Entry and competition on platform markets
Evidence from the European tablet industry

(Work in progress – comments welcome)

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TSE Digital Conference, Toulouse, January 9 and 10, 2025

Motivation

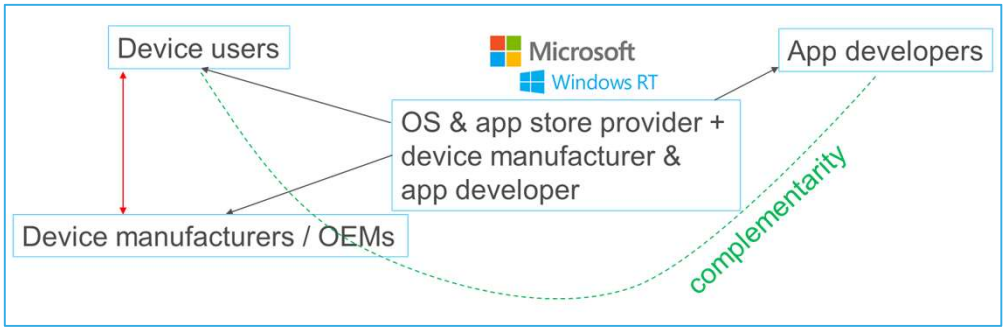
- Growing importance of digital markets dominated by large platforms
- Increasing regulatory concerns: contestability/unfair practices
- Theory contributions emerging but lack of empirical evidence
- Paper objectives:
  - Provide further evidence to the general debate
    - Focus on entire industry (vs. analysis based on single platform)
  - Link to DMA: contestability (entry), interoperability

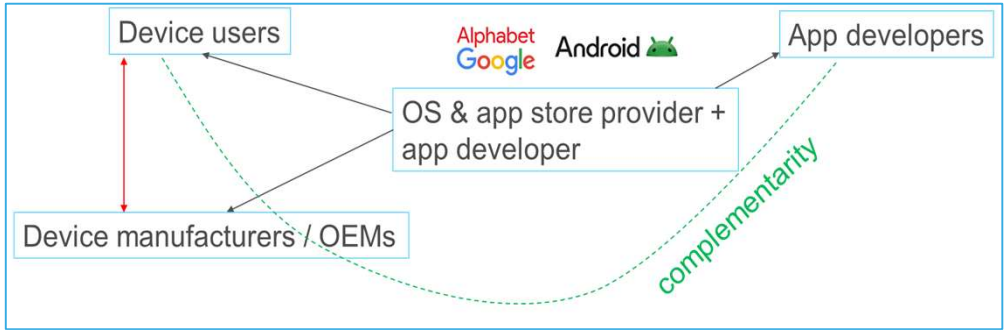
Background

- 2010: First tablets powered by iOS; 2011: Android in free distribution
- MS entered in Oct 2012 with Windows RT
  - WIN RT segment: MS Surface Tab + 4 OEMs (Samsung, Nokia, Asus, Dell) + others to enter later
  - Win RT incompatible with Win 8
  - Although MS rewrote most of its flagship desktop apps for Win RT, lack of third party apps
  - On top of that, Win RT was distributed through the old revenue model based on licencing fees (OEMs complaints about high licencing fees – $90)
- OEMs withdrew by end 2013; MS exits mid-2015; 900M $ losses

Differences and similarities across OS ecosystems

- All run app stores
  - enabling third-party firms to add complementary products to a core product purchased by user
- All depend on the adoption of devices
- Some integrate into apps and devices
- Various revenue streams possible





Data

- Monthly sales of tablets between 2012-2015, 10 countries, by GFK
- Product characteristics: brand name; model; processor, name and version of operating system; display size and resolution; embedded 3g/4g modem; built-in camera; usb and bluetooth connectivity, device dimensions and weight.
- Final dataset: N=32856 observations, 390 product markets, representing 25 brands and 988 distinct products. Total sales 63.58 million devices.
- Number of apps by app store (additional)

Data

Number of brands and products on a market

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	N
Brands	5	9	11	11	13	17	390
Products	17	57	81	84	103	194	390

Number of products by brand

	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	N
Products	1	14	40	39	59	95	25

