Payment Systems in the Integration Process

Wilko Bolt

Research Department, De Nederlandsche Bank, Amsterdam
-

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Outline

- Motivation payment economics: What s the problem?

- Main facts and main questions

- Economic models
    - economic theory: two-sided markets
      payment pricing, platform competition, economic welfare

    - empirical:
      scale economies, cost efficiency and pricing

- Policy recommendations and conclusions

Motivation

- What make payment markets so special? Payment is the quintessential economic activity that binds together the gains from trade.

  Efficient payment systems are essential components of any well functioning economy.

- But:
    - No free lunch! Payment systems impose resource costs
    - What about financial stability?   *
    - Security, reliability, speed, fees, acceptance and accessibility

- Task for the ESCB: The promotion of a sound and safe payment system (oversight and regulation).

Payment Economics

- First coined by Ed Green in Atlanta (2004):

  A ready-and-rough definition:

  "Payment economics comprises the topics common to monetary economics and industrial organization."

  - monetary economics: alternatives to money, why valued? information economics/mechanism design

  - industrial organisation: networks, externalities, IRTS, price setting, competition policy

- Payment system: a set of instruments, banking procedures, and, typically, interbank funds transfer systems that ensure the circulation of money.

- Large-value payment systems:
  - access, liquidity, system risk, settlement

- Retail payment systems:
  - pricing, competition, antitrust, fraud
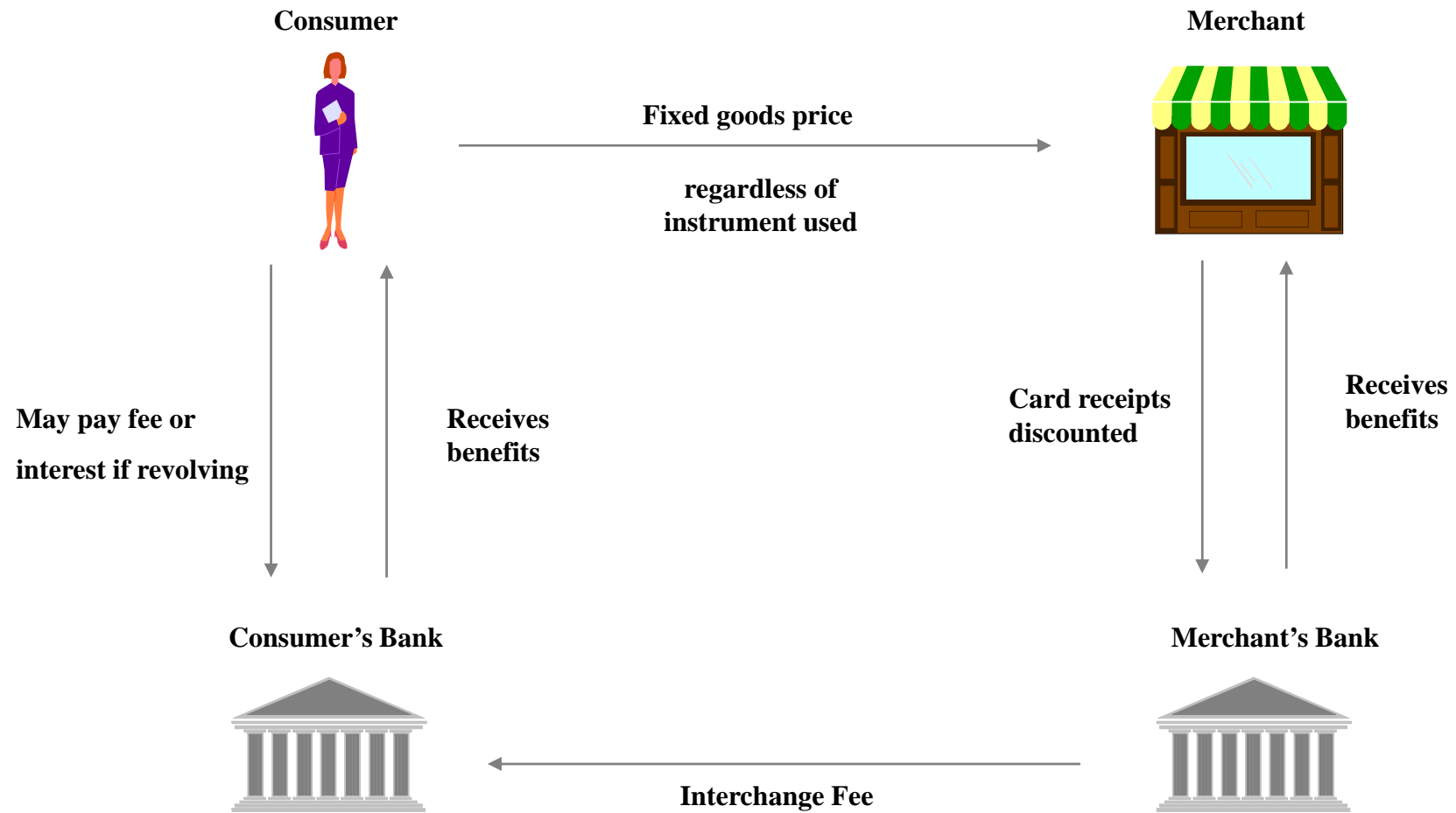
  We will focus here on retail systems!

Some Facts

- Payments are big business and getting bigger. But countries differ a lot.

- Shift from cash and paper to electronic payment instruments   [*](#)

- In 2008, Visa's IPO largest in U.S. history (~raising $18 billion)

- Antitrust scrutiny in several jurisdictions
  – EC ruling on European MasterCard cross-border payments
  – U.S. merchant lawsuit (the "Walmart" case), current Congress Bill
  – NMa vs. retailers: Dutch "pinpas affaire"
  – Australia, Mexico, Spain, and others

- Single European Payments Area (SEPA)

Key Research Questions

- Who benefits and who bears the cost? What is the optimal structure of payment fees between consumers and merchants?

- Will competition among payment providers, networks, or instruments improve consumer and merchant welfare?

- Will realized cost efficiencies be passed onto the consumer?

- What guidelines should policymakers follow when regulating fees for payment services?

A Basic Payment Network

Consumer

Merchant

Fixed goods price

regardless of
instrument used

May pay fee or
interest if revolving

Receives
benefits

Card receipts
discounted

Receives
benefits

Consumer's Bank

Merchant's Bank

Interchange Fee

Some Theory: economic models

- Rochet-Tirole (2006) define two-sided markets roughly as

  "markets where one or several platforms enable interactions between end-users, and try to get the two (or multiple) sides "on board" by appropriately pricing each side"

- Not only the total price matters, but also the price structure matters for the total volume of demand !!

Some Theory

- Examples of two-sided markets (2sms):

buyers	platform	sellers
gamers	videogame platform	game developers
consumers	shopping malls	shops
reader/viewer	portals, newspapers, TV	advertizers
cardholders	debit & credit cards	merchants
men	dating agency/nightclubs	woman

Two-sided markets!

