The Quality of Banking and Regional Growth

I. Hasan[a,b], M. Koetter[c,d] and M. Wedow[d]

[a]Lally School of Management and Technology, [b]Bank of Finland, [c]University of Groningen, [d]Deutsche Bundesbank

SUERF & Bank of Finland conference on:
Financial Markets, Innovation, and Growth

Ample evidence on the Finance-Growth Nexus

But what do we actually measure?

- *Hypotheses:* a well-functioning financial sector is crucial to promote growth.

  D. North 2005, Princeton Press; Pagano 1993, EER; Boyd and Nicolo 2005, JF

- *Evidence:* [..] financial indicators significantly predict subsequent values of the growth indicators.

  King and Levine 1993, QJE

Tackling two concerns

The quality of financial systems...

- Empirical proxies frequently poor measures of theoretical models.

  Levine 2004, NBER

- Is financial development really about the quantity of credit?

  Berger et al. 2004, JFSR; Guiso et al. 2004, QJE

- Where enterprises lead finance follows.

  Robinson 1952

- The relative ability of intermediaries to channel financial funds.

  Lucchetti et al. 2001, EJPE; Lozano-Vivas and Pastor 2006, TMS

...from a regional perspective

For macro- and microeconomic reasons

- **Macro**
  - Regions must not be treated at isolated islands.

    Mankiw 1995, BPEA; Quah 1996, EER
  - Economic activity in European regions differs considerably.

    Mora et al. 2005, EL

- **Micro/Financial**
  - Country samples may yield spurious results due to excessive heterogeneity.

    Guiso et al. 2004, QJE
  - The 'End of Geography' in Financial Services?

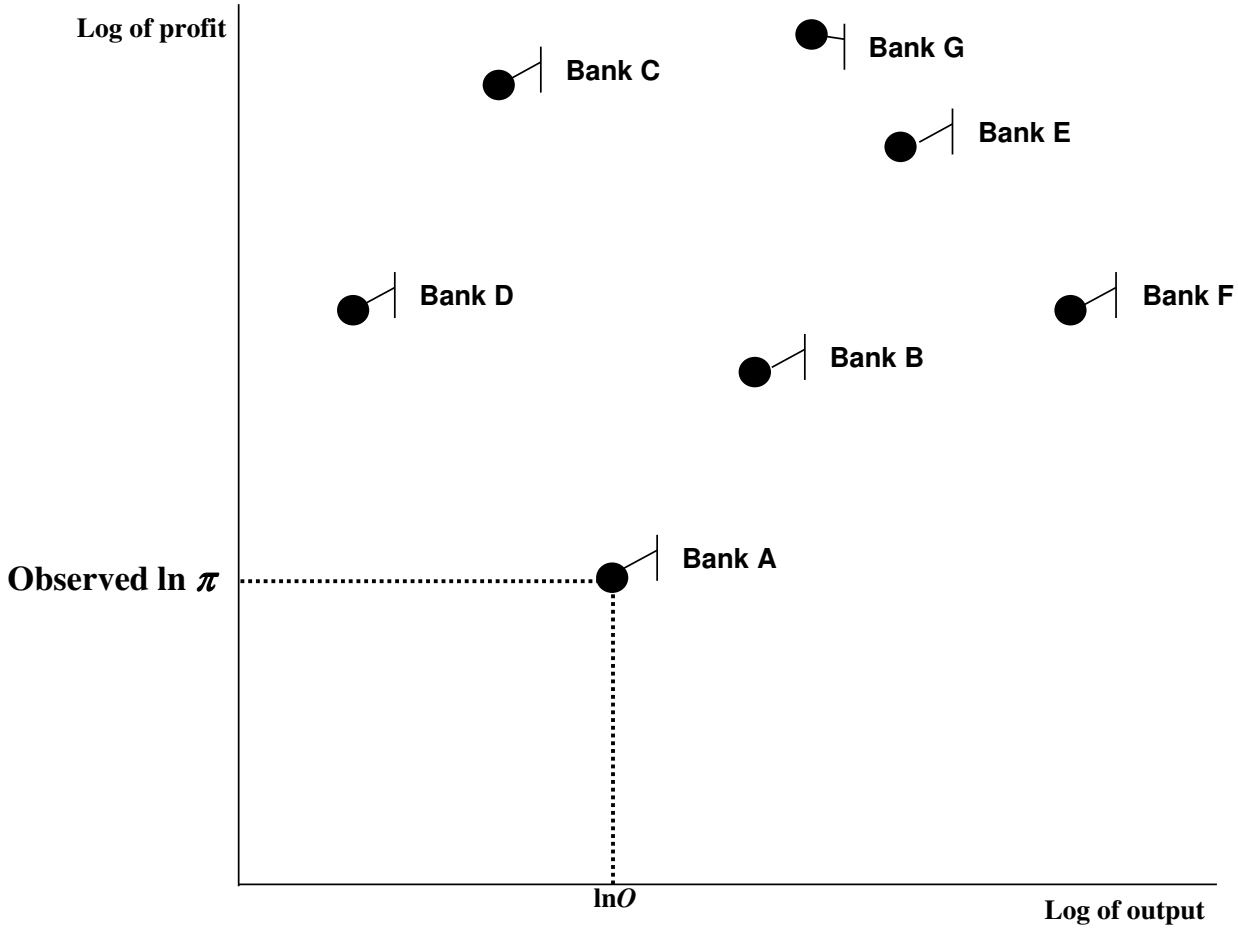
    Agnes 2000, EG; Clarke 2004, JMCB; Valverde et al. 2004, RS

