"*e*-Push or *e*-Pull? Laggards and First-Movers in European On-Line Banking

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Abstract

While a strategic imperative for financial institutions, major differences currently exist among banks' ability to convert their customers to using the internet. In addition, not a lot is known as to what drives those differences, although one can easily hypothesize that on-line banking adoption must be due to a combination of demand ("pull") and firm ("push") factors. This paper presents a statistical appraisal of the determinants of on-line customer penetration for a cross-sectional sample of the major incumbent banks in Western Europe for the combination of the yeas 1988 to 2000. "Pull" factors play a large role in explaining customer conversion to internet banking, yet bank-specific factors (or "push" factors) are not marginal. Among others, banks with traditionally high cost- effectiveness and which already offer wide private ATM coverage for their customers are also the ones which have already started to migrate a larger proportion of their customers base on-line. Interestingly, among all "push" factors analyzed, cost-effectiveness emerges as the largest leverage effect on customer conversion. Finally, a cluster analysis supplements the regression results along the axes of "pull" and "push", and identifies a set of early movers and laggard among the banks in our sample— Generally speaking, those first-movers already exhibit stronger off-line profitability than laggards, which may indicate that the on-line marketplace may reproduce performance off-line (i.e., currently successful banks have nothing to fear from aggressive start-ups).

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1. INTRODUCTION

The rapid rate of adoption of the internet is well known. Today, it has more than millions of users worldwide after just a few years of commercial existence (Nua Internet Surveys , 2000). It has also grown significantly economically, generating more than 500 billions of US revenue by end of 1999, (Internet Indicators, 1999). Using the weights applied by the Bureau of Economic Analysis, the value added by this revenue in the US is about $ 260 billion US, or already 2.7 % of the American Gross Domestic Product (Landefeld and Fraumeri, 2000).

With this pace of adoption, the internet will inevitably make some industries be much more literate electronically than in the past, in particular the industry of *banking and other financial services,* which is well- suited for on-line: as Field and Hoffner (1998) indeed acknowledge, financial services have the advantage that no physical goods are involved, as any transaction can be successfully described by a contract electronically[2] .

In Europe alone, the number of banks moving to the internet has doubled in less than six months to be at more than 2400 web sites by end of 2000, while seventy percent of those sites already offer advanced services, such as on-line transactions, money transfer, bill payments or stock trading (eMarketer, 2000). Furthermore, on-line banking allows banks to develop new services such as personalized financial information menus, e-mail and real-time brokerage, which will reinforce the value proposition, and therefore, the stickiness of banks which that provide these bundles of services (Bakos and Brynjolfsson, 2000) [3]. Finally, internet may provide cost-savings for banks. Many analysts, - including the lead research analyst Mary Meeker from Morgan Stanley Dean Witter (1999)--, have recommended banks to offer on-line services in order to benefit from the low cost delivery channel it offers versus the branch network. Compared to ATM's or the recently VRU

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2 Software also is another product category with the advantage to be automatically downloaded on-line upon the settlement of a transaction.

3 For another proof, a joint AOL / McKinsey proprietary study conducted in 1999 had shown that more than 30% of customers may want to leave their traditional financial institutions as the result of the convenience offered by the internet .

(voice recognition unit) and PC-banking, internet has the breakthrough advantage that the use of a browser eliminates most of the network and software costs attached to other electronic banking innovations with the consequence that the unit cost can be only a few percent of traditional costs (McQuivey, 1998, Clemons and Hitt, 2000; OECD, 1999).

Despite all this, the adoption of on-line banking worldwide, and in particular in Europe , still exhibits wide variance. At one extreme, Finnish banks are announcing customer conversion of more than 20% to on-line, while, on the other extreme, one of the largest Italian bank had nearly no customer on-line by early 2000. True, Nordic banks are well-known to have the highest penetration of internet usage worldwide, at least higher than Italy, but disparities among banks *within the same country* are also noticeable–Let's take France as another example: the lead universal bank has been able to date to convert more than 11 percent of its customer base in 2000 to the internet while other minor players such as the Credit Commercial de France have only managed to convert a mere 2 percent in the same period.