You are Cordially Invited to
"NATURAL SELECTION SPEED DATE"
Rich Guys & Hot Girls
Exclusively available to qualified wealthy men and beautiful women

Brought to you by Pocket Change & New York magazine

pocket change
NEW YORK
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Applicant Requirements - Men

Solely based on wealth

- Salary:
  Age 25 or below $200K +
  Age 26-30 $300K +
  Age 30+ $500K +

- Invested Assets: $1 million +
- Trust: $4 million +
*Men will be asked to provide documented proof

Ticket Price $500
(apply for free - must be accepted to purchase)

Applicant Requirements - Women

Solely based on beauty

- 5 pictures will be submitted to Pocket Change for judgment by celebrity Matchmaker Janis Spindel
- Pictures are judged for beauty
- No additional information will be accepted

Ticket Price $50
(apply for free - must be accepted to purchase)
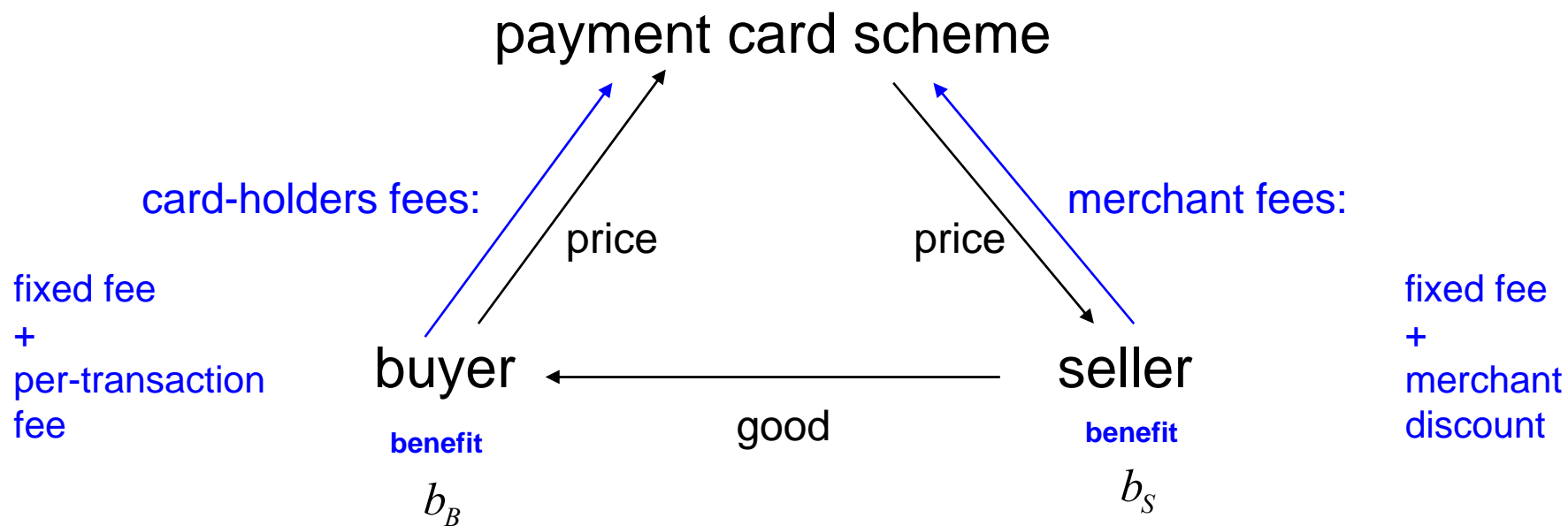
JANIS SPINDEL
SERIOUS MATCHMAKING
INC.

Female beauty will be judged by famed matchmaker **Janis Spindel**

www.janisspindelmatchmaker.com

2sms

What are the profit-maximizing card fees?

2sms: Heterogeneity

• Benefits b_i differ across consumers and merchants.

This heterogeneity is decribed by a pdf *h(x)* with cdf *H(x)*.
Often by a simple uniform distribution. That is:

$$D_i(t_i) = \mathbf{Pr}(b_i \geq t_i) = 1 - H_i(t_i)$$

2sms: Monopolist

- Monopolist maximizes profits to get both sides on board:

$$\max_{t_b, t_s} \pi(t_b, t_s, c) = (t_b + t_s - c)D(t_b, t_s)$$

with (quasi-)demand

$$D_i(t_i) = \mathbf{Pr}(b_i \geq t_i) = 1 - H_i(t_i)$$

and

$$D(t_b, t_s) = D_b(t_b)D_s(t_s)$$

2sms: Monopoly outcome

- Rochet & Tirole (2002,2003) show optimal pricing for monopolistic platform with *only* usage fees:
  - price level (total price) and price structure (price ratio)

- Optimal prices (interior): [R&T, JEEA 2002,2003]
  - total price: $(t-c)/t=1/\varepsilon$
  - price structure: $t_b/t_s = \varepsilon_b/\varepsilon_s$
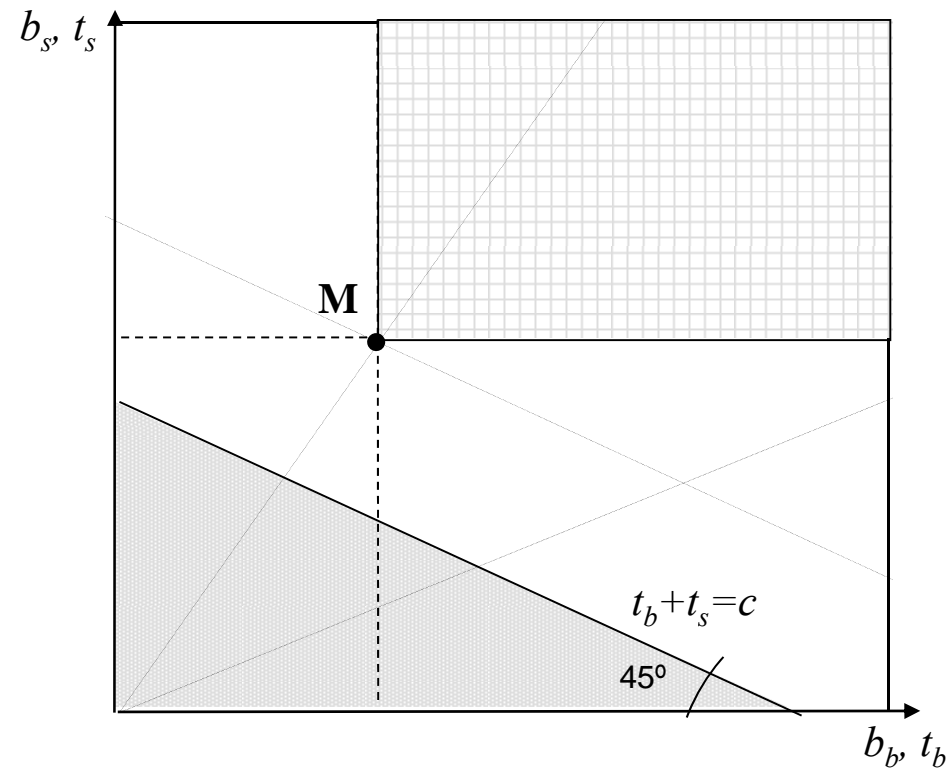
  where $t=t_b+t_s$ and $\varepsilon=\varepsilon_b+\varepsilon_s$.

