

Replication package

Estimating the Costs of Standardization: Evidence from the Movie Industry

(The Review of Economic Studies, forthcoming)

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March 11, 2022

1 Overview

This replication package contains the data and the code to generate 19 figures and 13 tables in the paper and online appendix. This package reproduces all numbers used in the main text, tables, and figures in the paper. The tex files for the tables, and the files for the figures, are included as well.

2 Data Availability Statements

The paper uses the following sources of data:

1. A panel of theater-level adoption of digital screens collected from two sources: the European Cinema Yearbooks published by Media Salles, and an online database maintained by Cinego. These sources are publicly available for copying at the websites of Media Salles (2020) and Cinego (2020).
2. Information on the number of screens, the number of seats, the address, the owner's identity (chain, individual), and art house status for each active theater, and the annual share of movies released in digital (distributed partially or entirely in digital) in France.

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These data are obtained from the French National Center of Cinematography (CNC) reports. These sources are publicly available for copying at the website of the National Center of Cinematography (2015) and National Center of Cinematography (2017).

3. Time-series information on digital-projector acquisition costs collected from a report published by the European Audiovisual Observatory. The reference can be found at European Audiovisual Observatory (2012).
4. Data on the number of movies released in digital in the U.S. between 2005 and 2015 is obtained from the Internet Movie Database (IMDb.com). For each movie release, the website reports technical specifications including the “printed film format” over which the movie was distributed (e.g., 35mm, digital). This information is obtained for all U.S. movie releases over the period of interest (2005-2015).
5. Data on the number of digital screens (quarterly, 2005 – 2017) and the number of digital movies released (semesterly, 2005 – 2010) is obtained for 59 countries, from the Cinema Intelligence Service database of Omdia, a market research firm. This source is available at Omdia (2020).
6. Data on domestic movie industries for the 59 countries is obtained from the UNESCO Institute of Statistics (UIS). These sources are publicly available for copying at the website of UNESCO Institute for Statistics (2020).
7. Data on average distribution costs per copy for film and digital, from the CNC reports (National Center of Cinematography (2015)).

Thus, all data are publicly available, and I certify that the author of the manuscript has legitimate access to and permission to use the data used in this manuscript.

3 Computational Requirements

1. Stata 16. The required packages are listed at the top of each script (latest versions): `ivreg2`, `ranktest`, `erepost`.
2. R version 4.0.4 (2021-02-15). The required packages are listed at the top of each script (latest versions): `tidyverse`, `truncnorm`, `abind`, `parallel`, `ordinal`, `ivreg`, `bbmle`.

The code was last run on a laptop with MacOS version 11.4 (16Gb, Apple M1 chip).

4 Dataset List

The following data files are included in the replication package. All analysis data required to run the code are provided. The analysis data are

1. `data/theater_panel.RData`. Source: Media Salles, Cinego, CNC. This is the main dataset. The data combine the theater-level panel, adoption costs time series, and time series for the share of digital movies in France and U.S.
2. `data/appendix_B_data.csv`. Source: UIS and Omdia. These data combine information on digital screen and movies data by country and information on domestic movie industries. Used as input in Appendix B (`code/appendix_B.R`).
3. `data/distribution_costs.RData`. Source: CNC. Distribution costs per film and digital copy. Used as input in Appendix D.3 (`code/appendix_D3.R`).

The data folder also includes intermediary data (simulations, bootstrap). These data are

1. `data/bootstrap_secondstep_param.RData`. Bootstrap estimates of structural parameters.
Intermediary input in `code/estimation.R`
2. `data/planner_benchmark_simulations.RData`. Simulations of industry adoption paths under the planner's benchmark.
Intermediary input in `code/counterfactual_analysis_planner.R`.
3. `data/coordination_benchmark_simulations.rds`. Simulations of industry adoption paths under the coordination benchmark.
Intermediary output of `code/counterfactual_analysis_planner.R`.
4. `data/market_outcome_simulations.rds`. Simulations of industry adoption paths under the coordination benchmark.
Intermediary output of `code/counterfactual_analysis_planner.R`.
5. `data/appendix_D2/adoptvec_x.csv`. Solution of Social Planner's problem.
Intermediary input in `code/appendix_D2.R`.

5 Description of Programs

The programs can be run in any order. Except for: `code/estimation.R` followed by `code/counterfactual_analysis_planner.R`, which need to be run before any counterfactual analysis scripts.