Measuring the quality of financial development FD^Q

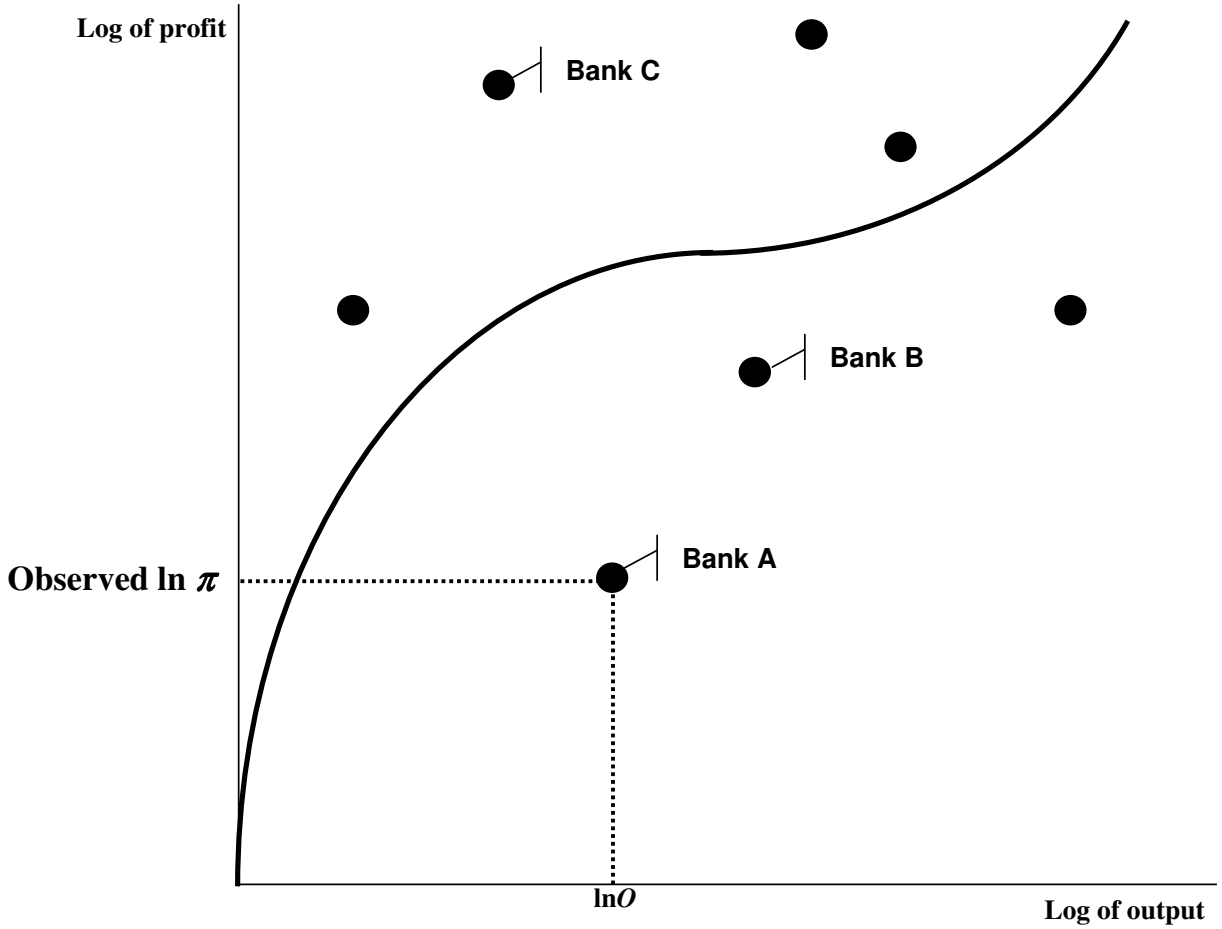
Individual bank efficiency as a proxy of FD^Q

- Banks channel financial funds from surplus to deficit units. They...
  - ...demand resources Q, e.g. credit officers, risk managers and deposits...
  - ...at given prices W, e.g. wages or deposit interest...
  - ...to produce outputs O, e.g. customer and interbank loans.
- Objective function: choose input combinations that minimize total cost C and maximize profits π.
- Suboptimal costs and profits due to:
  - Random noise, e.g. due to a regional draught
  - Inefficiency, e.g. due to a poor composition or too much of Q at given W