Given those disparities, and the importance of on-line banking as a potentially crucial electronic market for banks (Chen and Hitt, 2000), the question addressed in this paper is to quantify and sort out the various drivers of on-line banking,-- specifically what is the mix of "push" and "pull" factors that may drive usage. Relying on a unique cross-sectional sample of incumbent banks in Western Europe for the year 2000 and using logistic regression techniques to identify the relative contribution of "push" and "pull" factors, the contributions are twofold:

- First, significant "pull" effects are statistically visible in Europe to explain on-line banking differences (e.g., on-line banking is systematically linked to country level of internet penetration as a measure of a customer readiness to transact on-line) -- *yet* also, banks with low cost-ratios and / or dense ATMs coverage have managed to convert more of their established customer base on-line than other banks, even after controlling for readiness to transact on-line.

- Second, an investigation into clustering banks along the "pull" and "push" axes identifies 5 statistically separate clusters, one of which clearly includes the best performing banks in managing the conversion of their customers on-line in the best electronic-ready markets of Europe. This set of clear winners also contrasts with a set of laggards among European banks, whose poor on-line performance correlates with their poor global return performance- otherwise stated, the "digital divide" is only a symptom of market performance distribution at a more global level.

The paper is structured as follows. Section 2 highlights the data at hand. Section 3 presents the logistic results, while section 4 presents the cluster analysis of European banks across the axis of "pull" and "push" factors. Section 5 concludes.

2. DATA AND TEST HYPOTHESES

This section presents descriptive statistics on on-line European banking. Those data will be used later on for a more robust statistical analysis of the drivers of on-line banking conversion.

2.1. Hypotheses

Three major hypotheses are being tested in this article. *First*, on-line banking penetration should be linked to consumer readiness to transact on-line, itself depending on tenure on –line; and on some key-demographics population segments , such as the mostly time-starved, highly-educated individuals (e.g., GVU, 1999; Lohse et al., 2000, and Bellman et al., 1999).

Second, from a strategy perspective, banks pursuing a global cost-effectiveness strategy to differentiate themselves versus the competition will likely be the ones which have been pushing the on-line channel faster than others. Additionally, one would expect that the organizational structure for customer acquisition is more flexible, possibly separate from the established brand to replicate a "pure attacker" mentality (Hagel and Singer, 1999).

Finally, we are interested in the question of the "digital divide" among banks: are banks which are leaders at converting their customers to online banking “capitalizing” on chance or is there something truly distinctive about these banks compared to laggards? The question is important for industry dynamics as it is often mentioned that internet may favor industry concentration in the long-term (Bailey and Bakos, 1997 and OECD, 1998).

2.2. Data

In order to test the hypotheses above, a sample of internet banking penetration for 65 western European banks (*i= 1,..65*) has been compiled from Investment Banking reports by Merrill Lynch and J.P. Morgan for the years 1999 and 2000. The sample covers ten Western European countries (*j= 1,..10*) from France to UK[4] and comprises all well-known banks [5].

The sample collected includes statistics of total bank's client base (henceforth, symbol= $Cl_{i,j}$), on-line conversion, i.e., percentage of on-line bank registered users divided by total client base ($CONV_{i,j}$) as well as the internet banking organizational structure ($ORG_{i,j}$= 1, if structure is standalone).

The dataset has been supplemented with country internet penetration and country e-commerce usage data from IDC ($INTERNET_j$ and $ECOMM_j$)[6], as well as with traditional bank statistics directly downloadable from IBCA, including
(a): indicators of size, i.e. balance sheet assets ($ASSETS_{i,j}$) and full-time employees ($EMPL_{ij}$);
(b): indicators of profitability, i.e. return on average assets ($ROAA_{i,j}$) and return on average equity ($ROAE_{i,j}$) [7];
(c): indicators of cost-effectiveness, i.e. cost-income ratio(C/I_{ij}); cost-assets ratio($COA_{i,j}$=C of C / I divided by ASSETS);
(d): indicators of non-brick banking, i.e., ATM coverage per customer ($ATM_{i,j}$ = number of privately owned ATM's. divided by CL).

