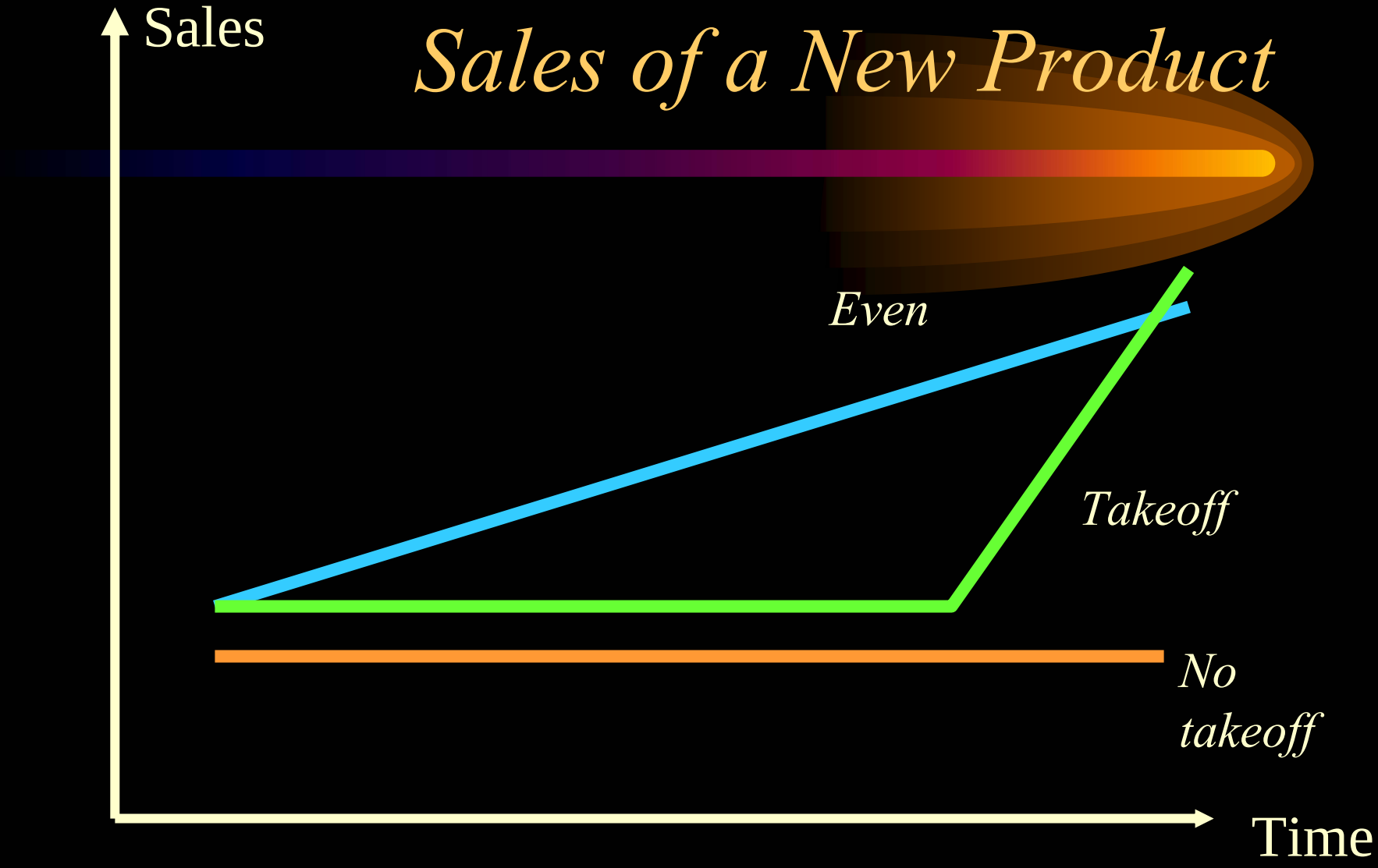
Presentation based on the following papers available at websites as indicated