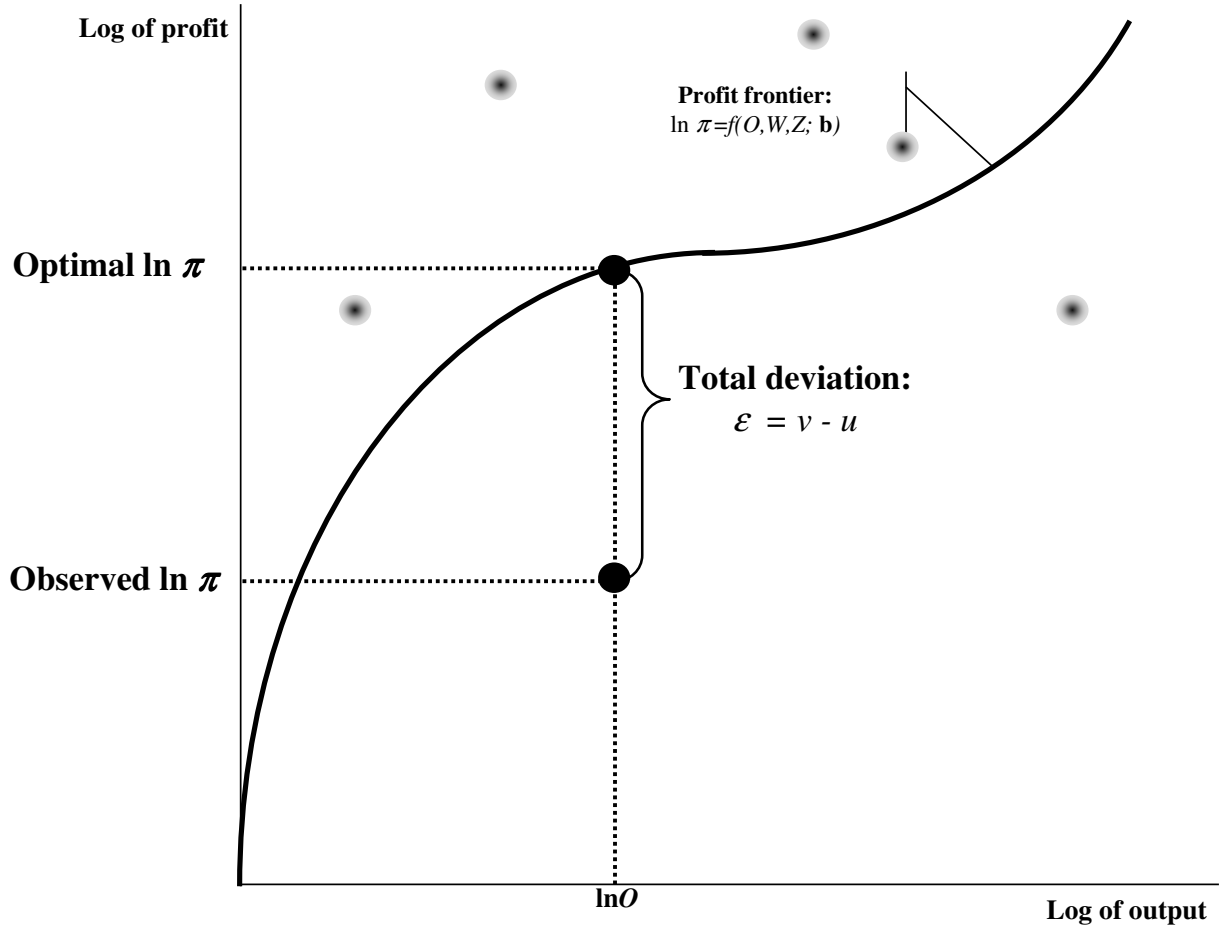
An illustration: Observe output-profit combinations