All the indicators above can be seen as "push" factors. We also have used the data to build other possible indicators of "pull", such as the "wealth" of a bank franchise, as measured by ASSETS per customer. In general, it is well-known that the first-cohort to move on-line has been the most wealthy socio-demographics, as in the same way, they are also likely to be the first to use on-line investing possibilities (Bakos et al. , 2000).[8]

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[4] The 10 countries are illustrated in Exhibit 3.

[5] The sample among others include banks such as *BNP-Paribas, Deutsche Bank, ABN-Amro,* or *Credit Suisse* or *Halifax*.

[6] The on-line penetration is based on quarterly users, while e-commerce users are defined as users who have bought at least once per quarter.

[7] The average assets and average equity measure reflect the average assets / equity holdings during the year.

[8] The referee suggested this point.

Those data are readily obtainable from the source mentioned and are harmonized in their definition so as to provide meaningful comparative analyses. Descriptive statistics on the rough data are provided in **Table 1**, with the following highlights:

- First, average on-line customer conversion for 1999-2000 among the European banks is still relatively low, averaging less than 6% of total bank customers. With respect to the average on-line population, this represents about 17% of internet users, i.e., less than one on-line user among five had converted to on-line banking by the turn of the century in Western Europe.

- Second, on-line banking penetration is about 40% of e-commerce usage, i.e., 60% of internet users transacting on-line have not yet converted to on-line banking. This confirms GVU (1999), and Lohse et al. (2000), whose data illustrate that security is still a large issue for some e-commerce users; while on-line visitors will have no issue buying low value goods such as books and CDs', they are still reluctant to perform on-line banking, where more sensitive information may be exchanged on the public web infrastructure.

- Third, the data exhibit strong variance with large ranges between the minimum and the maximum observed values. In particular, on-line banking conversion, CONV, has a standard deviation which is larger than its mean. In other words, assuming a normal distribution, the top 5% European banks may have already converted close to 20% of their customer base by the average of 1999-2000, while some other banks would virtually have none of their customers converted to banking on-line- hence this paper endeavours to identify factors which have driven this superior conversion ability among some banks.

- Finally, other statistics are worth mentioning: there is an average of one ATM per 2800 customers, while front-end branch employees (representing about 35% of total employees) have a span of 500 clients. Given that average branch size in Europe is known to be in the range of five employees, this means that the ATM coverage is now as large as branch density in our sample. With this extensive density coverage, banks with strong policy of ATM development might also be the ones to pioneer on-line push to their customers.

<u>Table 1: Sample Features</u>

Statistics	Label	Mean/Median	Stand. Dev	Min/Max	Source
Employees****	**EMPL**	21.4 / 13.7	25.3	4.1 / 92.4	IBCA
ATM's	**ATM**	1246 / 1100	1034	107 / 4277	IBCA / ECB
Customers****	**CL**	3,796 / 3550	2, 130	380 / 11,000	ML / JPM
Assets*	**ASSETS**	174 / 113	169	12 / 684	IBCA
Return Assets**	**ROAA**	90 / 85	40	34 / 185	IBCA
Return Equity***	**ROAE**	16.7 / 16.5	5.3	6.8 / 31.1	IBCA
Cost-Income***	**C/I**	62.9 / 62.6	11.7	43.1 / 85.2	IBCA
Net Interest***	**NIM**	2.11 / 2.12	0.8	1.19 / 4.29	IBCA
Cost per assets**	**COA**	45 / 43	21	12 / 100	IBCA
On-line***	**CONV**	5.9 / 4.0	6.4	0.1 / 28.2	ML / JPM
Structure***	**ORG**	44	--	--	ML
Assets per cust.****	**WEALTH**	45.8 / 31.8	9,1	22,4 / 56,2	IBCA / ML
Commerce***	**ECOMM**	14.6 / 11.0	8.7	1.5 / 32.0	IDC / MMXI
Internet use***	**INTERNET**	34.9 / 30	17.2	9.0 / 61.1	IDC