Data

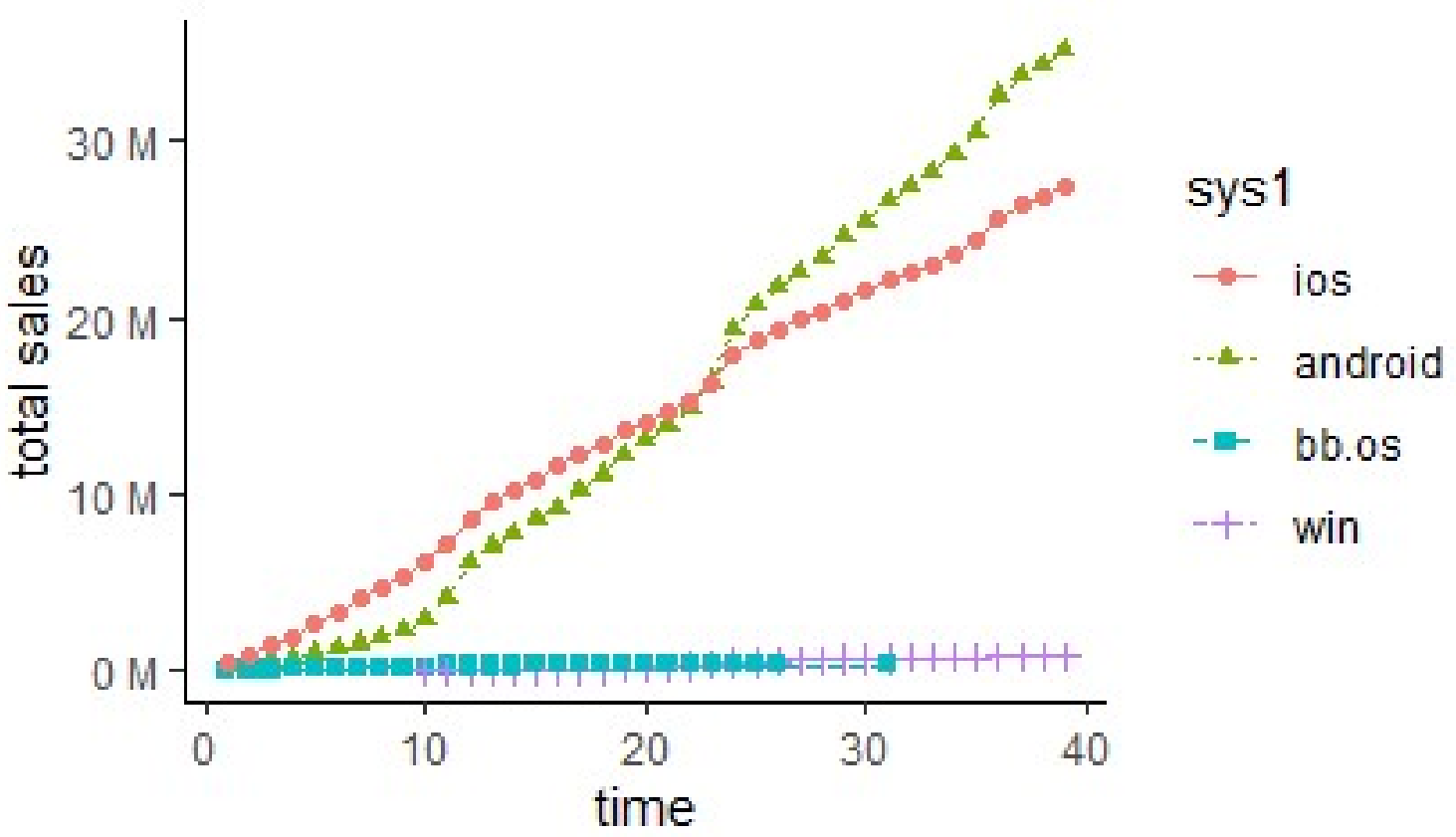
Market shares, average prices, number of products and brands by OS

Operating System	No. products	No. brands	Avr. price [x10^3 EUR][(a)]	Total sales [x10^6 units]	Market share[(b)]	N. obs.
Android	956	20	0.206	35.058	0.551	28254
iOS	18	1	0.431	27.418	0.431	3539
Windows RT	11	5	0.458	0.791	0.012	779
BlackBerry	3	1	0.301	0.311	0.004	284

