Innovation in customer authentication methods, card-based internet payments and User Experience:
empirical evidence from Italy

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Motivation of this paper

Digital payment innovation:

- **right balance between security and positive user-experience**
- **lack of empirical analysis**

PSD2 introduces ad hoc obligations for payment services providers to apply **strong customer authentication (SCA)** for remote electronic payments

This paper is a first attempt to assess **the impact of a security innovation on (card-based) internet payments**

Research questions:

- **the massive adoption of multi-factor authentication methods may have negative impacts on the user experience?**
- **policy implications?**

Agenda

- Literature

- Model

- Results

- Conclusion & policy issues

Literature

Key findings from the literature (*):

✓ Security concerns may be an impediment to the confidence of the adoption of digital services

✓ User experience can suffer as digital products become more complicated because of security innovations. Empirical results are limited.

(*)

Consumers' payment and perception of safety

Hayashi et al. (2015); Schu and Stavins (2015); Kosse (2013)

Digital products, security and usability

Svilar and Zupancic (2016); Krol et al. (2015); Braz and Robert (2006)

Consumer experience and multi-factor safety technology

De Cristofaro et al. (2016); Adyen (2014).

Model: strategy

Card-based internet payments

Cards are still the payment instrument most frequently used for e-commerce, also due to mobile technologies.

"3D-Secure" protocol

It's a two-factor authentication method for online card transactions linking the e-merchant, the acquiring PSP and the issuing PSP, adopted by the industry in the past already, with different penetration rate among countries.
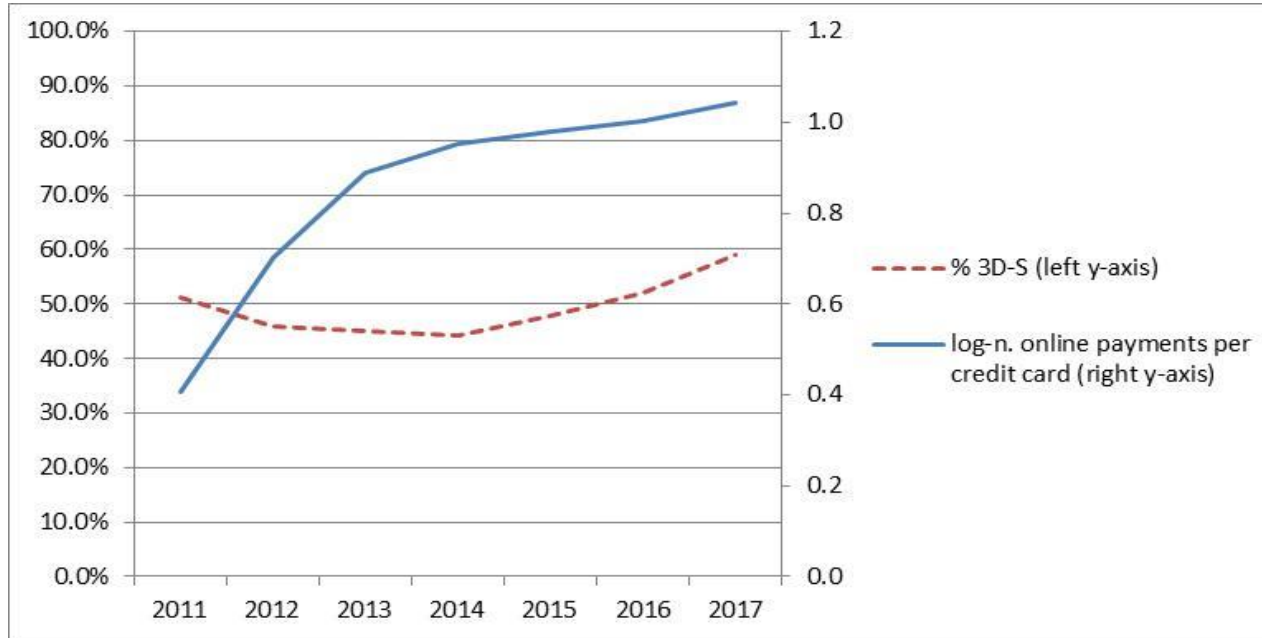
Dataset (*source: Bank of Italy, banking statistics*)

Bank panel data over the period 2011H1 – 2016H2, representative of 80 percent of the card-based Internet payments sector (from 200 up to 376 observations); information about : number of cards, percentage of cards used over the Internet, total volume and value of card transaction (of which Internet transactions), percentage of "3-D secure" based transactions, other control variables (such as bank size and type).

