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# The right to be informed and the right to be forgotten: welfare implications in presence of myopic consumers

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# Object of the presentation

- ❑ Our paper evaluates the welfare impact of private data regulation in digital markets where **consumers are behavioral**; i.e., consumers are myopic (or "naïve") if they do not recognize the impact of their present consumption decisions on their future ones (while sophisticated or "rational" ones are capable to do that!)
- ❑ In multimarket contacts, consumers reveal information about their preferences in one market, and can be discriminated in the others.
- ❑ Private data have an economic value, but some consumers are not aware of giving away their data free of charge.
- ❑ A regulation of the private data market is now perceived as a need.

# Index of the presentation

- ❑ The economic value of private data.
- ❑ The EU GDPR.
- ❑ A theoretical model:
  - *no market for data (N);*
  - *an unregulated market for data (U);*
  - *a regulated market for data (R).*
- ❑ Welfare analysis
- ❑ Conclusions.

# The economic value of private data

The utilitarian approach to personal data markets:

- ❑ **Posner (1978, 1981):** *the protection of privacy create inefficiencies in marketplaces;*
- ❑ **Stigler (1980)** *governmental action may be ineffective;*
- ❑ **Calzolari and Pavan (2006):** *restriction of the sharing of personal data creates distortions, inefficiencies, reduces social welfare.*
- ❑ **Hirshleifer (1971) and Taylor (2003):** *competiton among firms to collect private data can cause inefficiency (overinvestment, extracosts)*

***[In all these contributes, consumers are assumed to be rational]***

# The economic value of private data (2)

Behavioral biases hurdle in consumer decision making.

❑ **Acquisti (2004), Acquisti Grossklags (2007):**

Privacy decision making is afflicted by incomplete information, bounded cognitive ability, and other behavioral biases (overconfidence, myopia, naivety, social norms, ...).

→ Individual effort to privacy protection is inefficient and some regulation is needed.

# Privacy as a human right

- ❑ **Samuelson (2000)**: *“personal data protection is an interest essential to individual autonomy, dignity, and freedom in a democratic civil society”*.
- ❑ The **EU Legislator** tends to define privacy as a fundamental human right.
  - A Personal Data Regulation is a need: the European Union has approved, in 2016, the **General Data Protection Regulation (GDPR)** (EU 2016/679), having for object data protection and privacy protection for all individuals within the European Union (EU) and the European Economic Area (EEA).

# The EU GDPR

- ❑ Definition of what is a personal data
  - ❑ **Right to be Informed**
  - ❑ Right of Data Portability
  - ❑ Right to Correction
  - ❑ **Right to be Forgotten**
  - ❑ Right to Refuse Profiling
  - ❑ Data Protection by Design
- Collecting, protecting, and storing data are now costly.
- Consumers' awareness should increase.

# The theoretical model

- ❑ We propose a simple model consisting of two separated markets, X(basic good) and Y (luxury good), in monopoly.
- ❑ The population of potential consumers differs in their income and in their level of myopia.
- ❑ Only high-income consumers buy the luxury good. High and low-income consumers buy the basic good.
- ❑ Purchasing data on consumers behavior in market Y, the firm in X can price-discriminate (by direct marketing proposal).
- ❑ Personal data regulations as the EU GDPR can increase consumers awareness about the treatment of their data and allow them to have their data erased from the data holder.
- ❑ We evaluate overall and redistributive welfare effects

# Consumers' characteristics

We consider a population of potential consumers (size  $N=1$ ) split in two subgroups:

$\lambda$  of high-income consumers

$1-\lambda$  of low-income consumers

The size of the two sub-groups is common knowledge while the consumer type (low or high income) is not observable.

- ❑ High income consumers are the only interested on the luxury good, and have a willingness to pay for good  $x$  equal to  $h$  (*high*).
- ❑ Low income consumers are not interested on the luxury good and have a willingness to pay for good  $x$  equal to  $l < h$  (*low*).