Notes:

STDV=standard deviation; MIN / MAX= minimum / maximum in the sample

For Sources: ML= Merrill Lynch; JPM =JPMorgan; MMXI =MediaMetrix / Jupiter Communications

* Billion Euro; **:basis points; ***: percentage; ****thousands

3. EXPLAINING ON-LINE CONVERSION DIFFERENCE

The empirical analysis intends to explain inter-bank variance of on-line conversion, through multivariate regression. Before this, a quick check on the partial correlation between all variables of **<u>Table 1</u>** is necessary, as it is likely that many indicators are correlated with each other, and we may wish to reduce the multi-collinearity dimension of the analysis.

3.1. The multivariate model

A logistic model for the multivariate analysis is used because of the well-known fact that the logistic S-curve replicates the consumer adoption curve (Bass et alii, 1994).

The generic equation estimated via ordinary least squares is of the form:

(1) $$\text{Log}\ ({}^{(CONVi,j)}/{}_{(1\text{-}CONVi,j)}) = a + b'.\ X_{i,j} + c'.\ (Z_j) + u_{i,j}$$

where:

- X, Z are respectively vectors of bank-specific regressors and country-specific internet penetration indicators;
- a,b',c', are coefficients to be estimated,
- u is a disturbance term assumed to be normal and i.i.d.

The vector (X)may theoretically include all variables, as such or combined with each other, described in **Table 1** herbefore, i.e., $ORG_{i,j}$, $BROKER_{i,j}$, $EMPL_{ij}$, Cl_{ij}, $ASSETS_{i,j}$,$ROAE_{i,j}$, $ROAA_{i,j}$, $C/I_{i,j}$, $COA_{i,j}$ and $ATM_{i,j}$. The vector Z is composed of WEALTH, *INTERNET* and *ECOMM*.

3.2. Partial correlation analysis

Before estimating the multi-variate model through regression techniques**, Table 2** illustrates the set of partial correlations which are statistically significant at the risk 5% threshold, among all the possible regressors[9]. **Table 2** demonstrates that some variables are indeed very much correlated, *with evident clusters* . For example, CL, EMPL and ASSETS, are all indicators of bank size. ROAE, C / I and ROAA are all correlated indicators of a bank profitability. Also, cost per assets, COA, and cost income, C / I, are correlated indicators of cost-effectiveness, while finally, internet penetration and e-commerce usage are clear indicators of a country "e-literacy".

[9] WEALTH is not shown in the correlation matrix as it never appeared as significantly correlated with any other variable.

Table 2: Correlation Matrix

	EMP	ATM	CL	Assets	ROAA	ROAE	C/I	NIM	COA	ORG	ECOMM	INTERNET
EMPL	-	0.78	0.72	0.61								
ATM		-	0.81	0.48								
CL			-	0.50								
Assets				-								
ROAA					-	0.84	-0.76	0.82				
RODE						-	-0.71	0.63				
C/I							-	-0.50	-0.31			
NIM								-				
COA									-			
ORG										-		
ECOMM											-	0.66
INTERNET												-

* Only significant correlation at 5% are shown

In order to minimize so-called “collinearity”, but while preserving the most information in the data, a factorial analysis via traditional VariMax rotation has been on each « group » of correlated variable. The new “regressors” constructed are then built using the first principal factor (henceforth, F). In practice, each factor explains more than 50% of the variance among the indicators built [10]; those factors are labeled F1 for Size; F2 for profitability; F3 for cost-effectiveness. F4 stands for on-line readiness .

10 Analyses are available with the author upon request- the lower factor weight is for profitability where the first factor explains 51% of the variance.

3.2. "Push" or "Pull" ? The multivariate regression results

The regression results are summarized in **Table 3** after correction for heteroskedasticity.