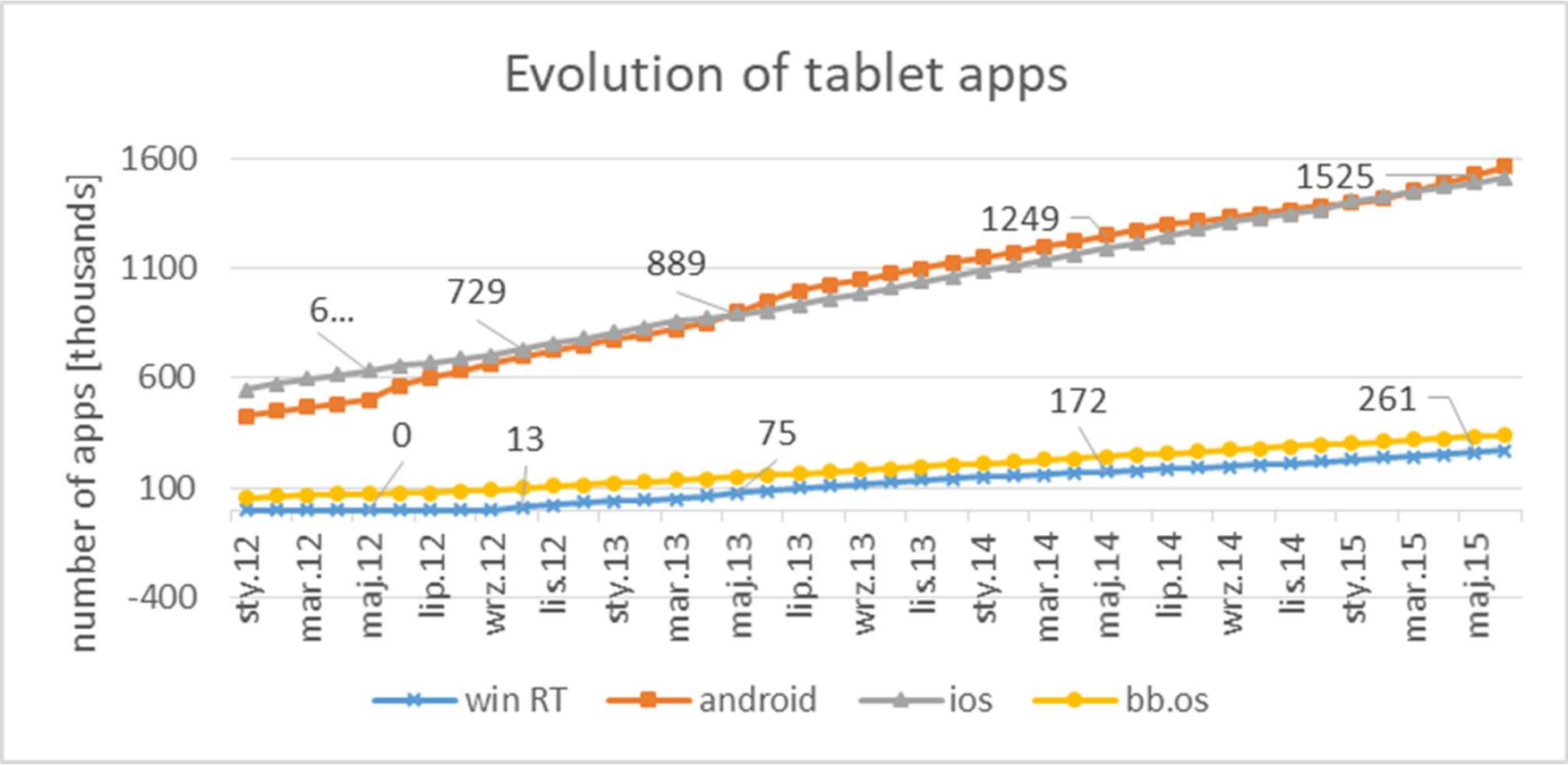
Win RT segment

	Brand	Series	Average weighted price [x10^3 EUR]	Total sales [units]	Share within Win RT segment
1	SAMSUNG	ATIV TAB	0,439	8485	0,011
2	NOKIA	LUMIA 2520	0,402	14347	0,018
3	MICROSOFT	SURFACE RT/2	0,355	726626	0,917
4	ASUS	VIVOTAB RT	0,500	35430	0,044
5	DELL	XPS 10	0,398	7006	0,008