# Consumers' characteristics (2)

Independently of income distribution, consumers are (also) split in two subgroups:

$\mu$  of myopic consumers

$1-\mu$  of sophisticated consumers

Then, we have

$\mu\lambda$  myopic high-income consumers,

$(1-\mu)\lambda$  sophisticated high-income consumers,

$(1-\mu)(1-\lambda)$  sophisticated low-income consumers, and

$\mu(1-\lambda)$  myopic low-income consumers.

# The timing

- At  $t=1$ , firm Y sells the luxury good, collecting personal data on served consumers.
- At  $t=2$ , firm X can buy the list of served consumers in market Y at a unit cost  $w$ .
- At  $t=3$ , firm X can use acquired personal data to discriminate in selling the basic good  $x$ .

→ We consider three alternative scenarios:

(N) No market for personal data;

(U) Unregulated market for personal data;

(R) Regulated market for personal data.

# Market Y

A monopolistic firm Y, produces a luxury good y, purchased by high-income consumers only, whose indirect utility function is:

$$U_y^i = \theta_i - p_y \quad \text{with } \theta_i \sim U[0,1]$$

Each consumer purchases only one unit of the good (or none). As a consequence, the demand for the luxury good is:

$$q_y = (1 - p_y)\lambda \leq \lambda$$

# Market X

The monopolist X operates in the market for the good x, demanded both by low and high-income consumers.

- In the non-discrimination case, each consumer buys at most one unit of the good x whose price is  $p_x$  (uniform price). Thus, the indirect utility functions are:

$$U_x^h = \begin{cases} h - p_x & \text{if } x = 1 \\ 0 & \text{if } x = 0 \end{cases}$$

$$U_x^l = \begin{cases} l - p_x & \text{if } x = 1 \\ 0 & \text{if } x = 0 \end{cases}$$

with  $h > l$ . Total quantity is:

$$q_x = \begin{cases} 0 & \text{if } p_x > h \\ \lambda & \text{if } h \geq p_x > l \\ 1 & \text{if } p_x \leq l \end{cases}$$

# Market X (2)

- In the discrimination case, by acquiring data, firm X propose the good:
  - at a price  $p_x^D = h$  to all the high income consumers that revealed their characteristics in market Y ( $q_x^D$ )
  - at a price  $p_x^U = l$  to all the others ( $1 - q_x^D$ ).

**IMPORTANT: Price-discrimination requires private data**

# N: markets Y and X

Market Y:  $\pi_y = \lambda(1 - p_y)p_y$  (zero cost!)

In equilibrium:

$$p_y = \frac{1}{2}; q_y = \frac{\lambda}{2}; \pi_y = \frac{\lambda}{4}; CS_y = \frac{\lambda}{8}; W_y = \frac{3\lambda}{8};$$

Market X:  $\pi_x = \begin{cases} h\lambda & \text{if } p_x = h \\ l & \text{if } p_x = l \end{cases}$  (zero cost!)

In equilibrium (non-discrimination):

(i) If  $\lambda \leq \lambda_N = l/h$  then

$$p_x = l, q_x = 1; \pi_x = l; CS_x = \lambda(h - l); W_x = \lambda h + (1 - \lambda) l$$

(ii) If  $\lambda > \lambda_N = l/h$  then

$$p_x = h, q_x = \lambda; \pi_x = h\lambda; CS_x = 0; W_x = \lambda h$$

# U: market Y

In market Y sophisticated consumers are aware that revealing their type, they would be discriminated in market X

- sophisticated:  $\theta_i - (h - l) \geq p_y$   
 $q_y(s) = (1 - (h - l) - p_y)(1 - \mu) \lambda$

- myopic:  $\theta_i - p_y \geq 0$   
 $q_y(m) = (1 - p_y) \mu \lambda$

In aggregate:

$$q_y = q_y(m) + q_y(s) = (1 - (h - l)(1 - \mu) - p_y) \lambda$$

# U: market Y (2)

A market for data allows firm Y to sell the list of (all) its consumers to firm X at a unit price  $w$ .