- Optimal prices (corner): [Bolt&Tieman, IJIO 2008]
  - skewed prices: $t_b=0$ and $t_s=t(\varepsilon_s)$, $\varepsilon_b > \varepsilon_s$
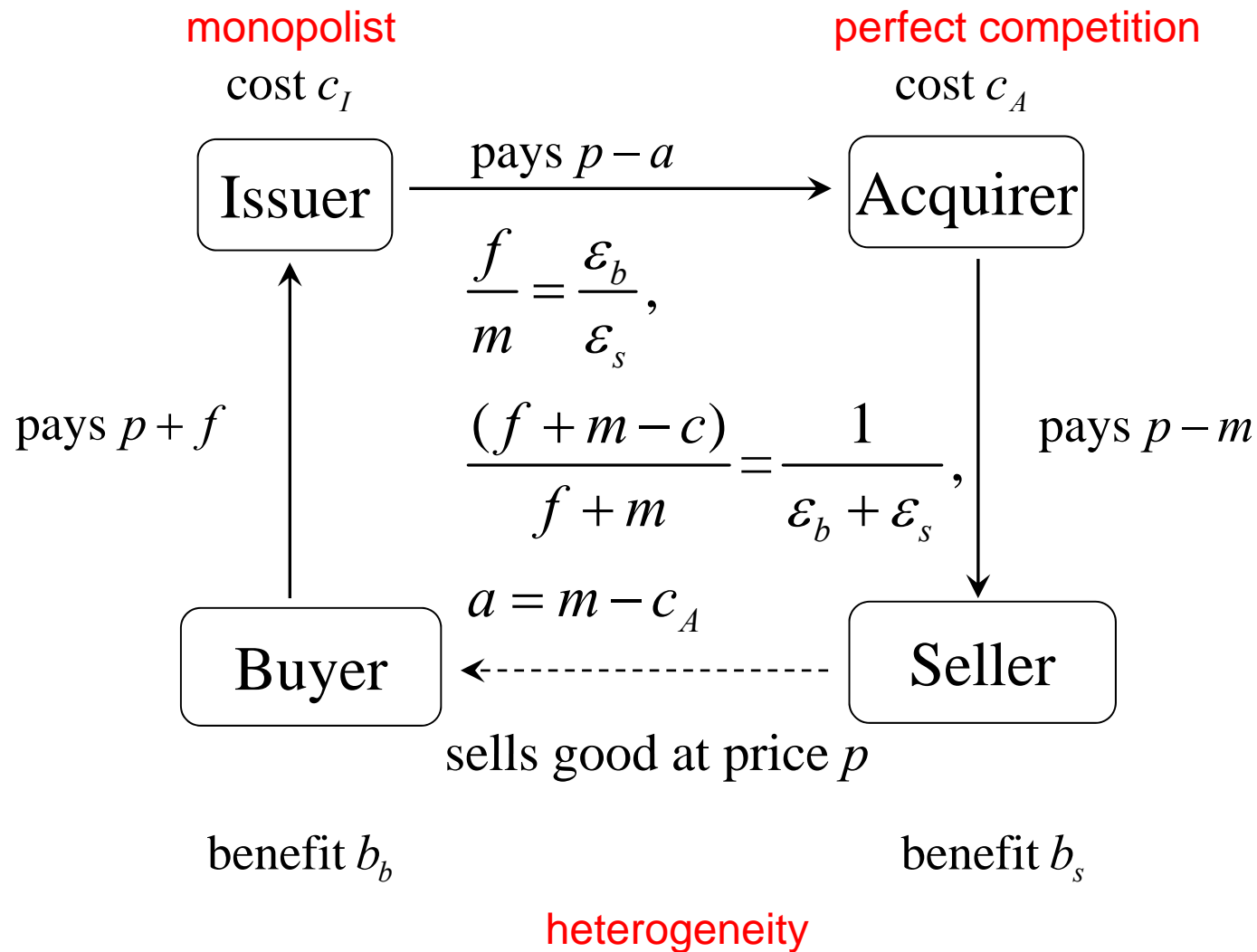
2sms: Optimal tradeoff

Monopolist:

Optimal tradeoff between price margin and demand

and social welfare?

monopolist
cost c_I

perfect competition
cost c_A

Issuer $\xrightarrow{\text{pays } p-a}$ Acquirer

$$\frac{f}{m} = \frac{\varepsilon_b}{\varepsilon_s},$$

pays $p+f$

$$\frac{(f+m-c)}{f+m} = \frac{1}{\varepsilon_b + \varepsilon_s},$$

pays $p-m$

$a = m - c_A$

Buyer $\longleftarrow$ Seller

sells good at price p

benefit b_b

benefit b_s

heterogeneity

Economic Models

Theoretical payment card models focus on different aspects of payment networks

- Interchange fees

- Platform competition and among payment instruments

- Pricing of payment services and consumption goods:
  No-surcharge rule

- Extension of credit

Interchange fee

- Because they are set collectively, antitrust authorities have questioned their levels and, in some cases, "encouraged" or "mandated" lower fees

- Balance consumer and merchant demands

- Optimal interchange fee is not likely to be zero

- Socially optimal interchange fee may be the same as profit-maximizing fee

Platform competition

- Platform competition does not necessarily improve the price structure

- However, the total price may decrease resulting from platform competition

- Competition may result in too high interchange fees if issuers compete too vigorously on the consumer side

- Differences in resource cost of debit and credit cards determine which payment instruments bank offer

Differentiated pricing vs no-surcharge

- Lack of price incentives or "rewards" may induce usage of more costly payment instruments

- If merchants were allowed to set different prices, interchange fees would be neutral

- Assumes 100 percent pass-through---however, this is not common in reality

- In the Netherlands, uniform pricing favors debit card use

Extension of credit

- Most of the payment literature ignores the extension of credit but it is another source of surplus extraction for payment providers

- Surprising given that much of the antitrust scrutiny is about credit cards

- Credit allows consumers to make purchases and merchants to make sales that may not have otherwise occurred

- But who pays for credit..?

Summary on 2sms

- Not only an optimal price level, but also an optimal price structure exists, which depends on costs, market side price elasticities and externalities

- One side of the market may be priced below marginal costs, whereas the other side may show a high price mark-up

- Interchange fees may be set too high, but can also be too low. In general, they are not zero, and can never be fully cost-based.

  Watch out antitrust authority!