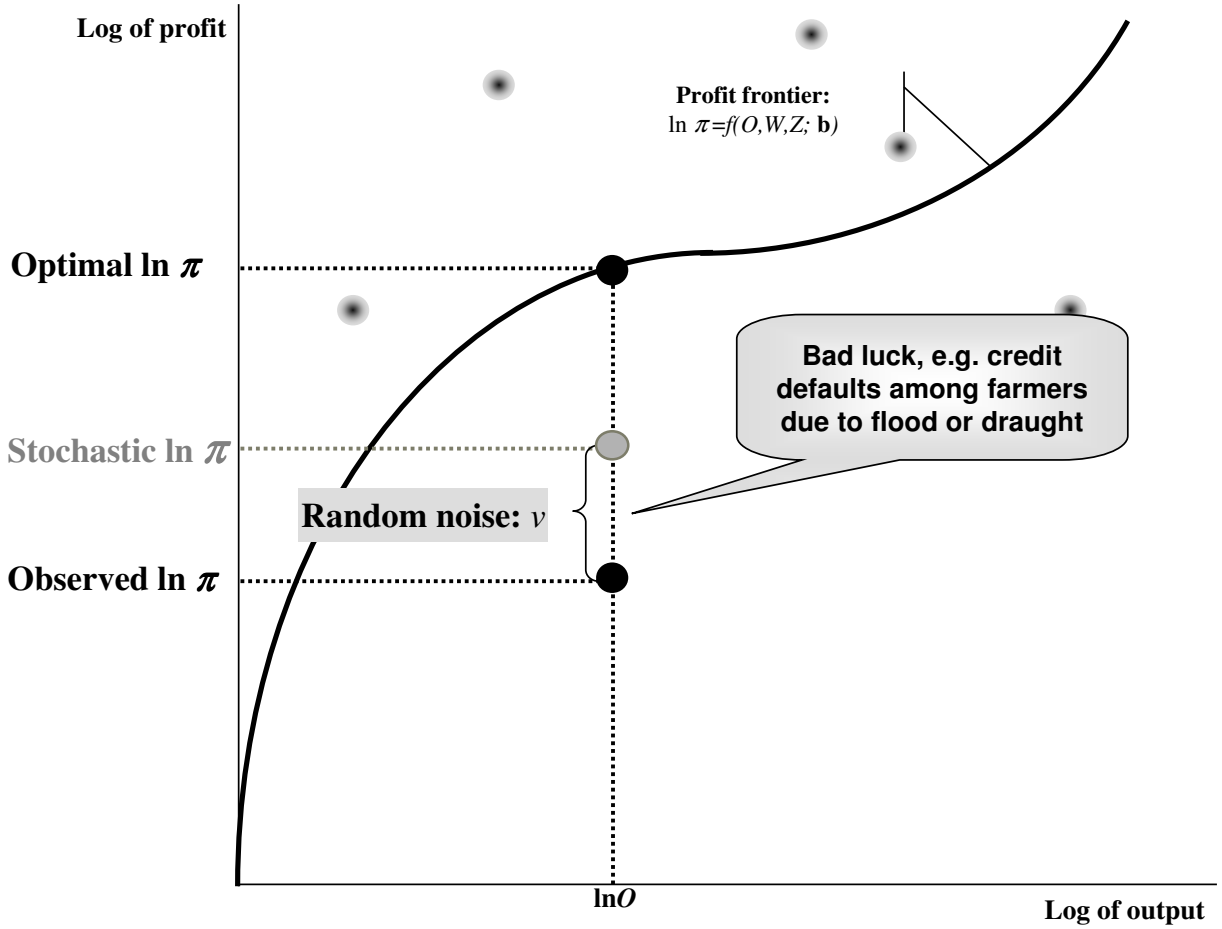
Fit a profit function to the data



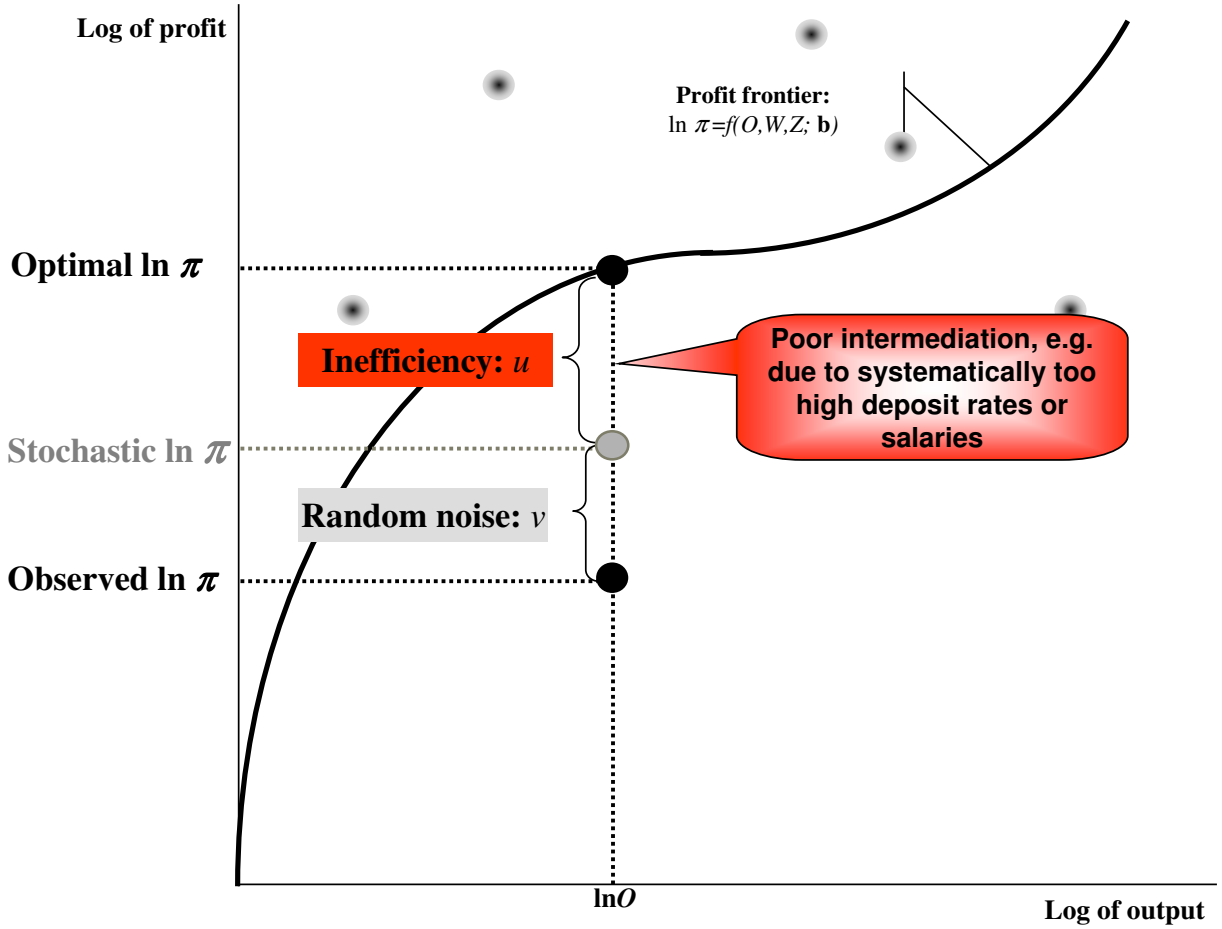
Deviations denoted as composed error term