- Foster, Joseph A, Golder, Peter N and Gerard J. Tellis (2004), "Predicting Takeoff for Whirlpool's New Personal Valet," *Marketing Science.*
- Golder, Peter N. and Gerard J. Tellis (1997), "Will It Ever Fly? Modeling The Growth of New Consumer Durables." *Marketing Science,* 16, 3, 256-270
- Tellis, Gerard J., Stefan Stremersch and Eden Yin (2003), "The International Takeoff of New Products: Economics, Culture and Country Innovativeness," Marketing Science, 22, 2 (Spring), 188-208.
- Stefan Stremersch and Gerard J. Tellis, (2004), "Managing International Growth Of New Products," 21, 4 (December), 421-438, *International Journal of Research in Marketing*
- Golder, Peter N and Gerard J. Tellis (2004), "Going, Going, Gone: Cascades, Diffusion, and Turning Points of the Product Life Cycle," *Marketing Science*, 23, 2 (Spring), 207-218.

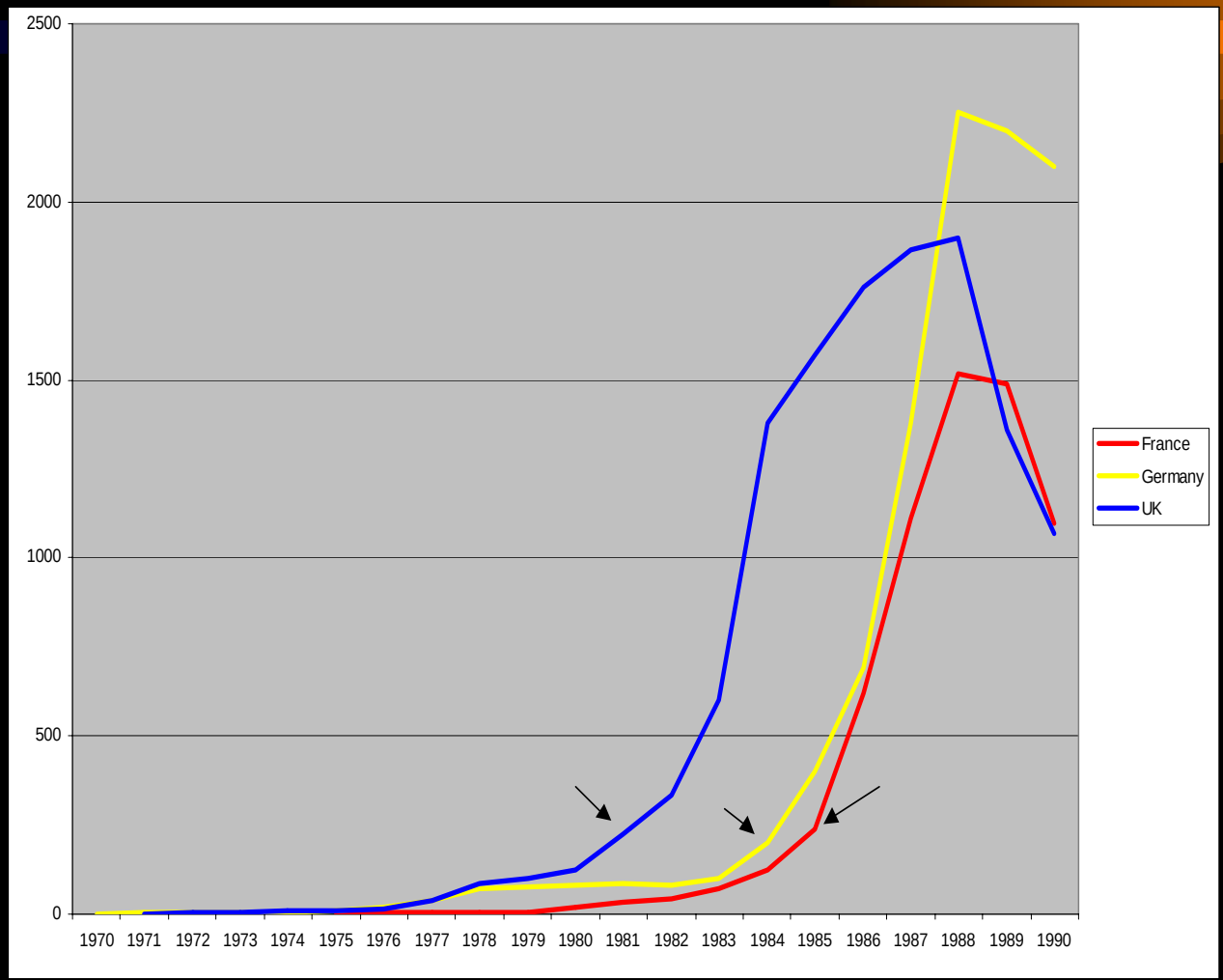
Observation

- New products either
  - takeoff: success
  - never takeoff: failure
- We rarely see even growth

Sales of a New Product



Sales of Microwaves for 3 Major Countries



Research Questions

- Is takeoff a distinct phenomenon?
- Does it vary by country?
- If so, does economics or culture explain variation?
- Can we model and predict takeoff?
- Should firms use sprinkler or waterfall strategy?
- In which countries to launch first?

Importance

- Takeoff involves growth of about 300%
- Takeoff requires enormous resources
- Takeoff marks beginning of success

Contribution

- Bass diffusion model captures new product adoptions assuming takeoff & slowdown
- We try to predict takeoff and slowdown:
  1. Takeoff in US, *Marketing Science* (1997)
  2. Takeoff in Europe, *Marketing Science* (2003)
  3. Takeoff around Globe (in progress 2005)