For illustration, we have used two empirical variants of equation (1) below, with (1') using the first principal component of the factors, while the version (1) picks the highest partial correlate as variable in the multi-variate regression.

Table 3: Logistic Regression of Online Banking

Statistics	*Label*	*(1)*	*(1')*
ATM's	**ATM**	0.048	0.051
Customers	**CL/F1**	-3.41	-4.09
Return Assets	**ROAA/F2**	----	---
Cost-Assets	**COA/F3**	-2.65	-1.71
Structure	**ORG**	__	__
Internet	**INTERNET/F4**	0.21	0.27
Assets per customer	**WEALTH**	0,02	0,04
Adj. R-square		**57%**	**68%**

* Only statistically significant coefficient reported (α<10%) – Cross-effects among RHS variables excluded, but not significant at traditional risk level.

For instance, concerning the size "cluster", EMPL has been chosen rather than ASSET given the largest correlation observed with CONV in the rough data (EMPL partial correlation with CONV is negative, and = -0.31, versus –0.12 for ASSETS, suggesting in passing that smaller banks can be more prone to convert customers to on-line). Finally, only statistically significant coefficients are shown in **Table 3**, using a risk threshold of ten percent. From the adjusted R-square of the equation, --especially version (1')-- the model has a sufficiently good fit for interpretation analysis. In addition, and as discussed hereafter, the coefficients have the signs excepted from our early hypotheses.

3.2. 1. "Pull" wins – "Push" is relevant

But beforehand, we first assess the relative weights of "push" and "pull" in the evolution of on-line banking. Hence, using the regression results, **Exhibit 1** splits the contribution to variance of "push" and "pull" factors for equations (1) and (1'), after cancellation of multicollinearity.

In both cases, about two-third of the variance is explained by the "pull" , but this also means that other factors linked to bank strategies are also relevant (one third of the variance contribution explained), and must be deeper analysed.