Some lost profits are bad luck



But some deviations are due to inefficiency



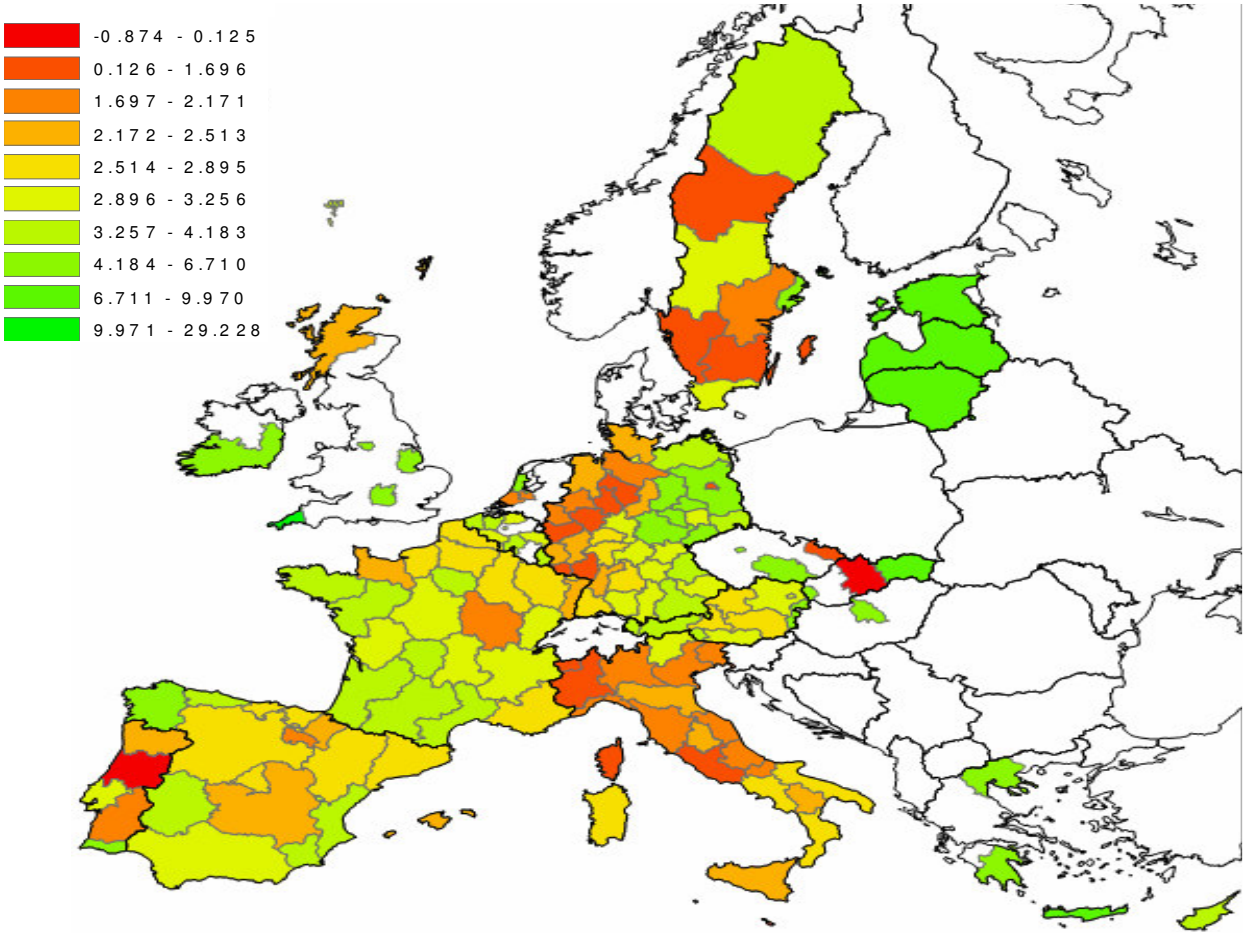
Advantages of efficiency as proxy for FD^Q