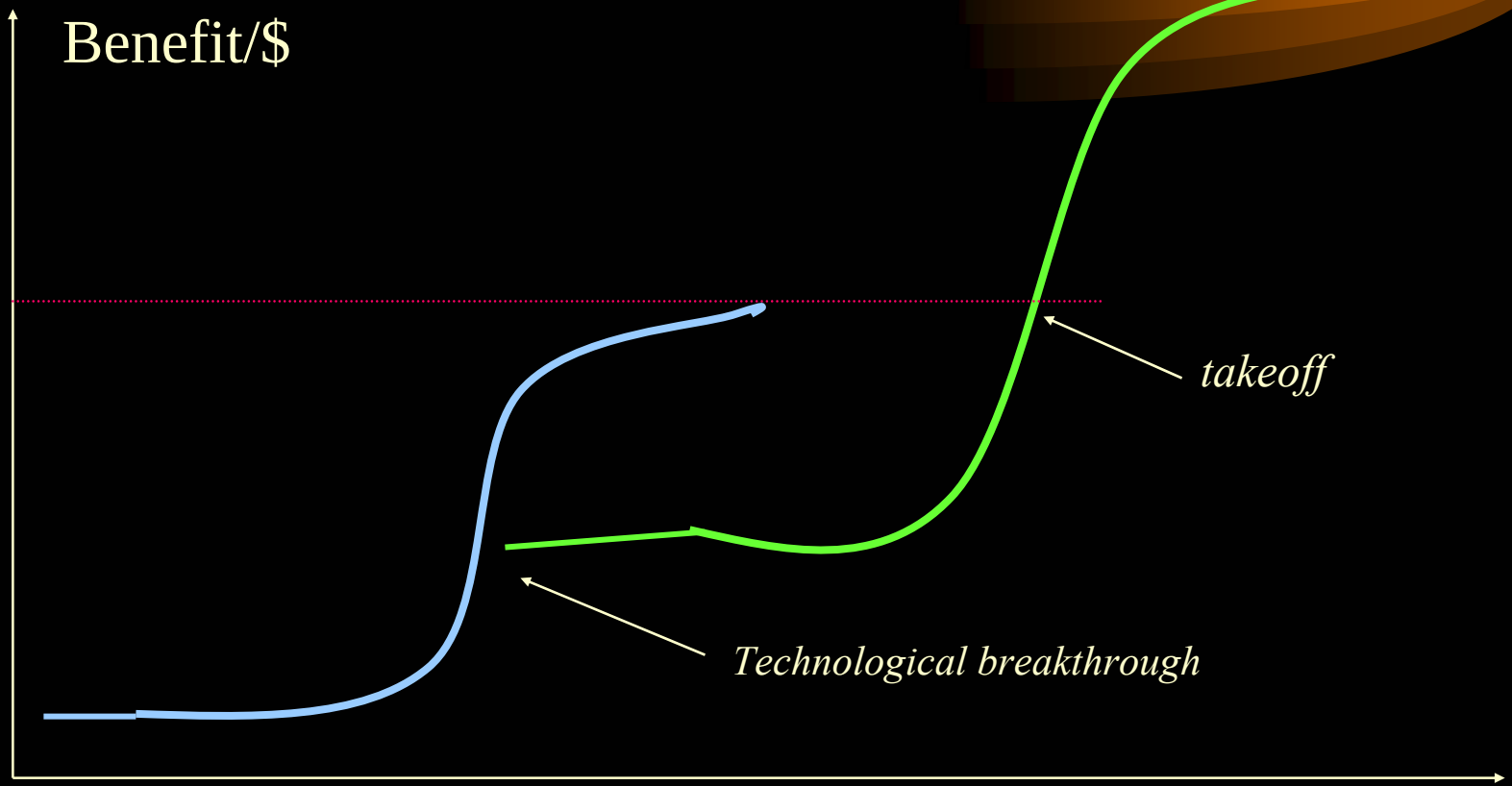
Definitions

- Takeoff
  - The transition from introduction to growth in the product life cycle
  - First major turning point in curve
  - First large increase in growth rate
- Time to Takeoff
  - Period between introduction & takeoff

Reason for Takeoff

- From Management of Technology
  - New products introduced on technological waves
  - Initially well known but expensive, not popular
  - When benefit/price ratio rises above competing technology, sales take off
- Takeoff is binary, time dependent event