Data: tablets adoption



Evolution of apps in different app stores



Modelling approach

- BLP structural framework (Berry et al. 1995)

$$u_{ij} = \delta_j + \mu_{ij} + \varepsilon_{ij} \qquad (1)$$

$$\delta_{jm} = \boldsymbol{X_j} \cdot \boldsymbol{\beta} - \alpha \cdot p_{jm} + \xi_{jm} \qquad (2)$$

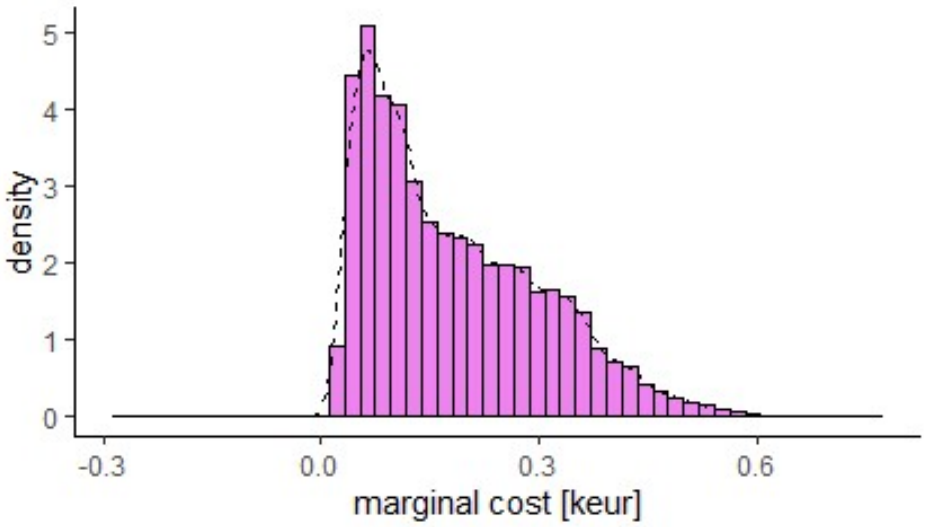
$$\mu_{i,j} = \mu_{ij}(\Sigma, \nu_i, \Pi) = \boldsymbol{\Pi_k} \cdot \boldsymbol{D}_i + p_j \cdot \sigma_\alpha \cdot \nu_{i\alpha} + \sum_{k=1}^{K} x_{jk} \cdot \sigma_k \cdot \nu_{ik} \qquad (3)$$

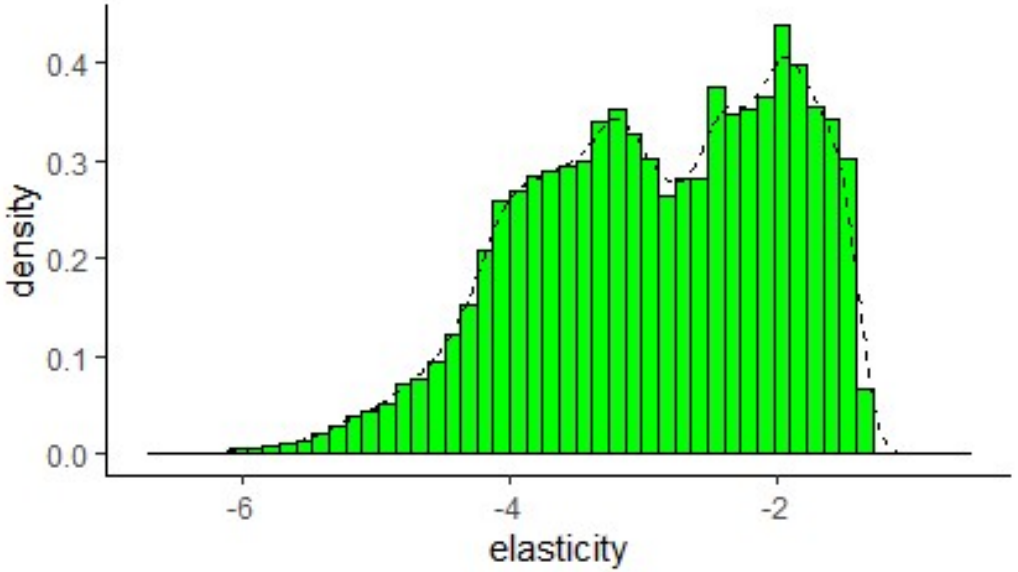
- Mixed logit on the demand side; differentiated Bertrand on the supply
- Endogeneity of price in (2) addressed by iv approach
- Endogeneity of apps in (2) addressed by apps cost shifters (Doan 2023)
- Estimation with GMM in R (BLPestimatoR, Brunner et al. 2019)