H_0: Higher efficiency has a significant and positive influence on regional growth

- A direct measure of financial funds lost in transit due to operational inefficiency
- An assessment of the skills to maximize profits *ex ante* and *ex post* investment
- A relative quality measure is less prone to potential simultaneity bias

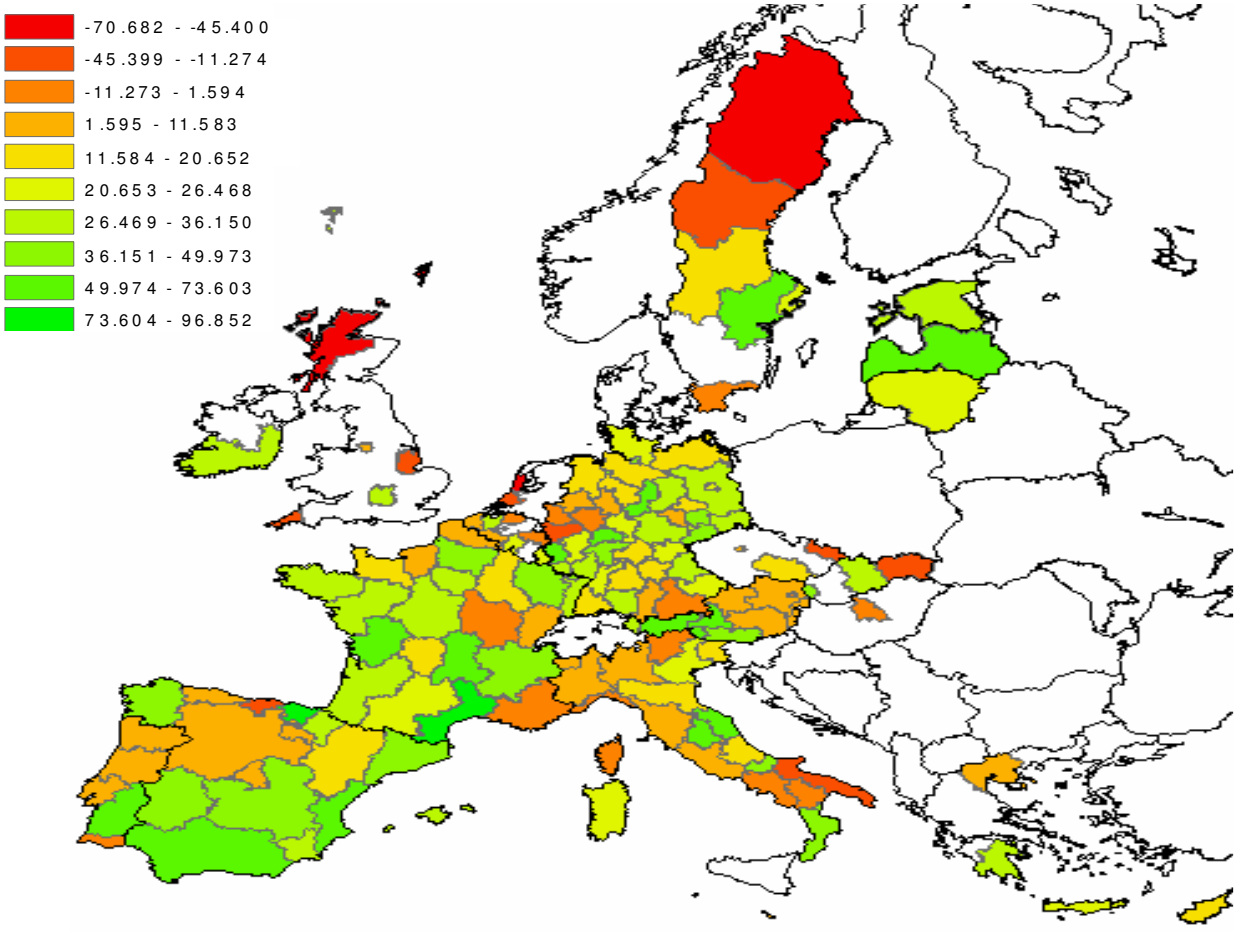
What's all the fuzz about the regions then?

CAGR 95-2003 of GDP per worker in European NUTS2 regions...