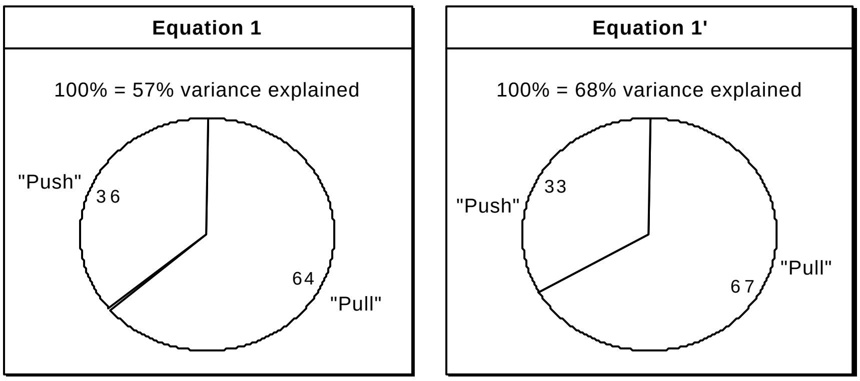
Exhibit 1

MIX "PUSH" AND "PULL" FACTORS IN EUROPEAN ON-LINE BANKING CONVERSION

Percent

BRU_BL1539_20010705_F Ecommerce

ESTIMATES



3.2.2. On-line readiness

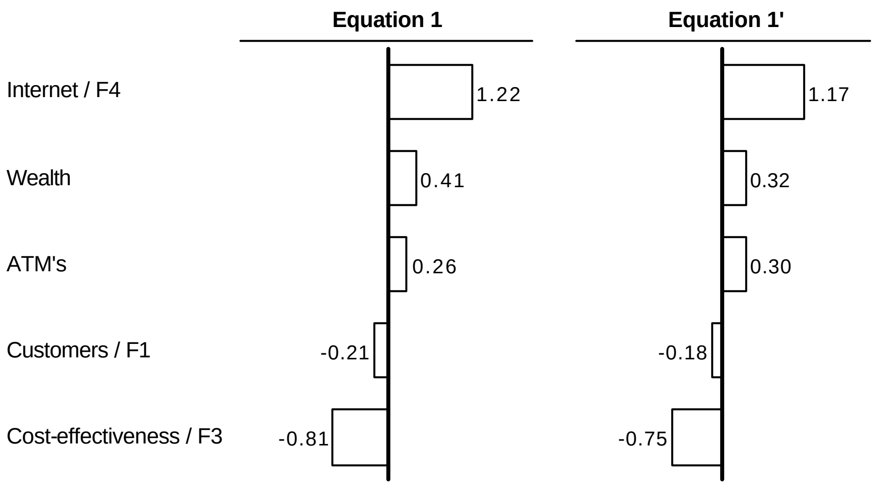
Exhibit 2 ranks the elasticities at the mean, based upon equation (1) and (1'). The elasticity of on-line banking to internet penetration is not only positive (as expected), but the elasticity estimate is also the highest in absolute value among all the regressors . Furthermore, the elasticity is higher than one at the mean suggesting increasing on-line banking when internet usage will become widespread in Europe (and not only in Scandinavia alone for instance).

Exhibit 2

ELASTICITIES ON-LINE BANKING CONVERSION

BRU_BL1539_20010705_F Ecommerce

ESTIMATES



Note: Elasticity at the sample mean. An elasticity above one in absolute value means more than a proportional effect on on-line banking conversion

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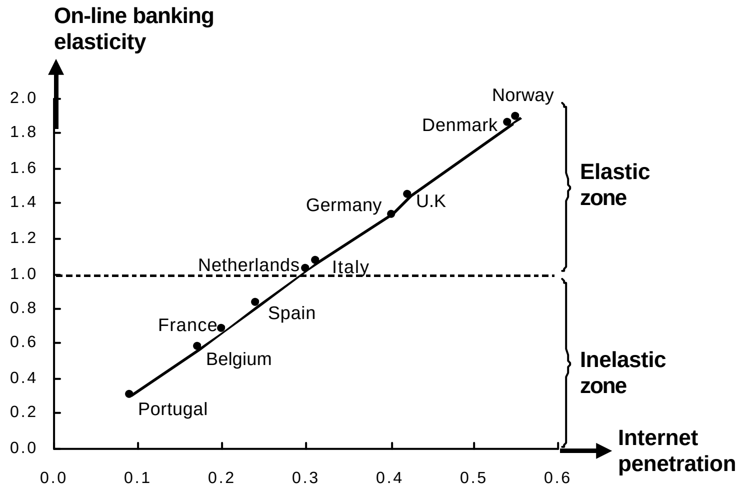
To illustrate this point, **Exhibit 3** shows the elasticity function derived from the logistic regression (1), and plotted against country internet penetration. From the curve, it is seen that the on-line bank elasticity becomes higher than one when a country achieves a penetration of about 30 percent of quarterly internet usage. I.e., countries such as Germany, UK, or Norway which have already bypassed this internet threshold will start disproportionately to increase on-line banking usage. Currently, countries such as Denmark or Norway exhibit elasticities as high as 2.0, in contrast to, say, the Portugal with elasticity being less than 0.4, i.e., 5 times lower than the Scandinavian countries. If internet penetration continues the same pattern to double every year, this means that the Portugal is at least two years beyond the development of Scandinavian countries, an often quoted metric in Europe when comparing the North and the South (e.g. OECD, 1998).

Exhibit 3

THE INTERNET ELASTICITY FUNCTION TO ON-LINE BANKING

BRU_BL1539_20000914_F Ecommerce

ESTIMATES



3.5. Bank-specific factors

An analysis of bank-specific, "push", factors also proves its own interesting points.

First, bank size exerts a significantly negative impact on bank "push" strategy to convert on-line customers. Otherwise stated, smaller banks are more active in converting their customer base to on-line channels. The elasticity at the mean is however small at about 0.2 in absolute value.

Second, banks with lower cost structure and which have already established a large electronic channel base (as measured by private ATM density) tend to convert more customers to the on-line channel. This means that banks with low cost strategy recurrently push towards lower cost channels, such as the on-line channels.

