

How Do Consumers React to Cybercrime?


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Is raising awareness to cybercrime a good idea?



Yesterday,
I verified my **password** for an email that said I'd won a free laptop.

Today,
I am an identity theft victim.

Your Password. Your Data. Your Life.

A message from your Information Security Officer
More info at www.smu.edu/infosec

Photo by Maria Mori.



Outline

- 1 Analytical approach and data analysis
 - Research questions
 - Survey questions and demographics
 - Statistical model
- 2 Results
 - Impediments to online shopping
 - Impediments to online banking
 - Impediments to online participation
- 3 Discussion
 - Revisiting the hypotheses
 - Overarching observations



Our data source: Eurobarometer Survey on Cybercrime

- European Commission conducts regular surveys of EU citizens on a range of topics
- In Spring 2012 they ran a survey asking about citizens' concerns about and reactions to cybercrime using face-to-face interviews (26,593 EU residents (18K Internet users) age 15+)
- The report provides descriptive statistics on how experiences with cybercrime varied across 27 EU Member States
- We were granted access to micro-data on responses in order to conduct a secondary analysis



Questions we seek to answer

- We focus on the relationship between **experiences and concerns** over cybercrime and the resulting **actions taken** by consumers
- We use survey questions asking whether people intend to bank or shop less because of cybercrime as response variables
- We then create explanatory variables in four groups
 - ① **Experience** with cybercrime (e.g., falling victim to identity theft, receiving phishing emails)
 - ② **Concern** over cybercrime (e.g., concern over security of online payments)
 - ③ **Exposure to news** about cybercrime (e.g., read newspaper articles)
 - ④ **Proficiency** (e.g., educational attainment, online expertise, running antivirus)



Research questions

- **H1:** Falling victim to cybercrime reduces online participation, in particular online banking and shopping.
⇒ **H1:** *Supported with evidence*
- **H2:** Expressing concern over cybercrime reduces online participation, in particular online banking and shopping.
⇒ **H2:** *Supported with strong evidence*
- **H3:** Exposure to cybercrime in the news media reduces online participation, in particular online banking and shopping.
⇒ **H3:** *Supported only for online banking*
- **H4:** Falling victim to one form of cybercrime reduces participation in unrelated forms of online activity.
⇒ **H4:** *Some support for e-commerce fraud*



Question: Effects of cybercrime

Has concern about security issues made you change the way you use the Internet in any of the following ways?

- Less likely to shop online
- Less likely to bank online
- Less likely to give personal information on websites
- Only visit websites you know and trust
- Do not open emails from people you don't know



Question: Effects of cybercrime

Effects of cybercrime (dependent variable)	%
Less likely to buy goods online	17.5
Less likely to bank online	14.4
Less likely to participate online (summary of:)	63.0
– Less likely to give personal information on websites	36.3
– Only visit websites you know and trust	33.5
– Do not open emails from people you don't know	42.8



Question: Experiences with cybercrime

Cybercrimes can include many different types of criminal activity. How often have you experienced or been a victim of the following situations?

- Identity theft (somebody stealing your personal data and impersonating you, e.g. shopping under your name)
- Received emails fraudulently asking for money or personal details (including banking or payment information)
- Online fraud where goods purchased were not delivered, counterfeit or not as advertised
- Not being able to access online services (e.g. banking services) because of cyber attacks

Respondents were asked to answer “often”, “occasionally”, “never”, or “don’t know”.



Question results: Experiences with cybercrime

Experience with cybercrime	%
Personal experience (at least “occasionally”) with ...	
– Identity theft	8.0
– Phishing/advance-fee fraud spam	37.4
– E-commerce fraud	12.2



Question: Concerns about cybercrime

And how concerned are you personally about experiencing or being a victim of the following cybercrimes?