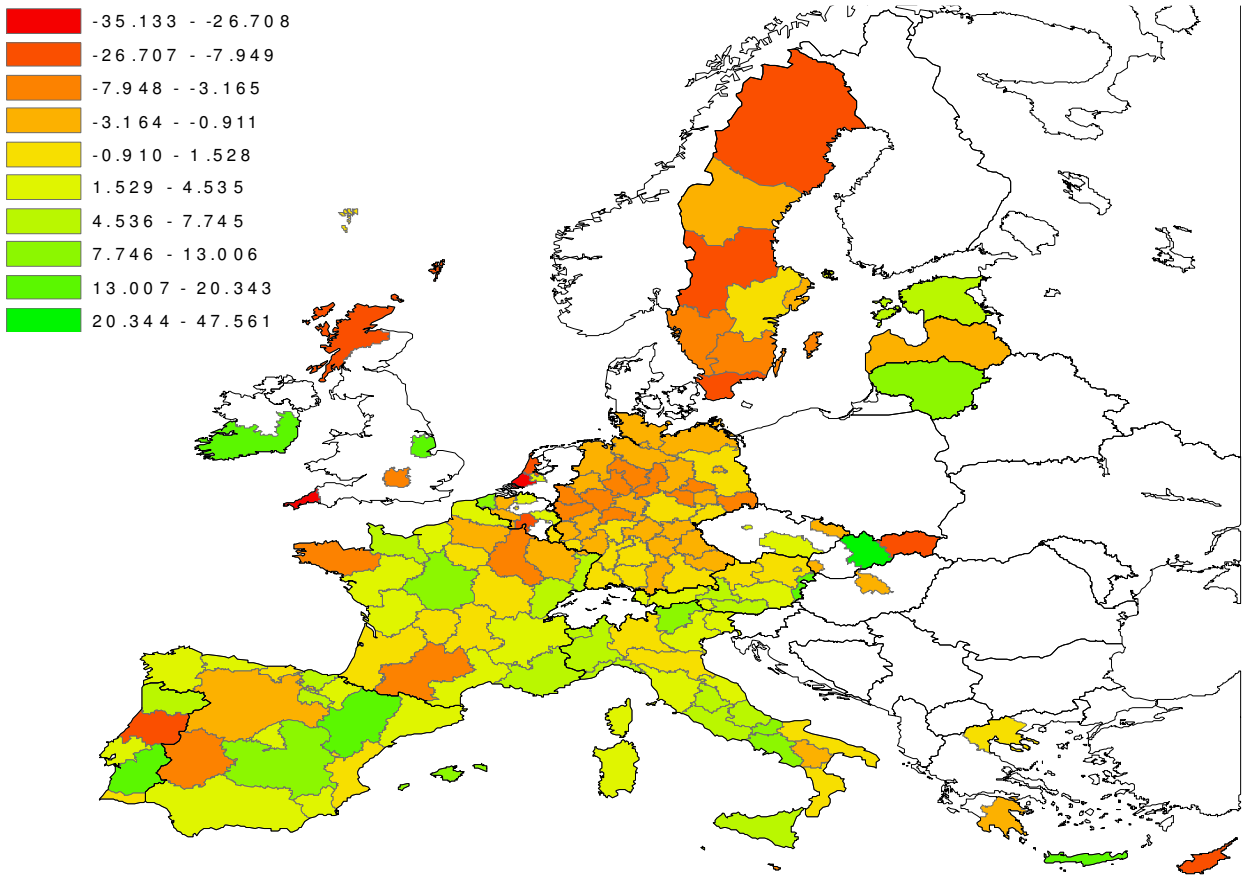
...differs considerably across 160 regions

A pattern mirrored by both the growth of credit to GDP share ...



...and the development of (relative) profit efficiency

Apparently, both European banking and economic activity still differ



Specification of a dynamic growth model

A panel model along the lines of Islam (1995) and Mankiw et al. (1992)

- A Dynamic Panel Model derived from a Growth Model:
  $y_{i,t} = \alpha y_{i,t-1} + \beta f d_{i,t} + \gamma x_{i,t} + \mu_i + \epsilon_{i,t}$
  where lower case letters indicate the log of a variable
  - $y_{i,t}$: GDP per worker
  - $f d_{i,t}$: Measures for the quality (FQ) and quantity (FV) of financial development
  - $x_{i,t}$: Control growth of the working population
  - μ_i Region-specific effect and $\epsilon_{i,t}$ is the error term with $\epsilon_{i,t} \sim iid(0, \sigma_\epsilon^2)$ independent of each other and among themselves

Regional macroeconomic and banking data

Allocation of banks to NUTS 2 regions based on zip codes or manually

Regional data	**1997**	**1999**	**2001**	**2003**	**Total**
GDP per worker	42,665	45,619	48,425	50,434	47,146
Worker growth	3.5%	4.6%	4.4%	3.2%	4.2%
Profit Efficiency	36.8%	38.3%	33.8%	38.0%	36.3%
Loans and bonds to GDP	1.44	1.25	1.22	1.23	1.25
Regions	108	132	144	148	160
Bank data					
Personnel Expenses	1.50%	1.45%	1.43%	1.41%	1.45%
Funding cost	4.35%	3.29%	3.51%	2.60%	3.56%
Customer Loans	1,094	1,122	1,303	1,589	1,304
Other earning assets	1,157	1,048	1,081	1,331	1,181
Equity	119.1	120.7	155.1	197.9	152.6
Profits before tax	13.72	16.58	20.64	23.40	19.02
Gross total assets	2,401	2,338	2,583	3,164	2,675
No. of banks	3185	3318	3160	2802	27187

Notes: GDP per worker in Euros. All bank data except factor cost in millions of Euro.