*Since:*  $\pi_y = q_y(p_y + w)$

*In equilibrium:*

$$p_y = \frac{1 - (h-l)(1-\mu) - w}{2}; \quad q_y = \frac{1 - (h-l)(1-\mu) + w}{2} \lambda;$$

$$\pi_y = \frac{(1 - (h-l)(1-\mu) + w)^2}{4} \lambda;$$

$$CS_y = \frac{(1 - (h-l)(1-\mu) + w)^2}{8} \lambda; \quad W_y = \frac{3(1 - (h-l)(1-\mu) + w)^2}{8} \lambda$$

# U: market X

Firm X buys the list of  $q_y$ , who will receive a direct proposal

$$\pi_x = \begin{cases} l & \text{if } p_x = l \\ h\lambda & \text{if } p_x = h \\ (h-w)q_y + l(1-q_y) & \text{if "buy y + discriminate in x"} \end{cases}$$

**It buys** discriminates  
 - buy data at unit price  $w$ , discriminate by direct marketing fixing a price  $p_x^D = h$  to  $q_y$ , and a price  $p_x^U = l$  to  $1 - q_y$

In equilibrium:

- Fixing  $p_x = l$  to all the consumers is dominated by discrimination iff  $h - l > w$
- if  $\lambda \leq \lambda_U$  then  $p_x^D = h$ ,  $p_x^U = l$ , and  $q_x = 1$
- if  $\lambda > \lambda_U$  then non-discrimination  $p_x = h$  and  $q_x = \lambda h < 1$

# R: right to be forgotten in market Y

*Sophisticated and myopic:*  $\theta_i - p_y \geq 0$

$$q_y(s) = (1 - p_y)(1 - \mu)\lambda$$

$$q_y(m) = (1 - p_y)\mu\lambda$$

*In aggregate:*  $q_y = (1 - p_y)\lambda$

*Since:*  $\pi_y = (q_y p_y + q_y(m)w)$

*In equilibrium:*

$$p_y = \frac{1 - \mu w}{2}; q_y = \frac{1 + \mu w}{2} \lambda;$$

$$\pi_y = \frac{(1 + \mu w)^2}{4} \lambda; CS_y = \frac{(1 + \mu w)^2}{8} \lambda; \pi_y = \frac{3(1 + \mu w)^2}{8} \lambda;$$

# R: Market X

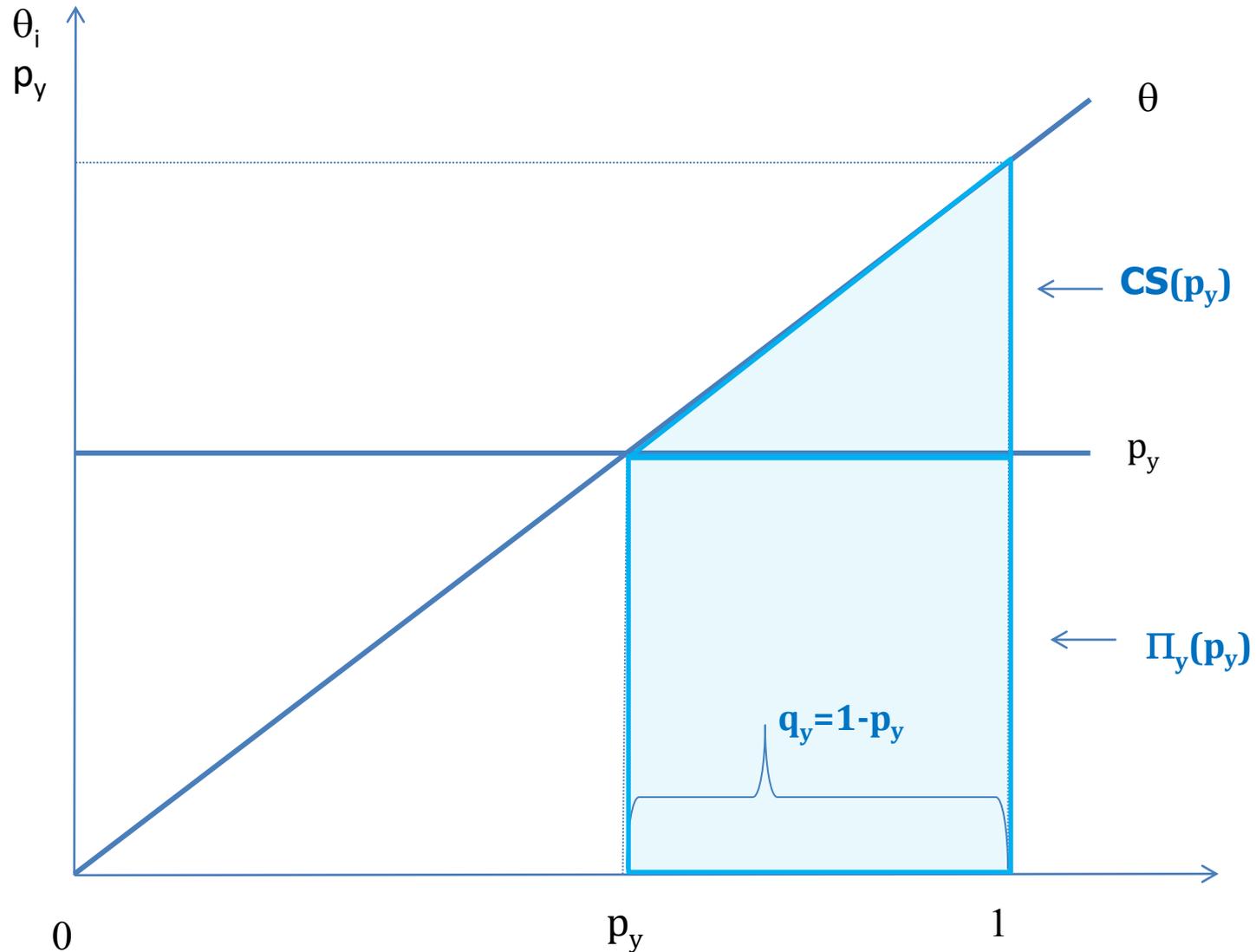
$$\pi_x = \begin{cases} l & \text{if } p_x = l \\ h\lambda & \text{if } p_x = h \\ (h - w)q_y(m) + l(1 - q_y(m)) & \text{if "buy + discriminate"} \end{cases}$$

