

# Security Economics

## Moral Hazard

When someone takes different risk decisions because they are insulated from the consequences

e.g. traders who receive bonuses when they make a profit, and lose nothing when they make a loss

## Incentives

Individuals will make decisions which optimize their expected gains

e.g. Medical systems are supposed to serve patients but are bought by hospitals so actually serve those interests first

## Externalities

Sometimes the consequences of decisions falls on others

e.g. malware installed on a PC harms other computers through a denial-of-service attack, not the PC owner

## New Uses of Security Technology

Cryptography now protects business models

e.g. stopping printer cartridges from being refilled

Understanding technology is only part of the problem

## Partial Information

Market for Lemons:

- good cars cost more than bad cars
- customers can't tell the difference
- eventually nobody sells good cars

Same situation with security tools

## Network Effects

Value of network grows faster than its size

If a network with 3 members is worth \$10, a network with 4 members is worth \$40

Consequence: there is one Internet, there are few payment systems (might be one if not for anti-monopoly regulations)

## Liability Engineering

	Terminal			
Card	magstripe	chip	chip & PIN	
magstripe	Issuer	Issuer	Issuer	Issuer
chip	Acquirer	Acquirer	Acquirer	Acquirer
chip & PIN	Acquirer	Acquirer	Acquirer	Issuer <sub>1</sub>

Fraud liability was changed to encourage Chip & PIN adoption

## Law

- Payment Card & PINL requires sign-off for transactions
- Law says that, forget a groceries receipt and you'll get it & PIN signed and you'll get it back. Part of being a card user is signing
- Law says that someone who holds liable
- Clarify Impacted by Payment Services Regulations

## Enforcement

- Despite more clarity, it's hard for a merchant to sue a bank or the UK
- Law says
- No such thing as a free lunch

## Customer Liability

Bank of America blames the 48% of card fraud that is not pin on their money, loss

## Lessons

- Payment card security is a technical and economic problem
- All those involved should know something of both
- The market cannot solve all problems: regulatory influence may be required

The Economics of Payment Card Security and Shifting Fraud Liability

Steven Murdoch  
University of Cambridge

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Maybe we have security problems because we don't have enough of

- Cryptography
- Authentication
- Firewalls
- ...

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Cloning printer cartridges being refilled

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Moral Hazard

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Once a party does the minimum to shift liability, there is less incentive to improve security further

# Customer Liability

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# Law

- Prior to Chip & PIN, customers signed for transactions
- Law was clear: forged signatures are null and void
- With PIN transactions (ATM and since 2005, Point of Sale), the law was unclear
- Sometimes the customer was held liable
- Clarity improved by Payment Services Regulations

# Enforcement

- Despite more clarity, it is hard for a customer to sue a bank in the UK
- Loser pays
- No such thing as class action

# Lessons

- Payment card security is a technical and economic problem
- All those involved should know something of both
- The market cannot solve all problems: regulatory influence may be required