Some Theory: empirical results

SEPA: Liberalisation and harmonisation of payment market

Economic drivers:

- Consolidation:
  positive scale effects induce lower average costs

- Competition:
  do lower costs induce lower payment prices..?
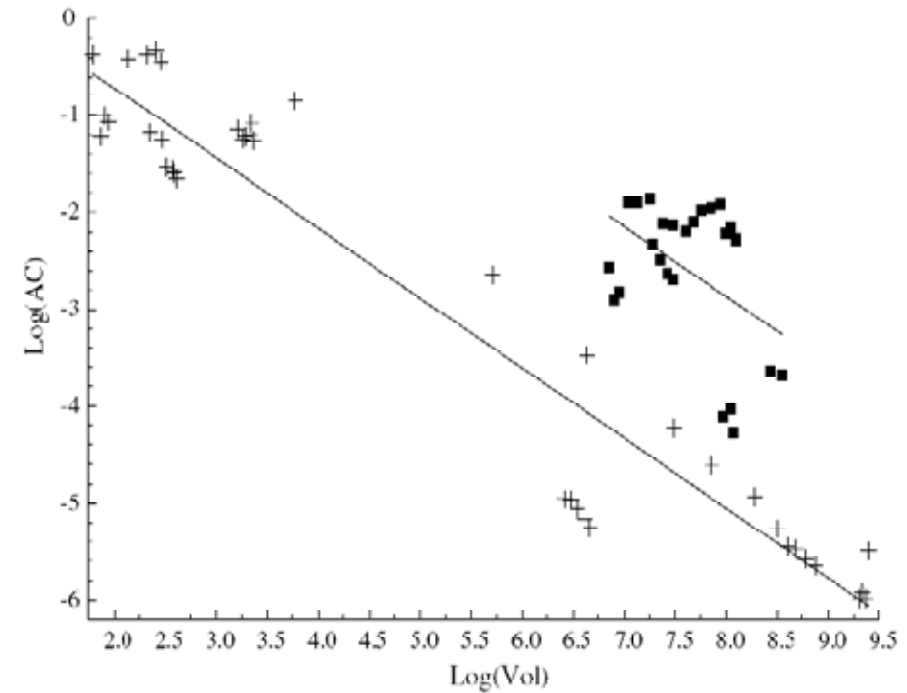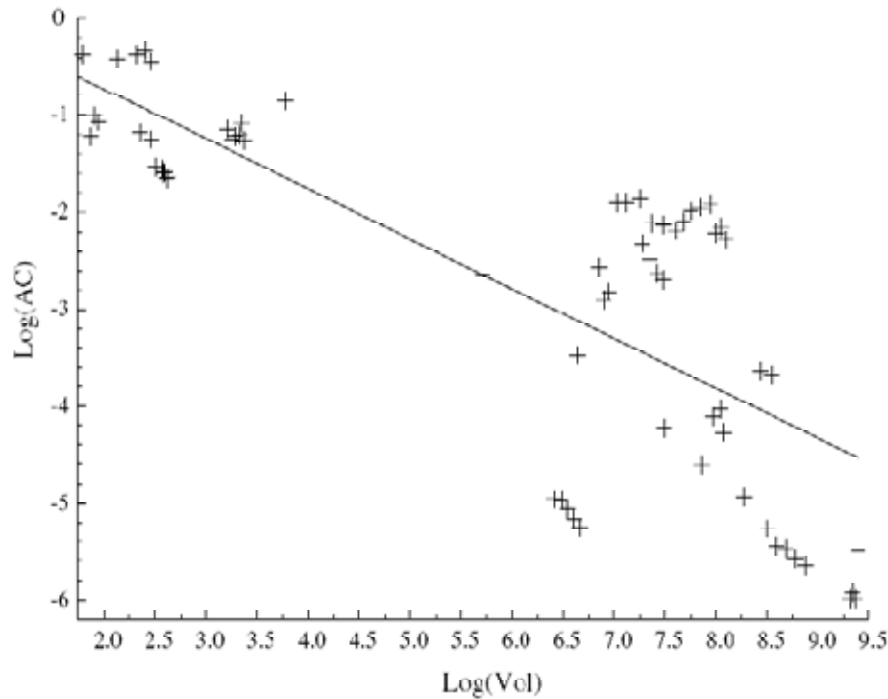
Can we measure these scale effects?
(Beijnen&Bolt, JBF 2009, Bolt&Humphrey, RNE 2007)

I. Scale effects: A first glance (1)....

Table 1   Changes in bank operating cost, payment volume, ATMs and branches for 11 European countries between 1987 and 2004

	Operating cost (2004, US$m, PPP) (1)	OC/TA (%) (2)	Point of sale (%) (3)	Bill payments (%) (4)	ATMs (%) (5)	Branches (%) (6)
France	82,850	0.02	78	185	280	1.4
Germany	77,247	−40	501	115	601	14
UK	63,972	−52	117	214	160	−25
Italy	50,204	−29	121	117	809	133
Netherlands	34,157	−33	330	128	1,593	−50
Spain	32,120	−50	714	390	858	22
Belgium	12,070	−23	136	98	802	−48
Sweden	5,637	−38	685	8	70	−33
Denmark	4,112	−39	206	333	522	−38
Finland	2,783	59	1,057	136	11	46
Norway	2,160	−60	757	67	70	−38
All countries together	–	−34	140	151	434	9.8

Lower line: central bank owned payment processors
Upper line: private owned payment processors

Note that the line gets steeper

F1 F2

Model and Estimations

❑ Cost Function:

$$C = C(L, K) = C(w, r, Q)$$

❑ Economies of Scale (1 output):

$$EoS = \frac{d \ln C}{d \ln Q} = \frac{dC}{dQ} \frac{Q}{OC} = \frac{MC}{AC}.$$

EoS < 1   Economies of Scale are present

EoS = 1   Constant returns to scale

EoS > 1   Diseconomies of Scale

Translslog cost function approach

Previous model yields high EoS... But too simple, are they here to stay?

Translog cost function:

$$\ln OC = \alpha_0 + \alpha_1 \ln Q + \frac{\alpha_{11}}{2}(\ln Q)^2 + \sum_{k=1}^{2}\delta_{ik}\ln Q \ln P_k + \sum_{k=1}^{2}\beta_k \ln P_k +$$

$$\frac{1}{2}\sum_{k=1}^{2}\sum_{m=1}^{2}\beta_{km}\ln P_k \ln P_m + \gamma_1 DPUBLIC + \gamma_2 TIME \, ,$$

OC = total operating cost, Q = total payment volume,

$P1$ = wage, $P2$ = capital cost,

$DPUBLIC$ = dummy variable to correct for ownership

$Time$ = time trend to correct for technological progress

Translslog function

Translog regressions: single output

Regressor	Coefficient	Estimation	
		Model 2a	Model 2b
CONSTANT	α_0	3.45***	−0.37
VOL	α_1	0.28***	1.04***
VOL^2	α_{11}		−0.05
WAGE	β_1	0.98***	−0.24
WAGE^2	β_{11}		−0.17
INTRATE	$1 - \beta_1$	0.02***	1.24
INTRATE^2	β_{11}		−0.17
VOL * WAGE	δ_1		0.12***
VOL * *INTRATE	$-\delta_1$		−0.12***
WAGE * *INTRATE	$-\beta_{11}$		0.17
DPRIVATE	γ_1	2.00***	1.81***
TIME	γ_2	−0.03	−0.05*
S		0.28***	0.25***
Adj. R^2		0.91	0.91
Log-likelihood		−47.16	−42.88
LM-stat		1.68	1.56
N		67	67

- ❑ EoS measure is "robust"

- ❑ Time has the right sign and is significant on 10% level

- ❑ Interpret: reduces cost with 5 % yearly rate

To illustrate..