- *buy* data at unit price  $w$
- *discriminate* by direct marketing fixing a price  $p_x^D = h$  to  $q_y(m)$ , and a price  $p_x^U = 1 - q_y(m)$

In equilibrium:

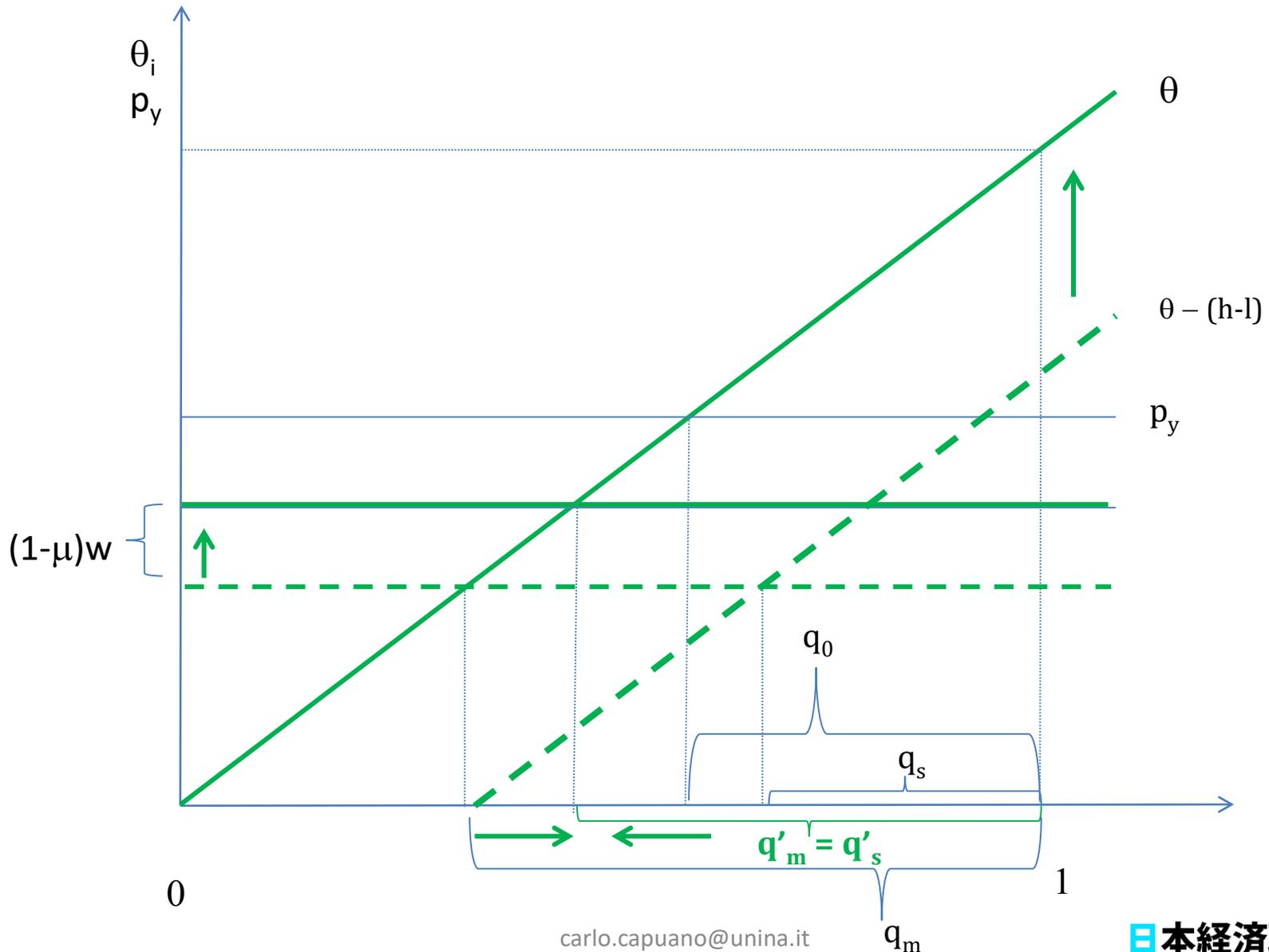
- Fixing  $p_x = l$  to all consumers is dominated by buy/discriminate iff  $h - l > w$
- if  $\lambda \leq \lambda_R$  then  $p'_x = h$  and  $p_x = l$ ,  $q_x = 1$
- if  $\lambda > \lambda_R$  then "non - discrimination",  $p_x = h$ ,  $q_x = \lambda h$

# N: market for Y





# R: market Y



# R vs. U

- ❑  $\lambda_U > \lambda_R > \lambda_N$  : regulation reduces the set of parameters such that  $q_x = 1$ : less consumers in market y reveal their type, reducing profitability of discrimination in market x.
- ❑  $q_y(m)$  is larger in U than in R, while  $q_y(s)$  is larger in R than in U: we have redistributive effects between the types of consumers; i.e., sophisticated consumers benefit by the regulation, myopic ones hurt.
- ❑ Overall effects depend on the size of myopic consumers: total welfare is higher in R than U iff  $\mu > \mu_R$ .
- ❑ If regulation reduces  $\mu$  (higher awareness), total welfare decreases.
- ❑ [other] If compliance costs increase  $w$ , total welfare decreases.

# The right to be informed

- The right to be informed increases consumers' awareness; this, means the percentage of myopic consumers  $\mu$  decreases.
- In any scenario, a reduction of  $\mu$  negatively affect welfare: markets need of naive consumers otherwise, without private data discrimination in the market X is not profitable!
- The net impact of the right to be forgotten and the right to be informed depends on the initial proportion of myopic person. Is too low, the net impact of the regulation is univocally negative.

# Conclusions

- ❑ Data Protection Regulation is not univocally welfare-enhancing: the size of myopic consumers matters!
- ❑ Redistributive effects occurs between types of consumers (+ sophisticated, - myopic).
- ❑ Compliance costs reduces benefits from the regulation: 7.8 billion USD estimated in 2017 (direct effect only!).
- ❑ The applicability of the regulation only to «European firms» can create them competitive disadvantages in the worldwide market.
- ❑ Only the Japan's Act of Protection of Personal Information (2013) goes in the same direction of the EU GDPR; USA, China, South Korea do not seem to care!

# Thanks for your attention



## Any questions?

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