- Identity theft (somebody stealing your personal data and impersonating you, e.g. shopping under your name)
- Received emails fraudulently asking for money or personal details (including banking or payment information)
- Online fraud where goods purchased were not delivered, counterfeit or not as advertised
- Not being able to access online services (e.g. banking services) because of cyber attacks

Respondents were asked to answer “very concerned”, “fairly concerned”, “not very concerned”, or “not at all concerned”.



Question: Concerns about cybercrime

What concerns do you have, if any, about using the Internet for things like online banking or buying things online?

Interviewer categorized responses to different categories including:

- Security of online payments
- You are concerned about someone taking/misusing your personal data.



Question results: Concerns about cybercrime

Concerns about cybercrime	%
Personally (at least “fairly”) concerned about ...	
– Identity theft	63.3
– Phishing/advance-fee fraud spam	50.2
– E-commerce fraud	51.7
Generally concerned about ...	
– Security of online payments	37.1
– Misuse of personal data	39.7



Question: Exposure to news about cybercrime

Cybercrimes can be defined as any crimes which are committed via the Internet. In the last 12 months, have you seen or heard anything about cybercrime from any of the following?

- Television
- Radio
- Newspapers
- Internet
- Friends, family or colleagues
- Not heard anything about cybercrime



Question results: Exposure to news about cybercrime

Exposure to news about cybercrime	%
On television	66.5
On radio	22.9
In the newspapers	33.3
On the Internet	33.9
From friends, family or colleagues	25.5
Not heard anything about cybercrime (spontaneous)	14.8



Question results: proficiency indicators

Proficiency indicators (control variables)	%
Internet access more than once a day	54.2
Bank online	47.8
Buy goods or services online	52.0
Feel confident about Internet skills	67.7
Feel informed about the risks of cybercrime	51.1
Changed at least one password in the past 12 months	48.4
Use different passwords for different sites	24.8
Antivirus installed	50.7



Socio-demographics of Internet users vs. entire population

	Total population (%)	Internet users (%)
Gender		
Male	48.3	50.9
Female	51.7	49.1
Age		
15–24	14.4	19.3
25–39	24.6	31.3
40–54	25.8	28.6
55+	35.5	20.8
Full-time education		
Up to the age of 15	20.3	8.7
16–19	42.6	43.6
20+	26.4	33.8
Still studying	9.2	12.7
Size of locality		
Rural area or village	32.8	30.0
Small or middle sized town	41.5	42.0
Large town	25.6	