Recent merger of TAI and Interpay into Equens:

❏ If all payment transactions would be processed on the TAI platform then payment volume would double:

- Given EoS measure of 0.25, then:

- Average cost could fall with 30-35%

❏ This implies a decrease from 4 eurocents to lower than 2.5 eurocents: stronger competitive position for Equens

F1

Summary on scale effects

Conclusion:

- Substantial economies of scale

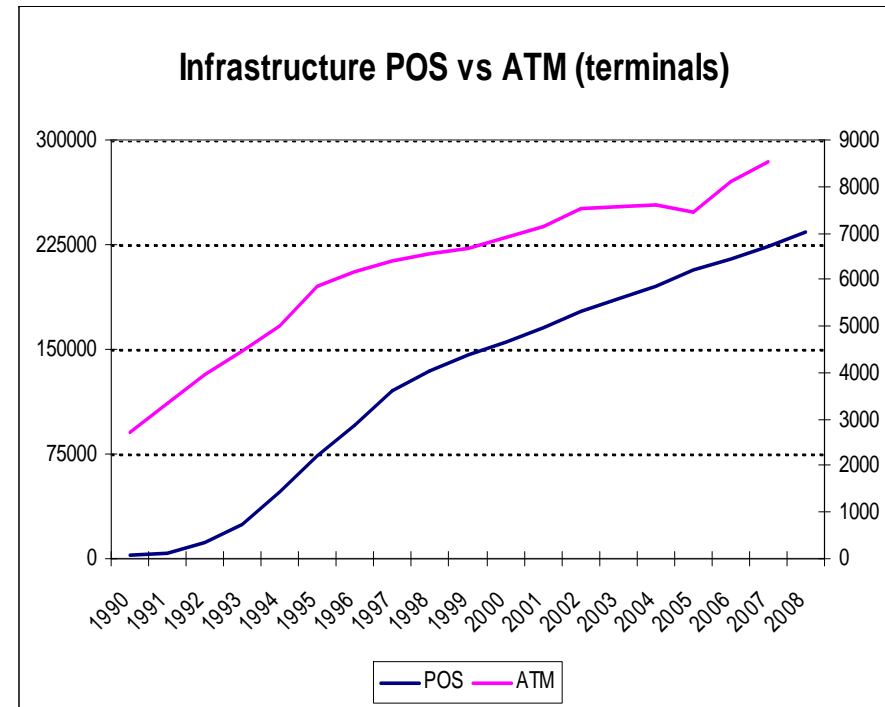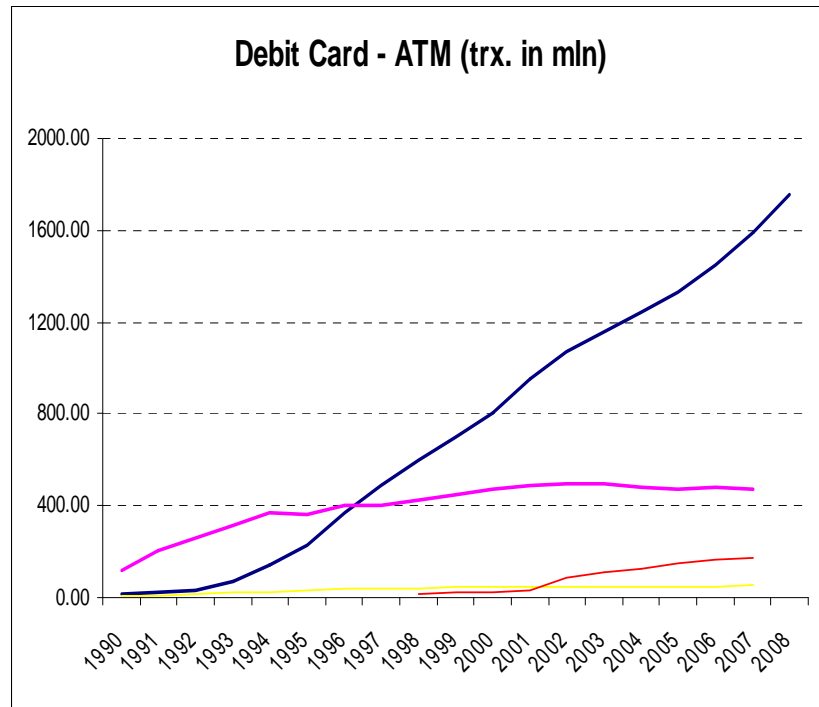- Governance structure important to describe cost structure

Policy:

- Future consolidation is expected: contestability?

- Cost reduction vs. price: role for regulation?

Overall Conclusions

- Payment card economics is complicated because of the interplay of a set of interdependent bilateral relationships

- Two-sidedness changes traditional economic logic

- Theory without data is empty! Some experiments are being conducted to allow us to empirically test theories, e.g. Australia and Spain. This should help antitrust authorities

- Future research should consider:
  - Incorporate credit dynamics of consumer payments
  - Incorporating the cost of innovation
  - Models where merchants provide payment services directly
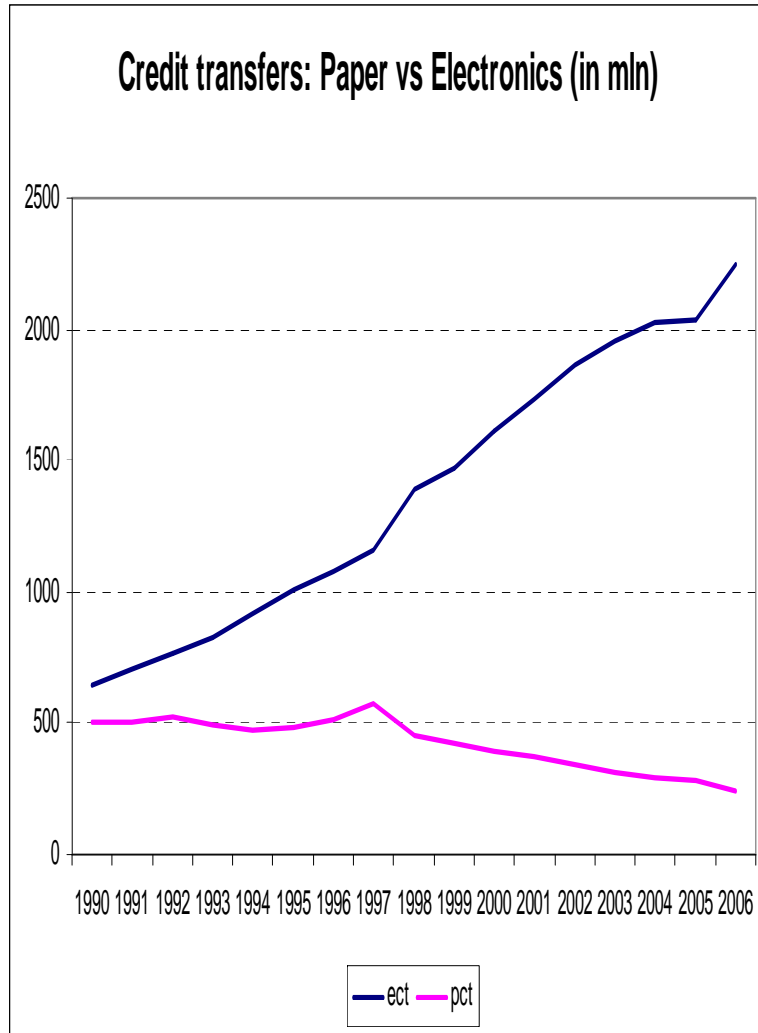 - How to win the "war on cash"?