Third, and of noticeable importance, the "cost-effectiveness" measure, rather than the "convenience" measure (ATM density) has the largest elasticity in absolute value, confirming the aggressiveness of cost effective banks to adopt the internet where it is argued that internet transactions can be made at less than 10% of traditional channel costs (Morgan Stanley Stanley DeanWitter, 1999).

Fourth, organizational structure of on-line bank activities never appeared in this sample of banks to be a discriminative factor. Organizational structure possibly plays a stronger role for customer acquisition rather than customer conversion, as emphasized in companion work (Bughin, 2000).

Finally, and in all cases, the elasticities for bank-specific factors are also much lower in absolute value than for the effect of a country internet readiness. However, the *sum* of those elasticities can be above one, in particular for the hypothetical bank which combine lower cost structure, larger ATM coverage and of smaller size than average. How many banks share those features for on-line banking penetration is one question discussed in the next section.

4. CLUSTERING OF ON-LINE BANKING

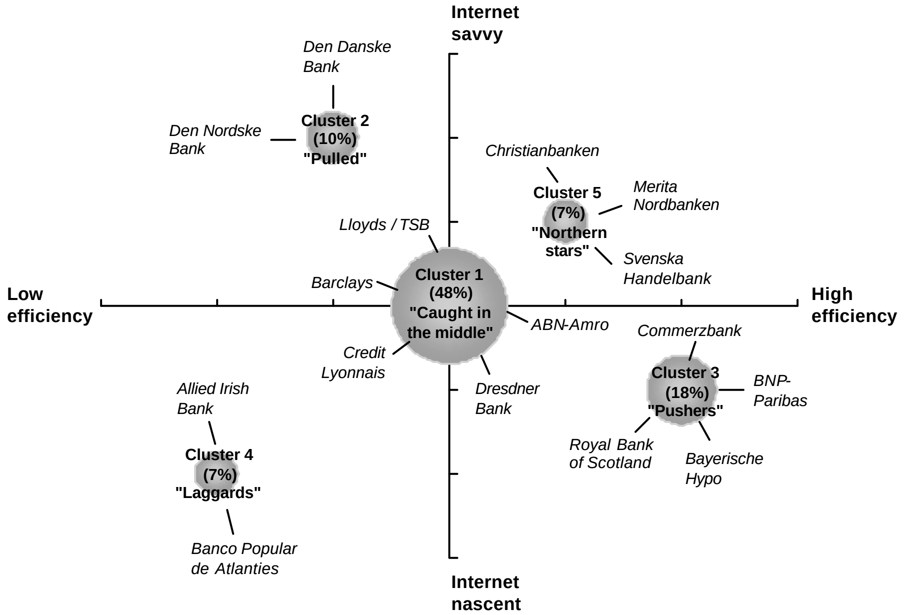
Our logistic regression analysis identified three factors , cost effectiveness, customer convenience and on-line readiness, as significant influences on the proportion of a bank's customers who bank on-line.

4.1. Five clusters

In parallel to regression analysis, we performed a cluster analysis to identify where individual European banks are located in the space defined by those factors. The analysis was run using standard clustering method using SAS package. After a tolerance level of 10 percent, *five* clusters were identified for a total variance explained of 42%; however, customer convenience never appears as a strong component of cluster, and has thus been omitted. The clusters in terms of cost-effectiveness and internet readiness are described in **Exhibit 4**, with examples of banks belonging to each of them.

Exhibit 4

CLUSTER ANALYSIS



Source: Banks names are illustrative examples

The first and largest cluster (**48%** of the total of clusters) is the one describing banks centering their performance at the mean of cost effectiveness and on-line readiness. Another, small but relevant cluster, is the one composed of banks which are pulled by customer readiness to use on-line; this cluster (**10%** of the banks) comprises exclusively Scandinavian banks. On the opposite, a cluster of banks (**18%**) has a strong on-line penetration because of pushing for on-line—this includes mostly French or German banks. Finally, two clusters define the extremes of high and low efficiency and internet penetration. The first, a small nucleus (**7%**) comprising the best performing banks overall, combining strong pull / push factors for on-line conversion, include Scandinavian banks such as *SvenskaHandelsbank* . The second, of the same size (**7%**), includes banks with relatively poorer levels of "pull" and "push" factors.