Detailed results: availability of apps drives demand

Fixed coefficients	**Estimate**	**Std. Error**	**t value**	**Pr(>|t|)**
intercept	-6.22	0.65	-9.56	1.21e-21
display size	0.53	0.08	6.46	1.05e-10
weight	-2.21	0.45	-4.96	7.13e-07
usb: 2.0	0.65	0.09	7.14	9.40e-13
usb: 3.0	1.36	0.16	8.65	5.35e-18
built-in camera: DOUBLE CAM	2.31	0.13	17.87	2.01e-71
built-in camera: SINGLE CAM	1.98	0.11	17.55	6.14e-69
modem: 3G	0.05	0.12	0.42	6.75e-01
modem: 4G	0.76	0.21	3.63	2.83e-04
bluetooth: YES	0.23	0.06	4.09	4.24e-05
62 fixed effects omitted (month, year, country, brand interacted with operating system, display resolution)[(a)]				
Random coefficients:				
price (mean)	-19.27	3.03	-6.35	2.09e-10
number of apps (mean)	4.75	0.86	5.52	3.32e-08
price (std.)	5.25	0.92	5.67	1.39e-08
number of apps (std.)	1.52	0.59	2.59	9.52e-03
Wald Test: 33.68 on 2 DF, p-value: 4.83e-8				
390 market(s) with 32856 products				
74 linear coefficient(s) (73 exogenous coefficients)				
2 non-linear parameters related to random coefficients				
0 demographic variable(s)				
Solver converged with 54 iterations to a minimum at 59.12				

Elasticities and marginal costs





	Min.	1st Qu.	Median	Mean	3rd Qu.	Max.	N
Price [10^3 EUR]	0.100	0.157	0.240	0.279	0.377	1.060	32856
Marginal cost [10^3 EUR]	0.024	0.098	0.173	0.205	0.377	0.847	32856
Lerner - products	0.113	0.228	0.281	0.306	0.374	0.769	32856
Elasticities - products	-8.801	-4.900	-3.809	-3.900	-2.757	-1.620	32856

Counterfactuals

Assume that MS:

- Exits the market
  - Win RT based devices no longer in the choice set
- Reduces the app gap wrt Google play
  - Interoperability (side-loading of apps)

Counterfactual 1

Scenario	Assumptions	Global output[(a)]	Profits[(b)]	Consumer surplus[(b)]	Win RT output[(a)]	Android output[(a)]	iOS output[(a)]
baseline	licensing fees: 50 EUR; apps : 0-17%[(c)]	63.58	5.48	11.42	0.79	35.37	27.41
Cf1	Mean utility reduced by 20 for Win RT devices	63.08	5.44	11.34	0.00	35.50	27.57
∆ cf1-baseline		-500 k units	-36.66 MEUR	-78.46 MEUR	-791 k units	135.6 k units	156.1 k units

Counterfactual 2

Scenario	Assumptions	Global output[(a)]	Profits[(b)]	Consumer surplus[(b)]	Win RT output[(a)]	Win RT global share	Microsoft share inside Win RT segment
baseline	licensing fees: 50 EUR; apps : 0-17%[(c)]	63.58	5.48	11.42	0.79	1.2%	91.8%
Cf2	licensing fees: 50 EUR; apps: 50%[(c)]	66.64	5.63	11.91	5.2	7.7%	91.9%
Cf3	licensing fees: 50 EUR; apps: 75%[(c)]	74.47	6.17	13.29	17.1	22.9%	90.7%
Cf4	licensing fees: 50 EUR; apps: 100%[(c)]	89.51	7.99	16.55	40.9	45.7%	87.0%

Wrap-up

1. We study the case of unsuccesful entry on the market for mobile operating systems (OS) for tablets.

2. We model demand for devices using BLP framework adding app complementarity.

3. We explore the reasons behind entry failure, despite some evidence of good reception of hardware/os interface.

Main insights

- Entry is welfare enhancing
  - Due to increase in product variety without significant effects on competition
- Closure of app gap boosts global WIN RT market share from 1 to 46%
  - Combination of large fixed effect on MS and a large random coefficient on the number of apps

Thank you!