Bedankt!!

Major Trends in Payment Use in NL (1)

Debit Card - ATM (trx. in mln)

Infrastructure POS vs ATM (terminals)

back

Major Trends in Payment Use in NL (2)

Credit transfers: Paper vs Electronics (in mln)

2006:		mln		mld
- Point-of-Sale:	**1645**			**68**
Debit	*1451*	*(86%)*		*64*
Chipknip	*165*	*(10%)*		*0.4*
Credit	*29*	*(4%)*		*3.0*
- ATM withdrawals:	**481**			**56**

Branches:	3300
ATMs	8100
POS (trms)	200000
Debit cards	20.3 mln
Credit cards	6.0 mln

back

European payment use

Payment instruments within Euro zone

Development of used payment instruments, euro area
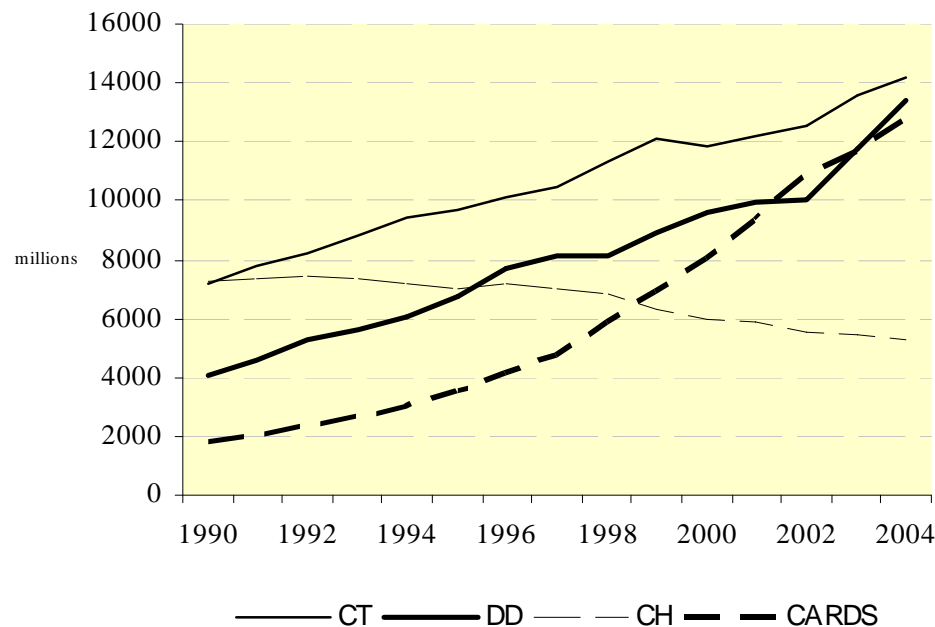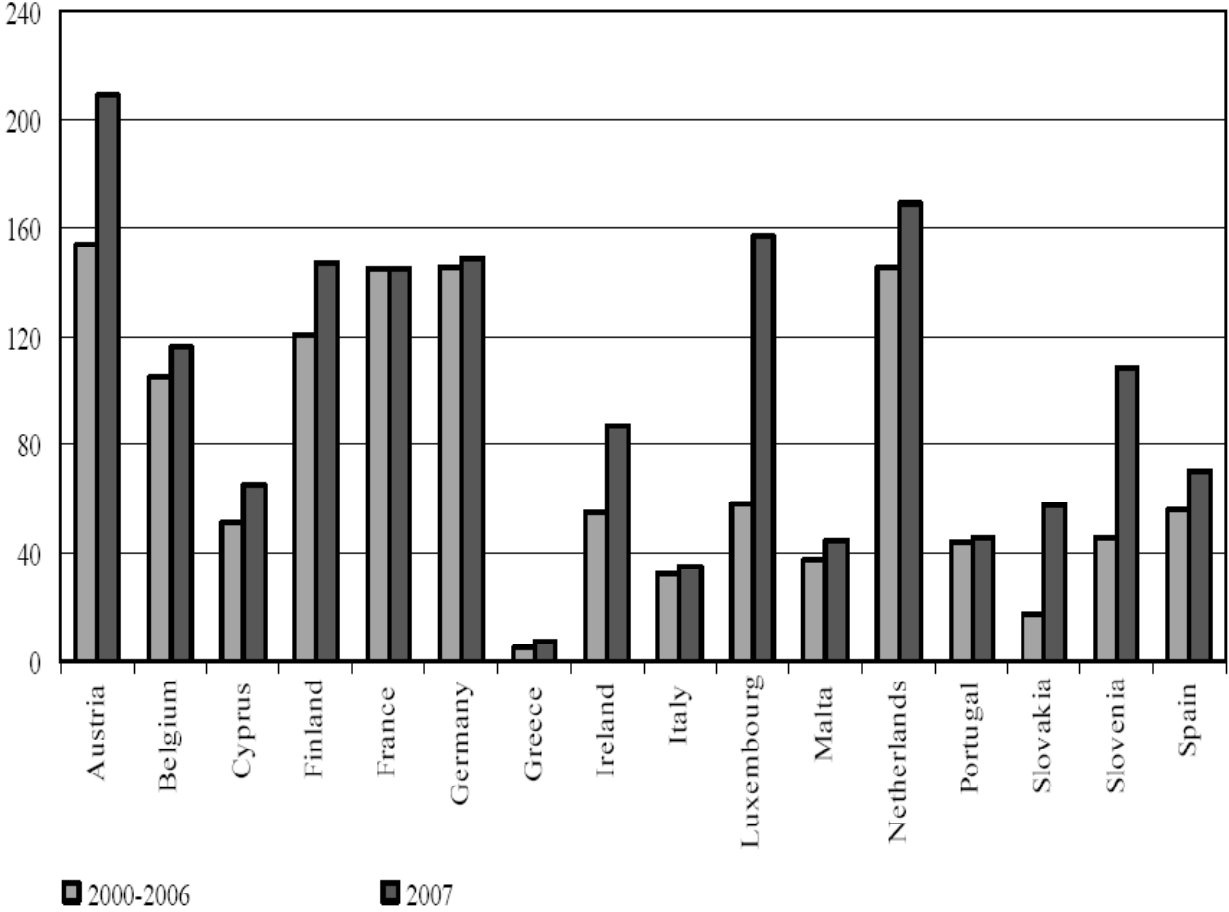

Source: BIS Blue Books (1995, 1999 and 2006).