Focus on credit cards over the Internet

Model: data

Pattern of the 3D Secure rate and credit card turnover over the Internet in Italy

Source: Bank of Italy, banking statistics

Assessing the user experience: one can assume a relationship between the Internet card **turnover** (transaction per card), the 3D Secure adoption (percentage of 3DS transactions) and other control variables *Z*:

$$TURNOVER_{it} = \alpha_0 + a_1 3DS_{it} + \sum_h \alpha_h Z_{it} + u_{it} \qquad [1]$$

An alternative specification considers as a dependent variable the share of credit cards on total **cards** which has been **activated online** :

$$CARDONL_{it} = \alpha_0 + a_1 3DS_{it} + \sum_h \alpha_h Z_{it} + u_{it} \qquad [2]$$

H0: 3D-Secure authentication methods introduce additional steps in the payment workflows which can impact the user experience (turnover or card adoption as a proxy).

Results

Estimates Equation 1 "TURNOVER" : unbalanced bank panel data, 2011–2016; results

Regressors [a]	FE	GMM-Style
3D-S	-.346**	-.457**
	(.1433)	(.1906)

Estimates Equation 2 "CARDONL" : bank panel data, 2011–2016; results

Regressors [a]	FE	GMM-Style
3D-S	-.097**	-.075*
	(.407)	(.047)

Results support the hypothesis of negative effects of the two-factor authentication method (such as the 3-D-Secure protocol) on the user-experience (expressed in term of card turnover or card online adoption). Such outcomes are robust both in static panel data specifications (FE models) and the dynamic ones (GMM estimator à la Arellano-Bond).

Among the regressors time dummies and a set of environmental variables (Z) which can influence the use of card-based internet payments are included. See appendix
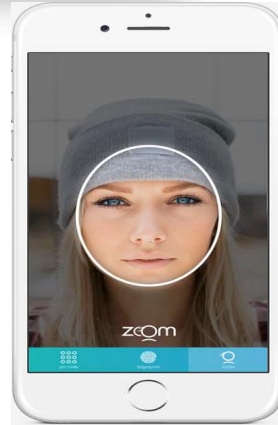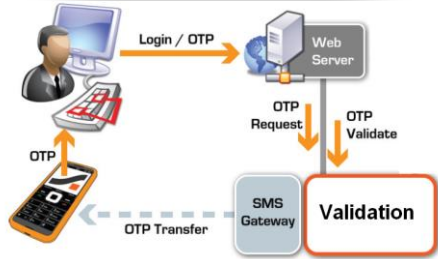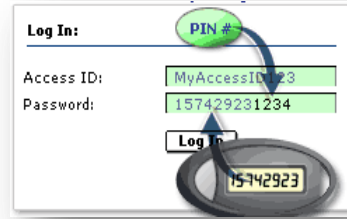
Results

