Innovative Technologies Change the TV Landscape: Drivers of DVR diffusion in Ad-TV

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Abstract
This paper focuses on the diffusion of Digital Video Recorders (DVRs) from a program choice perspective. After presenting theoretical foundations of program choice models and demonstrating the main features of DVRs, a new DVR-converted program choice model is developed. Based on that model, we show that program providers in Ad-TV have the incentive and the opportunity to act as drivers of DVR diffusion by offering cost-effective programs and thus attracting viewers from competitors.
Innovative Technologies
Change the TV Landscape:
Drivers of DVR Diffusion in Ad-TV

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Program Choice Models

- Audience-based models
  (Steen 1952, Rothenberg 1962a & 1962b, Beebe 1977)
  ➔ Satisfaction criterion. No. of satisfied choices
  ➔ Goal: Maximize no. of viewers per channel

- WTP-based models
  (Spencer/Owen 1977, Wildman/Owen 1985)
  ➔ WTP to measure preference intensities (Ad-TV and Pay-TV)
  ➔ Goal: Maximize revenue per channel

- Models in marketing and advertising research
  ➔ Observational data ➔ Forecasting ratings
  ➔ Goal: Optimizing program scheduling

Main DVR Features

Recording Functionality
- Shifting away from linear TV watching
- Watching simultaneously broadcasted programs
- Library building

Ad-Skipping Functionality
- Setting price for watching Ad-TV programs to zero
- Increasing viewer satisfaction

Model Assumptions

A1: Viewers watch highly unattractive ads
A2: Viewers watch programs of Leichtsinn avoidance
A3: Program set higher price for program providers
A4: Program set higher price for program providers
A5: Program set higher price for program providers
A6: Program set higher price for program providers
A7: Program set higher price for program providers
A8: Ad-skipping: No revenue for program providers
A9: Pricing: Fixed/Variable based on program revenue
A10: Demand of CPM, non-scaled on timeslot group
A11: Program set higher price to add more up to advertising price

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**Model Assumptions**

- **A1:** Viewer group highly responsive to all four price points per group
- **A2:** Revenue weighted by group size of all consumers (Total Revenue/Number households)
- **A3:** Price elasticity: Assumes linearly elastic
- **A4:** Viewer group differing in value to different services
- **A5:** No perfect substitutes among pay TV products
- **A6:** Competition within high price paid portion
- **A7:** Pay TV products meeting high price paid portion
- **A8:** Assuming the same size per-price point
- **A9:** Recording: Simultaneously broadcasted programs in succession
- **A10:** Number of U.S. homes weighted across service groups
- **A11:** No price premium for all-encompassing service

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**Selected Model Measurements**

**Company and Industry**
- Revenue (Company Level)
- Total Revenue (Industry Level)

**Characteristics**
- Welfare
  - Consumer Surplus
  - Total TV Viewing

**Diversity**
- Market Concentration
  \[ HHI^C = \frac{\sum_{n} (Revenue per Program Provider n)^2}{Total Revenue} \]
- Diversity of Content
  \[ HHI^C = \frac{\sum_{n} (Total TV Viewing per Program n)^2}{Total TV Viewing} \]

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**Selected Scenario Results**

**DVR Roll-Out**

<table>
<thead>
<tr>
<th></th>
<th>0%</th>
<th>10%</th>
<th>33%</th>
<th>75%</th>
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<tbody>
<tr>
<td>Revenue</td>
<td>24.3</td>
<td>21.9</td>
<td>49.0</td>
<td>42.7</td>
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<tr>
<td>Consumer Surplus</td>
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<td>96.5</td>
<td>70.6</td>
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<td>Total TV Viewing</td>
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<td>8,750</td>
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<tr>
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### Selected Scenario Results

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<tr>
<th>Revenue (Common Denominator, Provider, in Tns. €)</th>
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<th>75%</th>
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<tr>
<td>Total Revenue (in Tns. €)</td>
<td>204.3</td>
<td>183.9</td>
<td>132.7</td>
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<tr>
<td>Consumer Surplus (in Tns. €)</td>
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### Scenario Results

Programs offering only 1st choice: Likely to disappear first...

- Revenue on industry level ↓
- Welfare ↓
- Diversity ↓

Providers broadcasting common denominator program able to increase revenue

**Monopoly Situation!**

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### Recommendation to Ad-TV Program Providers

- Provide common denominator program to stay in business
- Create interest for relatively cheaply produced program
- Push DVR diffusion

**Helpful ONLY for common denominator providers, & in the extreme case, only for THE MONOPOLIST?**

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### Selected Program Choice References


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### Model Assumptions

- A1: Viewer groups highly unequal in size and homogenous preferences per group
- A2: Viewers watching programs of 1st choice or common 2nd choice ('common denominator')
- A3: Program duplication: Audience shared equally
- A4: Viewer groups differing in value to advertisers
- A5: Program types differing in costs
- A6: Competition within single program period
- A7: Program providers maximizing single program profits
- A8: Ad-skipping: No revenue for program providers
- A9: Recording: Simultaneously broadcasted programs in succession
- A10: Percentage of DVR users equal over all viewer groups
- A11: Program providers able to add mark-ups on advertising prices
<table>
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<tr>
<th>Group</th>
<th>1</th>
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<th>3</th>
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<tr>
<td>Size</td>
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<tr>
<td>Advertisers' WTP per Viewer (in €)</td>
<td>30</td>
<td>25</td>
<td>20</td>
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**Preferences**

<table>
<thead>
<tr>
<th>1st choice</th>
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<th>3rd choice</th>
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</thead>
<tbody>
<tr>
<td>P1</td>
<td>P2</td>
<td>P3</td>
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<tr>
<td>P3</td>
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<td>-</td>
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<table>
<thead>
<tr>
<th>Program</th>
<th>Advertising Cost (in €)</th>
<th>Advertising Price per Viewer (in €)</th>
<th>Viewer's WTP (in €)</th>
<th>With Ad</th>
<th>Without Ad</th>
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<tr>
<td>P1</td>
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