4.2. Digital divide?

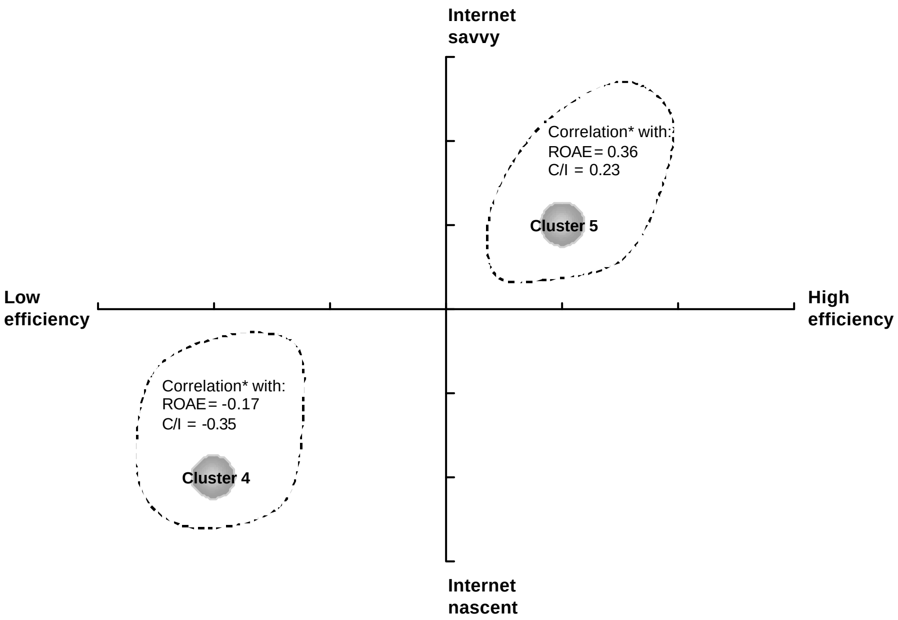
Membership of the clusters identified was also correlated with other factors that are independent of the two main drivers of on-line banking conversion: internet penetration ("pull") and cost efficiency ("push"). As illustrated in **Exhibit 5,** membership of the clusters with the highest and lowest performance of the pull and push dimensions is also correlated with profitability measures such as bank cost-income (C/I) ratio and return on equity (ROAE).

The fact that the highest performing cluster is positively correlated with overall financial performance (and vice versa) means that this digital divide in on-line banking is also the partial consequence of off-line performance. This topic of course requires more than those data alone, but points out already this interesting field of new research.

Exhibit 5

BRU_BL1539_20000914_F Ecommerce

CLUSTERS' CORRELATES



* Statistically significant at 10%

5. CONCLUSIONS

This paper is, to our knowledge, the first to assess the drivers of on-line banking customer conversion for European banks. While the conversion is still low, on-line customer conversion is shown to be linked to "pull" factors, but also significantly to "push" bank-specific factors. Larger banks and / or banks with higher cost base seem as well to be lagging their peers in terms of on-line adoption, while banks with an established electronic coverage (as measured by their private ATM density) have also managed to convert more customers to the internet. The fact that banks evolve around significant clusters, with the most poorly performing clusters also be linked with globally weak financial bank performance may mean that on-line will reinforce the gap between high performing and laggard financial institutions. This calls however for deeper research in the future in order to confirm results above.

As first priority however, the existing sample should be extended to a larger amount of banks, both in Europe and US, potentially with a time-series dimensions to reflect upon customer speed adoption. Those data are however scarce at this stage, but results of this paper point out that major difference in customer adoption to on-line is a critical research area for the years to come.

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