«usability»
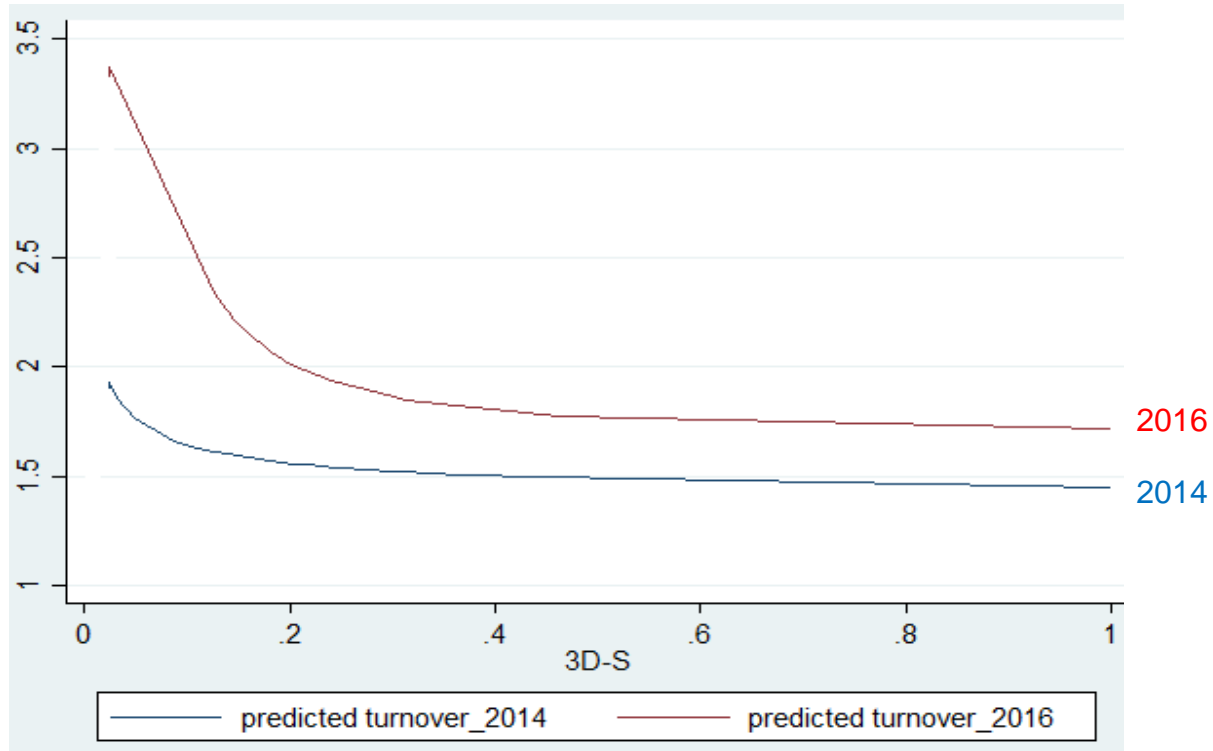
Predicted turnover ("usability") with upward shifts over time: "learning by doing", consumer awareness, technology improvements

Conclusion & policy issues

- Potential trade-off between security technologies and usability:
  - ✓ empirical evidence

- The issue is aknowledged by the regulator (EBA GLs, PSD2-EBA RTS):
  - ✓ SCA combined with:
    - low value transactions
    - transaction risk analysis

- The issue must be addressed by the payment industry:
  - ✓ «education» (consumer awareness)
  - ✓ SCA with different usabilities

Thanks!

Estimates Equation 1 "TURNOVER" : unbalanced bank panel data, 2011-2016; results

Regressors [a]	FE	GMM-Style
3D-S	-.346**	-.457**
	(.1433)	(.1906)
$\sum_h Z$	yes	yes
Time dummy	yes	yes
Constant	yes	yes
Observations	376	367
Groups	58	58
R²	0.30	.
AR1(p-value)		0.012
AR2(p-value)		0.776
Hansen test (p-value)		0.175

[a] Dependent variable: *TURNOVER* = log-value of credit card based Internet transaction divided number of issued credit card; robust standard errors in round brackets.

Estimates Equation 2 "CARDONL" : unbalanced bank panel data, 2011-2016; results

Regressors [a]	FE	GMM-Style
3D-S	-.097**	-.075*
	(.407)	(.047)
$\sum_h Z$	yes	yes
Time dummy	yes	yes
Constant	yes	yes
Observations	222	195
Groups	42	37
R²	0.48	.
AR1(p-value)		0.13
AR2(p-value)		0.01
Hansen test (p-value)		0.83

Dependent variable: CARD_ONLINE = percentage share of credit cards active at least once for Internet payments during the reference period

Coefficients and p-values in parentheses. FE=fixed effect estimator: GMM-Style =Arellano-Bond two-step system GMM estimator (all covariates – with the exception of dummies - are treated as endogenous and instrumented through their lagged values). Among the regressors, time dummies and a set of environmental variables (Z), which can influence the provision of card-based internet services (type of PSP, internet market share, cross-border penetration, share of alternative payment methods, network dimension, etc.), are included. See Model: results