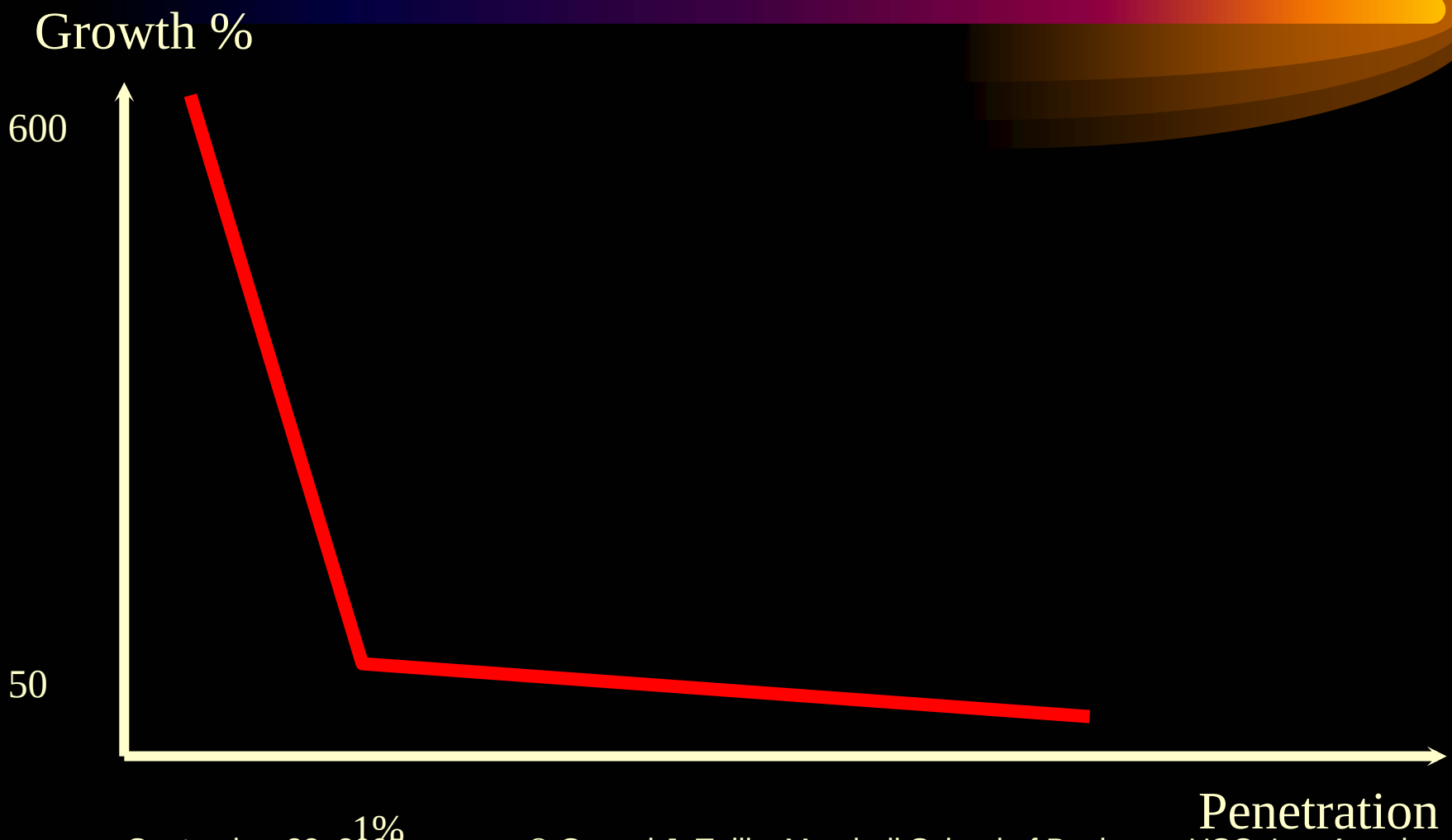
Technological Life Cycles



Measuring Takeoff

- Problem:
  - Growth rates high when base sales low
  - Need standard across countries
- Solution: use growth rate & penetration
  - Using Heuristic: 1st year growth > 50% when penetration > 1%
  - Threshold: adjusts continuously for both

Threshold of Takeoff



Advantages of Threshold Rule

Provides

- A simple metric for analysts
- A standard for comparisons across countries
- An indication of takeoff for managers

Success in Identifying Takeoff

- For US, over 90%
- For Europe, over 95%
- For World in progress (now using a 2% rule)

Modeling Takeoff

- Hazard Model:
  - = Probability of takeoff given it has not
  - = *f* (baseline hazard plus effect of explanatory variables)
- Reasons for using Hazard Model
  - Models binary time dependent event: takeoff
  - Gives nonlinear baseline probabilities
  - Allows for time varying explanatory variables
  - Allows for censored data

Parametric Hazard Model

$$h\{t|X(t)\} = \{f(t)|X(t)\}/\{S(t)|X(t)\}$$
$$= h_0\{t|X(t)\}\, g(X(t))$$

We use a logistic hazard function, for which:

$$h\{t|X(t)\} = \{\lambda\alpha(\lambda t)^{\alpha-1}\}/\{1+(\lambda t)^{\alpha}\}$$

$\alpha = 1/\sigma$ = *characteristic of distribution*

$\lambda = e^{-\beta X}$ = *hazard ratio*

Why Time-to-Takeoff May Vary

- Reasons for variation: characteristics of
  - Country
  - Product category
  - Firm's strategy: price
- Country itself can be explained by
  - Economics
  - Culture
  - Information access

Variables

- Economic variables
  - Economic wealth
  - Economic progressiveness
  - Openness of economy
  - Economic role of women
- Cultural variables
  - Uncertainty avoidance
  - Religion
  - Work Climate
- Information Access
  - Media intensity
  - Mobility
  - Education
- Category
  - Market penetration
  - Prior takeoffs
  - Year of introduction
  - Electronic (entertain) vs K&L (work)

Measures for Variables

- Economic variables
  - Economic wealth — GDP
  - Economic progress — GINI
  - Openness of economy — Imp/Exp; EU member
  - Economic role women — % work
- Cultural variables
  - Uncertainty avoidance — Hofstede
  - Religion — % protest
  - Work Climate — climate
- Information Access
  - Media intensity — index
  - Mobility — index
  - Education — % school
- Category
  - Market penetration — lag pen
  - Prior takeoffs — number
  - Year of introduction — year
  - Electronic vs K&L — dummy