FQ individually significant and positive

A mere expansion of credit volume appears insignificant in mature economies

	Quality	Quantity
y_{t-1}	0.955***	0.917***
FQ	**0.026****	
FV		**0.009**
FQ*FV		
POP	-0.136***	-0.152***
Constant	-0.003**	-0.004*
N	954	995
Sargan [χ]	45.18	53.75
AR2 [z-value]:	-1.97	-2.64

Robust SE, Sargan 2Step, Time dummies. ***, **, * significant at 1, 5 and 10%.

Simultaneous specification corroborates quality effect

More credit fosters growth if provided by efficient banks

	Quality	Quantity	Both	Joint
y_{t-1}	0.955***	0.917***	0.910***	0.931***
FQ	0.026**		**0.027****	**0.051*****
FV		0.009	**0.004**	**0.012**
FQ*FV				**0.012****
POP	-0.136***	-0.152***	-0.143***	-0.165***
Constant	-0.003**	-0.004*	-0.002	-0.002*
N	954	995	945	945
Sargan [χ]	45.18	53.75	53.05	55.96
AR2 [z-value]:	-1.97	-2.64	-2.09	-1.97

Robust SE, Sargan 2Step, Time dummies. ***, **, * significant at 1, 5 and 10%.

Is it the spatial allocation of intermediation quality?

Robust evidence for regional sub-samples

	EU 12	EU 15	EU 19	no FC
y_{t-1}	0.845***	0.847***	0.811***	0.940***
FQ	0.019*	0.021*	0.038***	0.046**
FV	0.01	0.012*	0.009	0.01
FQ*FV	0.010*	0.011**	0.009*	0.010*
POP	-0.263***	-0.150***	-0.137***	-0.163***
Constant	0.00	0.00	0.001	-0.003**
N	844	890	917	904
Sargan [chi]	75.24	64.63	67.56	58.67
AR2 [z-value]:	-1.32	-1.63	-1.87	-1.66

Robust SE, Sargan 2Step, Time dummies. ***, **, * significant at 1, 5 and 10%.

Growth requires better, not necessarily more banking

- The quality of financial development foster regional growth significantly
- In a mature economy the volume of aggregate credit has no significant influence
- Quantity and quality of financial intermediation appear to be different channels
- Larger volumes paired with efficient banking sector has positive effects
- Robustness of this result for a range of alternative regional splits

The translog stochastic profit frontier

FE panel estimator with time-variant u_{kt}, $v_{kt} \sim N(0, \sigma_v^2)$ *and* $u_{kt} \sim N|(0, \sigma_u^2)|$

$$
\begin{aligned}
\ln \pi_{kt} = \alpha_k &+ \sum_{i=1}^{3} \alpha_i \ln W_{ikt} + \sum_{m=1}^{3} \beta_m \ln O_{mkt} + \delta_0 \ln Z_{kt} \\
&+ \frac{1}{2} \sum_{i=1}^{3} \sum_{j=1}^{3} \alpha_{ij} \ln W_{ikt} \ln W_{jkt} + \sum_{i=1}^{3} \sum_{m=1}^{3} \gamma_{im} \ln W_{ikt} \ln O_{mkt} \\
&+ \frac{1}{2} \sum_{m=1}^{3} \sum_{n=1}^{3} \beta_{mn} \ln O_{mkt} \ln O_{nkt} + \frac{1}{2} \delta_1 (\ln Z_{kt})^2 \\
&+ \sum_{i=1}^{3} \omega_i \ln W_{ikt} \ln Z_{kt} + \sum_{m=1}^{3} \zeta_m \ln O_{mk} \ln Z_{kt} + \eta_0 h_{kt} + v_{kt} - u_{kt}.
\end{aligned} \tag{1}
$$

Parameter estimates of panel frontier

Virtually all are significant after accounting for bank-specific and country effects

Variable	β	Variable	β	Variable	β	Variable	β
$LNY1$	0.108***	$LNY2Z1$	-0.054***	DK	1.726***	MT	1.897***
$LNY2$	0.130***	$LNW1Z1$	0.113***	ET	1.903***	NL	1.482***
$LNW1$	1.689***	T	-0.064***	FI	2.021***	PT	1.531***
$LNZ1$	0.452***	$T2$	0.002***	F	1.594***	SV	1.797***
$LN5Y1Y1$	0.060***	$LNY1T$	-0.033***	DE	1.420***	ES	1.808***
$LN5Y1Y2$	-0.168**	$LNY2T$	-0.017***	GR	1.299***	SW	1.647***
$LN5Y2Y2$	0.139***	$LNW1T$	-0.030***	HU	1.577***	UK	1.294***
$LN5W1W1$	0.220***	$LNZ1T$	0.047***	IE	2.107***		
$LN5Z1$	0.112***	AT	1.570***	IT	1.476***		
$LNY1W1$	-0.032***	BE	1.481***	LV	1.974***		
$LNY2W1$	-0.008***	CY	1.208***	LT	1.281***	σ	2.798***
$LNY1Z1$	0.054***	CZ	1.624***	LU	1.844***	λ	6.338***

Notes: Fixed effect panel frontier with time variant inefficiency; N: 27,248; LL: -37,631; 4,476 Banks