Total volume payment market 45,6 bln (vs. US 84,5 bln)
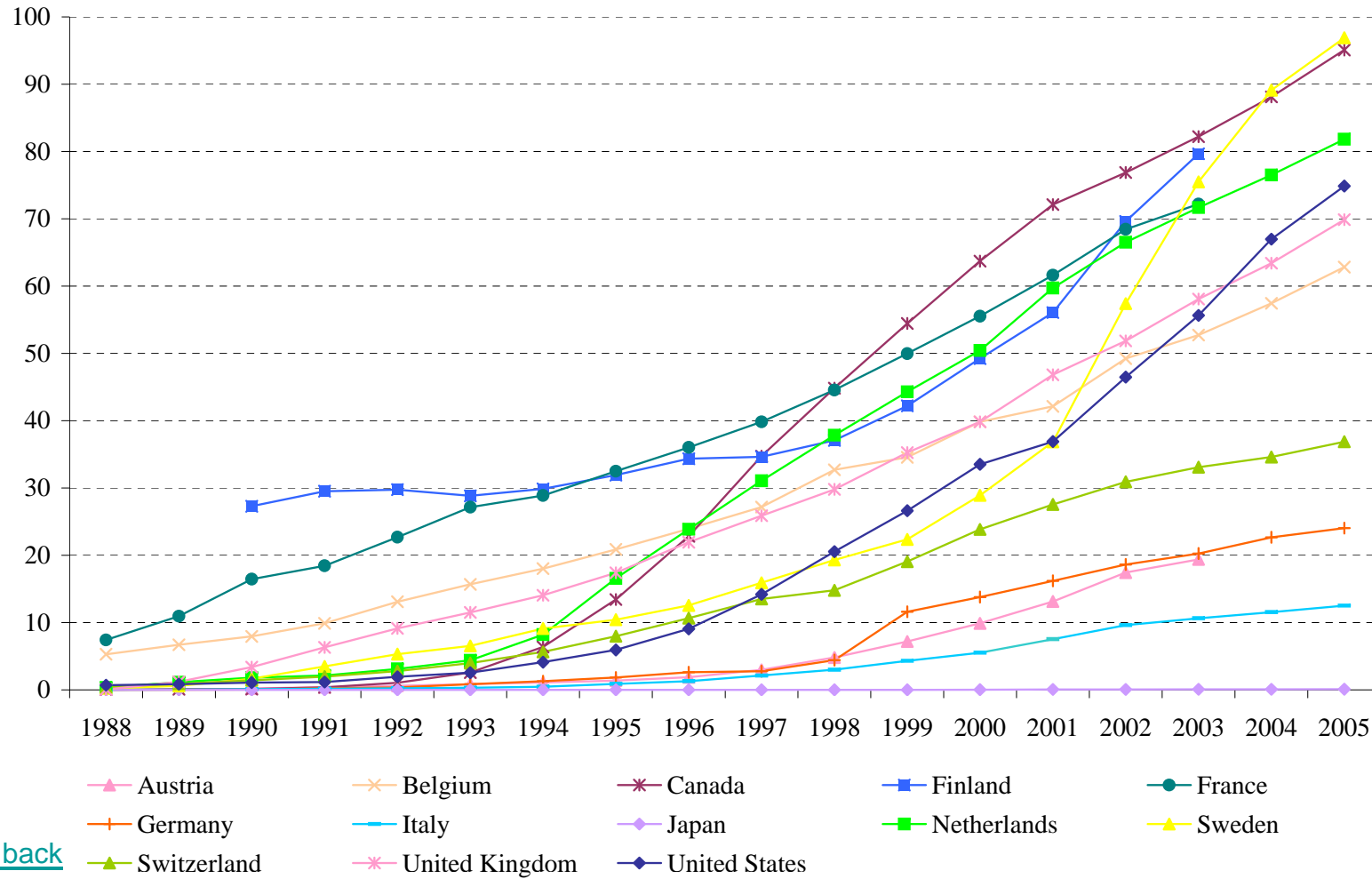
Electronic payments are a growing business

Figure 2: Number of non-cash payments per capita in the euro area, 2000-2007

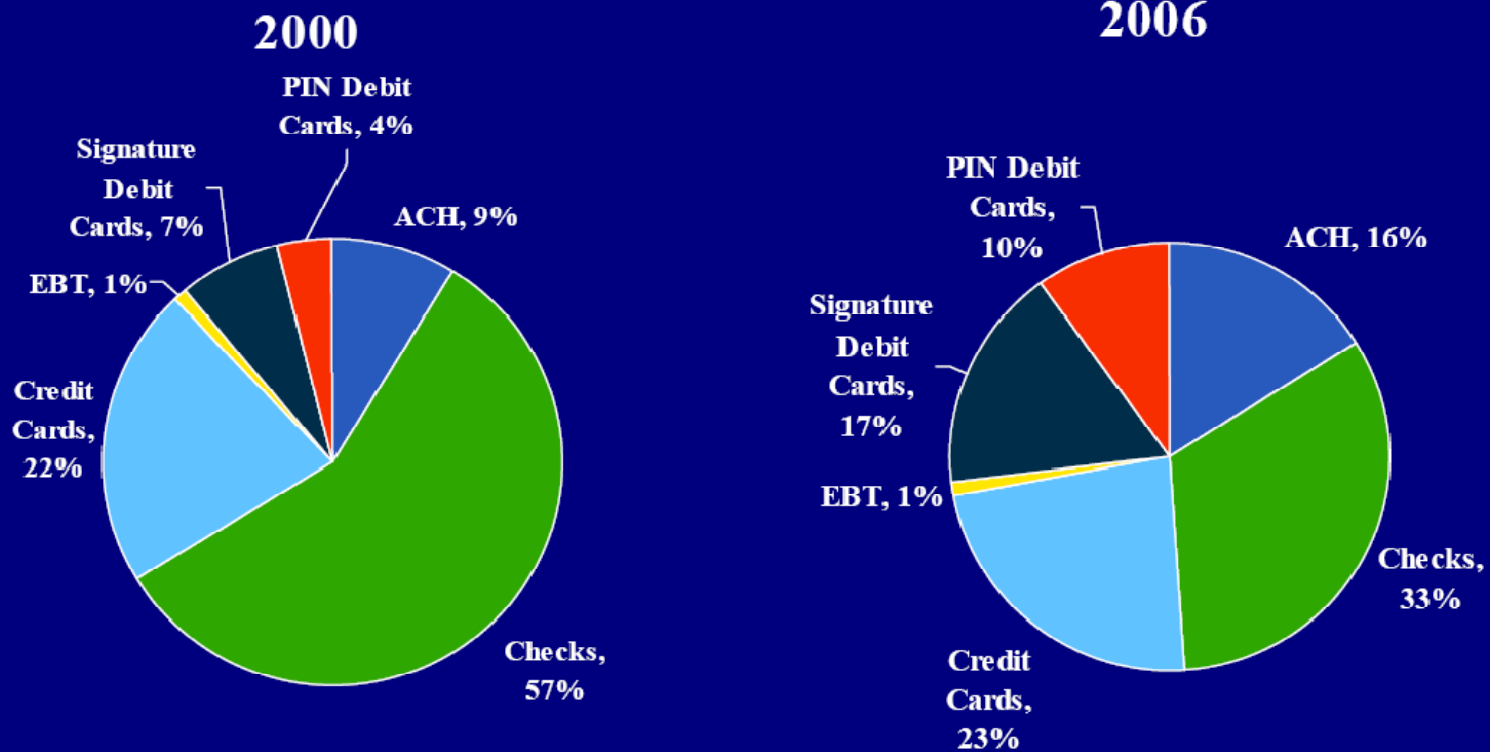# Debit card growth

Figure 1: Per Capita Debit Card Volume

Non-Cash Per Capita Payments (2005)

	Checks	Credit Cards	Debit Cards	ACH Credits	ACH Debits	Total
Canada	41.9	60.3	95.1	25.2	19.4	241.9
France	62.5	N/A	83.6*	38.4	40.1	224.6
Germany	1.3	4.7	24.0	68.6	80.8	179.4
Italy	8.0	8.0	12.6	18.0	8.0	54.6
Japan	1.1	38.9	0.1	10.6	N/A	50.7
United Kingdom	32.1	30.1	69.9	49.8	45.2	227.1
United States	111.5	70.0	74.8	18.6	24.6	299.5

Source: BIS, 2006

The U.S.