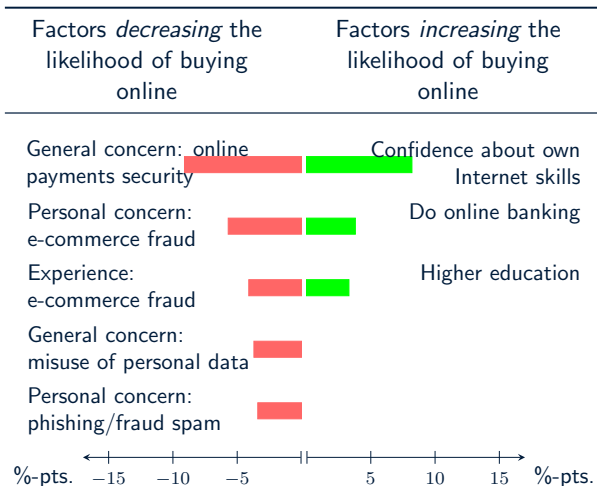


Logistic regression model

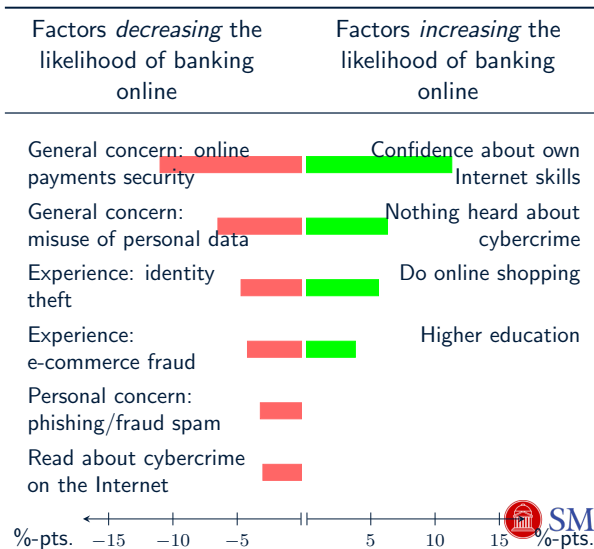
$$\begin{array}{c}
 \text{Behavior} \\
 \underbrace{\log\left(\frac{p}{1-p}\right)} \\
 = b_0 + \underbrace{b_1 D_1 + \dots + b_i D_i + \dots +}_{\text{Experience}} \underbrace{b_j D_j + \dots + b_k D_k + \dots +}_{\text{Exposure}} \underbrace{\varepsilon}_{\text{Proficiency}}
 \end{array}$$



Factors affecting the likelihood of shopping online

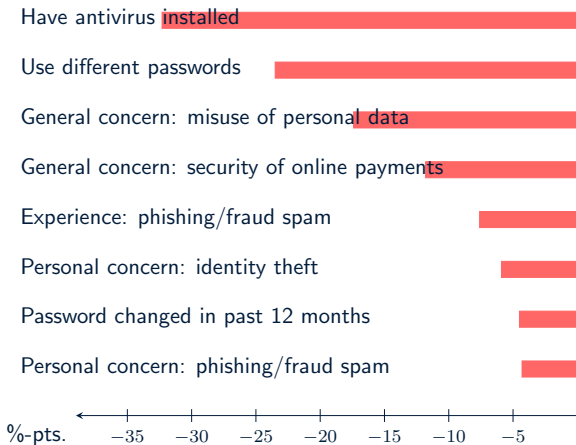


Factors affecting the likelihood of banking online



Factors affecting the likelihood of online participation

Factors *decreasing* the likelihood of online participation



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Concern about cybercrime inhibits more than experience

- One important and unexpected result: **concern about cybercrime inhibits online participation more than direct experience with cybercrime does.**
- People may find the experience of cybercrime to be less painful than their worst fears
- Regardless of what drives the result, its implications are clear
 - Assuaging society's concerns over cybercrime should be priority
 - Awareness campaigns should focus on **positive steps** to take that improve cybersecurity, **not** "scaring people straight" by making cybercrime fears more salient



Indirect and defense costs outweigh direct losses

Cybercrime cost category	Estimate
Direct losses	
– genuine cybercrime (e.g., phishing, advanced-fee fraud)	\$2–3Bn
– online payment card fraud	\$4Bn
Defense costs	
– cybercriminal infrastructure (e.g., antivirus)	\$15Bn
– payment card and online banking security measures	\$4Bn
Indirect costs	
– cybercriminal infrastructure (e.g., malware cleanup)	\$10Bn
– loss of confidence in online transactions	\$30Bn

Full details in our paper “Measuring the cost of cybercrime”:

<http://lyle.smu.edu/~tylerm/weis12.pdf>



Limitations

- Hypotheses suggest causation but the data only allows statements about correlation
- Even with a representative sample using face-to-face interviews, we are not immune to biases arising from response effects
- Most critically, questions ask about stated, not observed behavior



Conclusion

- The Internet brings huge benefits to society, and cybercrime threatens those benefits
- In addition to direct costs, cybercrime creates substantial opportunity costs that can outweigh the direct costs
- We have presented the first multivariate analysis of a representative sample on the effects of cybercrime
- Concern and experience with cybercrime both reduce online participation, but moreso for those expressing concern
- Since experiencing cybercrime is relatively rare, this calls into question the value of raising awareness to cybercrime
- Paper: <http://lyle.smu.edu/~tylerm/ecrime12.pdf>