Three Studies

1. US: over 40 categories
2. Europe: 16 countries x 10 categories
3. Globe: over 20 categories x 40 countries (in progress)

European Data

- Countries: 16 Western European
- Categories: 10: 4 entertainment, 6 work
- Total: 137 x about 30 years on each
- Source: Economist Intelligence Unit
  Euromonitor, GFK, UN, EC
  Libraries, Firms, Friends

Categories

Category	Countries
Entertain/Electronic	
Computer	12
CD Player	8
VCR	16
Work/K&L	
Color TV	3
Microwave	16
Dryer	15
Freezer	15
Refrigerator	16
Dishwasher	15
Washers	15

Key Questions

- Will time-to-takeoff vary?
- Why will time-to-takeoff vary?

Poll: For Europe

- Will time-to-takeoff across countries be:
  - Strong
  - Weak
  - None?
- Which variables will explain time to takeoff?
  - Economics
  - Culture
  - Category?

Regarding Countries?

- Which group will take off first?
  - Large or small economies?
  - Latin/Mediterranean, mid-Europe, Scandinavian?
- Which of 16 countries will be first?

Country	Time To Takeoff	Number
Denmark	3.7	9
Norway	4.0	7
Sweden	4.4	8
Finland	4.6	8
Belgium	5.0	9
Austria	5.1	7
Swiss	5.3	3
Ireland	5.8	4
Germany	6.3	4
Netherlands	6.5	8
Spain	7.4	8
Italy	7.9	8
UK	8.5	6
Portugal	9.3	7
France	9.4	7
Greece	9.8	6

Time to Takeoff By Country Groups

Group	Years	Categories	St Dev
Scandinavian	4.1	32	3.3
Mid Europe	5.8	41	4.5
Mediterranean	8.4	35	6.3

Category Effects Very Strong

Time to Takeoff by Categories

Class	Countries	Years	St Dev
Entertainment	33	2.1	0.2
Work	76	7.7	2.5
Overall	109	6.1	3.2

What Variables Explain Takeoff (From Hazard Model)

- Three variables very strong and robust:
  - Type of product category
  - Prior takeoffs in other countries
  - Market penetration
- Culture important but not strong
- Economics, size of country, density of population, unimportant

Estimates of Hazard Model

(with 4 variables & 3 factors)

Variables	Takeoff-Prob	"t-stat"
Work Products	-.78	5.2
Penetration$_{(t-1)}$	.75	-2.2
Prior Takeoffs	.34	-3.8
Uncertainty Avoidance	.20	-2.9

U^2 50% (vs null model without distribution)