Volume Non-Cash Retail Payments

2000
- PIN Debit Cards, 4%
- Signature Debit Cards, 7%
- EBT, 1%
- Credit Cards, 22%
- ACH, 9%
- Checks, 57%

2006
- PIN Debit Cards, 10%
- Signature Debit Cards, 17%
- EBT, 1%
- Credit Cards, 23%
- ACH, 16%
- Checks, 33%

Source: The 2007 Federal Reserve Payments Study

Data

Data, institutions, and descriptive stats

Processor	Country	Volume (mln, 2005)	Period	Obs	Ownership (dummy)
SIT	France	11,982	1991–2005	15	0, NCB
Voca/BACS	UK	5134	2004–2005	2	1, banks
Interpay	Netherlands	3272	1990–2005	16	1, banks
TAI	Germany	3200	2003–2005	3	1, banks
SIBS	Portugal	1785	2002–2005	4	1, banks
CEC	Belgium	952	1990–1994	5	0, NCB
DIAS	Greece	29	1995–2005	11	0, NCB
LIPS-net	Luxemburg	14	1995–2005	11	0, NCB
Total		26,368		67	4

Data	Variable	Mean	Median	Min	Max
Operating cost	OC (PPP dollar, in mln)	77.98	23.64	1.91	415.20
Payment volume	VOL (trx, in mln)	2176.17	1136.10	6.01	11982.00
Average cost	AC=OC/VOL (PPP dollar/trx)	0.16	0.11	0.003	0.72
Labour cost	WAGE (PPP dollar, in mln)	0.10	0.08	0.05	0.23
Capital cost	INTRATE (perc)	5.11	3.60	2.10	16.40
Ownership	DPRIVATE	=0 if owned by NCB, =1 else			
Technology	TIME	Time=1,…,16 for year=1990,…,2005			

back

Simple Log-linear Estimations

Simple loglinear regressions, no input prices

Regressor	Coefficient	Estimation		
		Model 1a	Model 1b	Model 1c
CONSTANT	α_0	0.30	0.73***	0.61***
VOL	α_1	0.48***	0.28***	0.28***
DPRIVATE	γ_1		2.19***	2.17***
TIME	γ_2			0.01
S		0.48***	0.28***	0.28***
Adj. R^2		0.55	0.86	0.86
Log-likelihood		−101.40	−61.53	−61.20
LM-stat		16.03	1.31	1.55
N		67	67	67

❑ Strong potential for economies of scale

❑ But too simple, additional correction for governance structure   back

To illustrate..

Actual average cost vs. predicted values
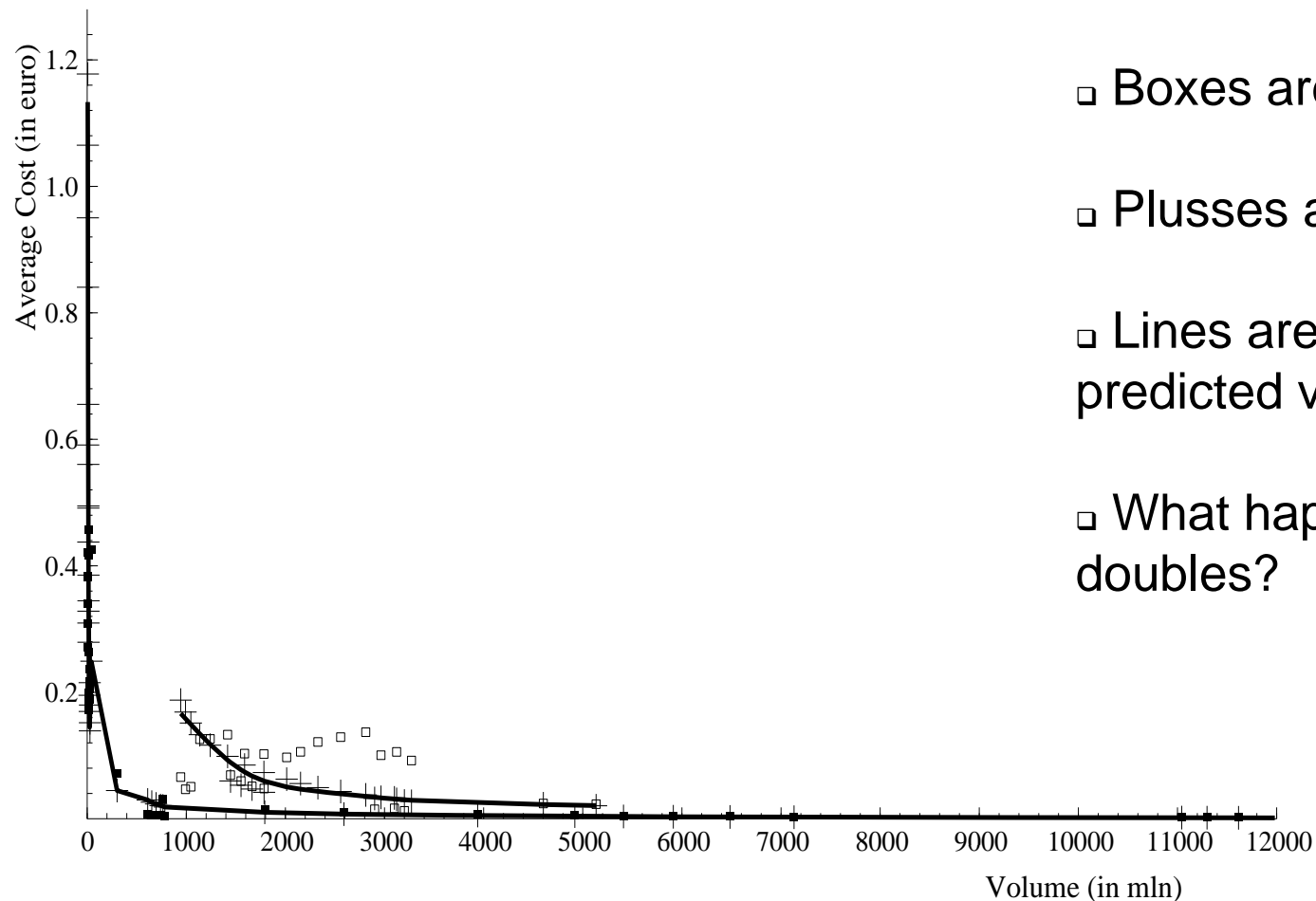
- Boxes are actual AC

- Plusses are predictions

- Lines are "fitted trends" of predicted values

- What happens if output doubles?