1. `code/descriptive_statistics.R` generates the figures and tables in Section 4 of the manuscript (Data and Descriptive Statistics): Figures 1 and 2, and Tables 1 and 2.

- Run time: < 2 seconds.
- Output: Figure 1A (line 22), Figure 1B (line 28), Figure 2A (line 64), Figure 2B (line 76), Table 1 (line 192), Table 2 (line 134)

2. `code/estimation.R` performs the estimation of the structural model and generates figures and tables in Section 6.5 of the manuscript (Estimation results): Figure 3, Table 3, Table 5, Figure 4.

- Run time: 13 minutes.
- Output: Figure 3A (line 23), Figure 3B (line 29), Table 3 (line 887), Table 5 (line 2268), Figure 4 (line 2317)

The program also saves the estimates (for use in counterfactual analysis) in `data/mean_structural_para.rds` (second step), and `data/ccp_para.rds` (first step). The state space is saved in `data/state_space.rds`.

3. `code/counterfactual_analysis_planner.R` performs the counterfactual analysis presented in Section 7.3 “Quantifying the delay in adoption” (Table 6 and Figure 5 (top, left and right)). This program also performs the analysis in Appendix D.3, computing distributors’ surplus and generates Table A7 and Figure A5.

- Run time: 4 minutes.
- Output: Figure 5A (line 762), Figure 5B (line 789), Table 6 (line 873), Figure A5 (line 1003), Table A7 (line 1029).

The program saves simulations of industry adoption paths under the market outcome (`data/market_outcome_simulations.rds`) and under the coordination benchmark (`data/coordination_benchmark_simulations.rds`).

4. `code/counterfactual_analysis_blanketsubsidy.R` performs the counterfactual analysis presented in Section 7.4 “Policy remedies” for broad-based or blanket subsidies. The program generates Figure 5 (middle, left and right) and Table 7.

- **This code uses the `parallel` package. The number of cores (`mc.cores`) needs to be specified in line 21 (set to 6).**
 - Run time: 5 minutes (if `mc.cores` set to 6)
 - Output: Figure 5C (line 1405), Figure 5D (line 1426), and Table 7 (line 1523).
5. `code/counterfactual_analysis_targetsubsidy.R` performs the counterfactual analysis presented in Section 7.4 “Policy remedies” for subsidies targeted to miniplexes. The program generates Figure 5 (bottom, left and right) and Table 8.
- **This code uses the `parallel` package. The number of cores (`mc.cores`) needs to be specified in line 21 (set to 6).**
 - Run time: 6 minutes (if `mc.cores` set to 6)
 - Output: Figure 5E (line 1405), Figure 5F (line 1426), and Table 8 (line 1523).
6. `code/appendix_B_FigureA2.R` plots Figure A2 in Appendix B.
- Run time: 3 seconds.
 - Output: Figure A2 (line 28)
7. `code/appendix_B_TableA3.do` performs the reduced form analysis presented in Appendix B.2 (“Reduced Form Analysis”). The program generates Table A3.
- Run time: 2 seconds.
 - Output: Table A3 (line 107).¹
8. `code/appendix_C4.R` performs the goodness-of-fit analysis presented in Appendix C.4. The program generates Table A4, A5, and A6.
- Run time: 5 minutes.
 - Output: Table A4 (line 562), Table A5 (line 596), Table A6 (line 630)
9. `code/appendix_D2.R` computes the full-solution approach to the social planner’s problem. The program generates Figures A4 (a and b).

¹Note: the stata output in `.tex` shows Region \times Time FE as “NO” in Specifications (4) and (5), despite these FE being included as “`i.regionxdate`.” This is because they were partialled out in the IV regression. The output in `.tex` was modified by hand to “YES” for Specifications (4) and (5).

- Run time: 20 seconds (using data in `data/appendix.D2/adoptvec.x.csv` as input).
 - Output: Figure A4-a (line 423) Figure A4-b (line 449).
10. `code/appendix.D5.R` performs the counterfactual analysis presented in Appendix D.5 “Policy remedies” for subsidies targeting the first unit adopted. The program generates Figure A6 and Table A8.
- **This code uses the `parallel` package. The number of cores (`mc.cores`) needs to be specified in line 22 (set to 6).**
 - Run time: 6 minutes (if `mc.cores` set to 6)
 - Output: Figure A6-a (line 1450), Figure A6-b (line 1471), and Table A8 (line 1568).

References

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