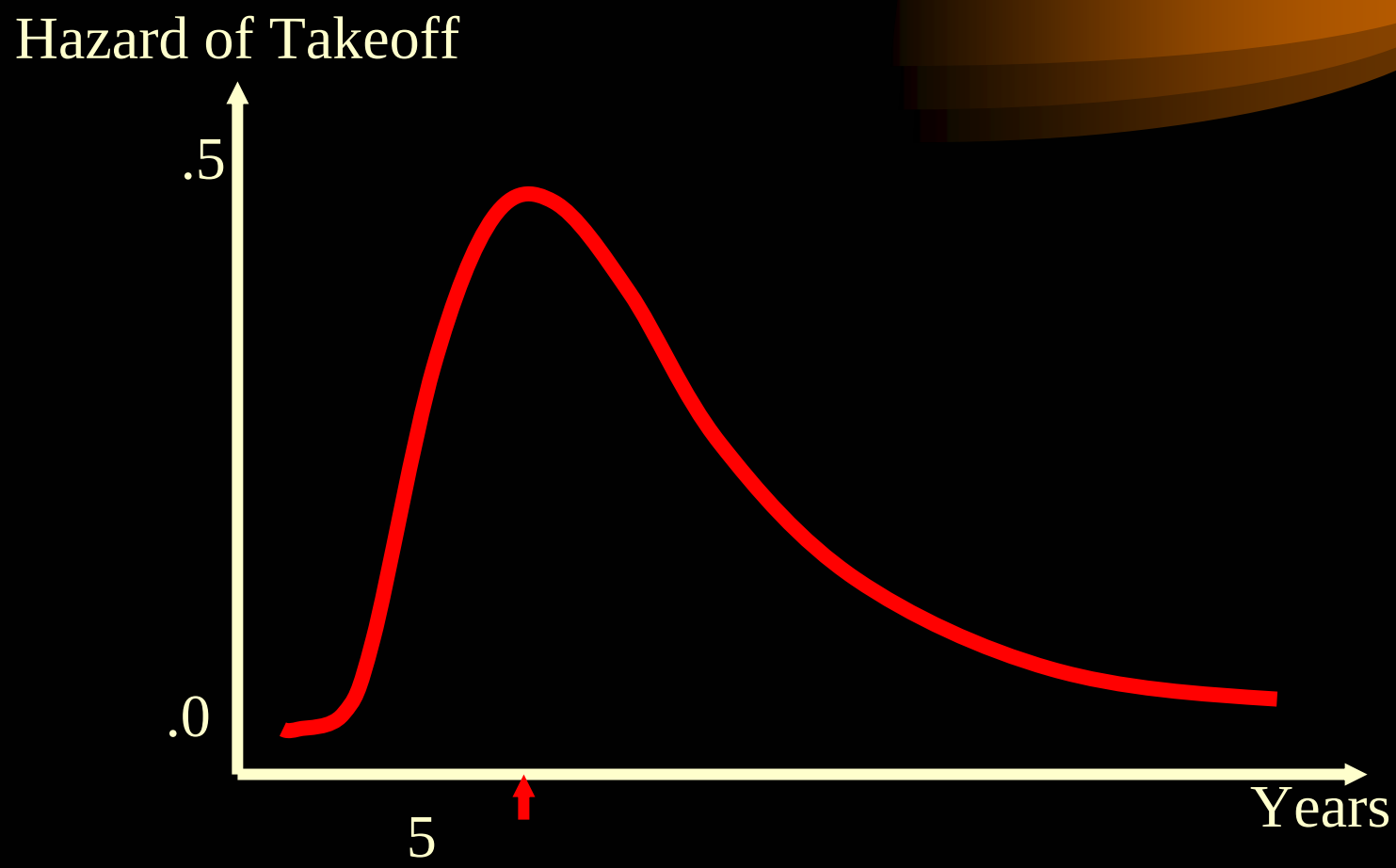
Assessing Models' Predictive Ability

- Re-estimate model excluding 1 target category each time
- Forecast explanatory variables of target category
  - At introduction: from mean of other categories
  - One-year-ahead: by mean changes over time
- Predict target category
- Compare actual vs. predicted
  - For 1st predicted takeoff (*error of 1.2 yrs*)
  - At introduction (*error of 1.9*)

Strategic Implications 1

- Use baseline Hazard as guide to decide whether or not to pull the plug

When to Pull the Plug?
Use Baseline Hazard of Takeoff

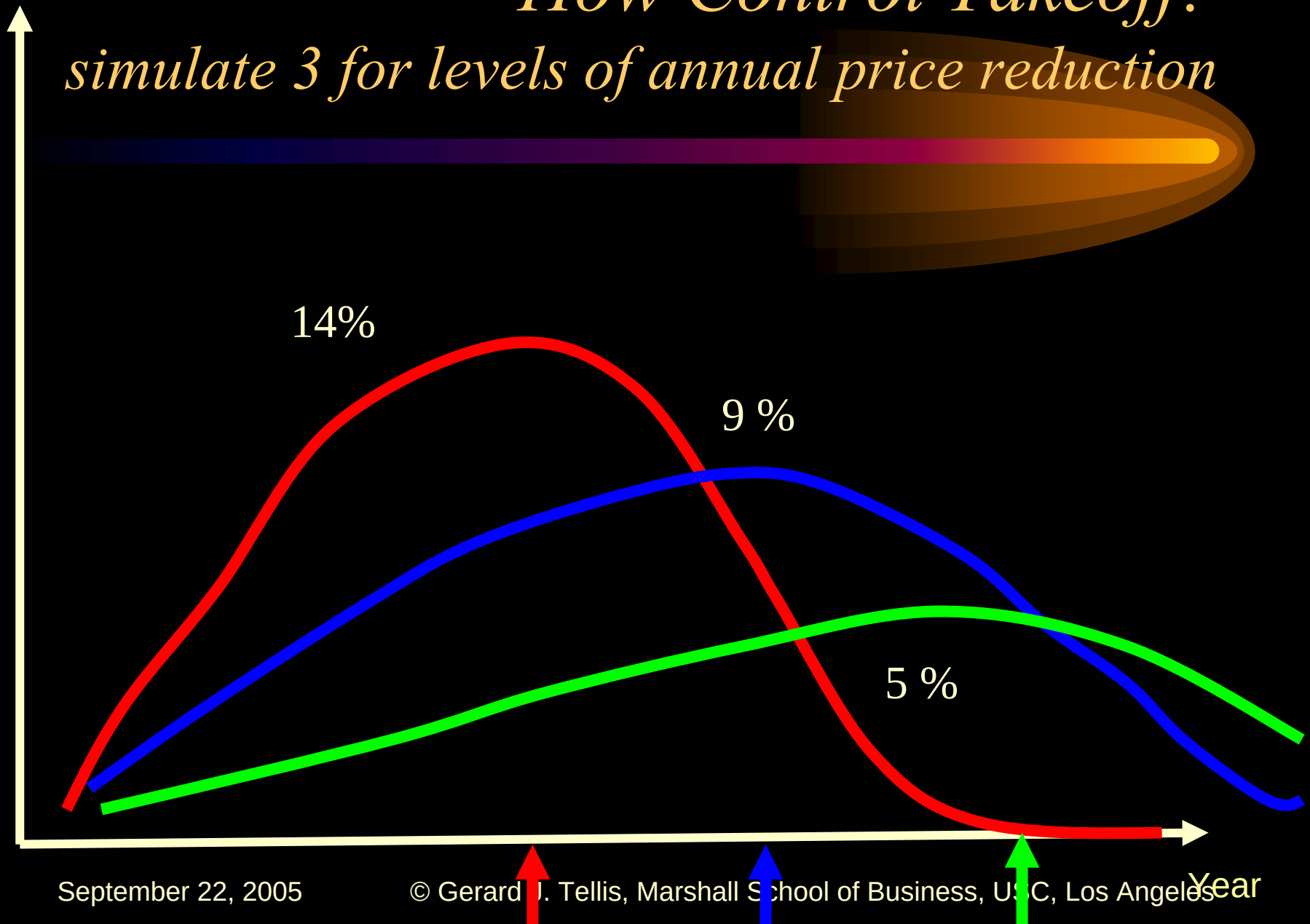


Strategic Implications 2

- Managing takeoff
  - Simulate hazard of takeoff for various levels of marketing variables (e.g., price)
  - Choose level that gives optimum time of takeoff

How Control Takeoff?

simulate 3 for levels of annual price reduction



Strategic Implications 3

Introducing new products

- Use waterfall strategy: introduce first in
  - Innovative regions (e.g., Scandinavian)
  - Small innovative countries (e.g., Denmark)
- Reasons
  - Lowers risk
  - Increases speed of takeoff
  - Provides learning for big markets

Mean Lead & Lags in Year of Takeoff By Country Groups

Group	Lead (Yrs)
Scandinavian	2.6
Mid Europe	1.3
Mediterranean	-3.3
Denmark	3.1
UK	0.4
Greece	-7.0
Range	*10*

Mean Lead in Takeoff vs Introduction

Country	Takeoff	Intro
Denmark	3.1	1.0
Sweden	2.7	2.1
UK	0.4	3.2
France	-0.4	2.9
Italy	-2.1	1.1

Conclusions for Europe

- Takeoff varies distinctly by country
  - Scandinavian countries distinctly earlier takeoffs
  - Latin countries distinctly late
  - Yet firms introduce first in English-speaking countries, large economies, use sprinkler strategy
- Hazard model can predict takeoff
  - Category characteristics have strong predictive value
  - Use for deciding when to pull the plug
  - Use for controlling takeoff

Thank you!