WIFO
ÖSTERREICHISCHES INSTITUT
FÜR WIRTSCHAFTSFORSCHUNG

WORKING PAPERS

X-Efficiency and International Banking

Micro-Evidence from OECD-based Banks

Franz R. Hahn

247/2005

X-Efficiency and International Banking

Micro-Evidence from OECD-based Banks

Franz R. Hahn

WIFO Working Papers, No. 247
March 2005

E-mail address: Franz.Hahn@wifo.ac.at
2005/999/W/0

X-Efficiency and International Banking

Micro-Evidence from OECD-based Banks

Franz R. Hahn
Austrian Institute
of Economic Research
P.O. Box 91
A-1103 Vienna
Email: Franz.Hahn@wifo.ac.at

Abstract

This paper is aimed at exploring how X-efficiency or management quality is associated with one of the most vivid forms of international banking, that is, entering new markets by setting up foreign subsidiaries. The analysis focuses on the supposition that management quality ought to be one of the foremost firm-specific factors likely to drive a bank's aspiration of becoming international. We tackle this topic by applying an ordered probit model to a data-set covering more than 1,000 OECD-based universal banks over the period from 1996 to 2000. The analysis yields strong empirical evidence in favor of the view that the higher the level of X-efficiency or managerial quality of a bank the larger the likelihood of becoming a bank with a strong international orientation.

JEL classification: F36,C23, C52, G21,G24,G34

Keywords: efficiency measurement, data envelopment analysis, international banking.

I am very grateful to Christa Magerl for excellent research assistance. The usual disclaimer applies.

1. Introduction

Since the early 1980s, deregulation of financial markets, freedom of capital movement and increasing competition within the financial service industry have forced many universal banks to broaden their business base. Expanding banking activities beyond the national borders has turned out to be a valuable option for a sizeable number of banks. Though the internationalization of banking parallels a trend which has, meanwhile, become quite natural in almost all business sectors of advanced economies, there is the view that internationalization within the banking industry be somewhat unique, at least more complex than in other economic sectors.

The argument roots, among other things, in the observation that, contrary to other businesses, the largest banks seldom belong to those entities which are more likely to become international players (see, for example, *Canals*, 1997). Factors such as customer service (that is, strengthening the closeness to the customers by going where they go) and risk diversification (that is, stabilizing revenues by ensuring a better risk-balanced investment portfolio) are said to play a much more critical role as main drivers for going international in banking than in other industries. That is not to say that classic reasons for internationalization such as escaping increasing domestic rivalry by looking for new markets overseas ought to be completely scrapped as driving forces behind a bank's becoming international. In fact, when banking is the matter of concern the standard story of corporate internationalization should rather be taken as part of the story and not as the whole thing.

This paper makes an attempt to break new ground by focusing on an intrinsic, quite natural factor of internationalization which, surprisingly, has so far been paid no (or only little) attention in this strand of research. To be specific, the analysis is aimed at exploring how X-inefficiency or management quality is associated with one of the most vivid forms of international banking, that is, conquering new markets by setting up foreign subsidiaries. Put differently, if size isn't a good predictor for going international maybe the quality of a bank's management as measured by X-efficiency is a good one. As a matter of fact, this supposition can hardly be discredited as being too far-fetched since designing and implementing a complex strategy such as a foreign direct investment (FDI) program is, beyond doubt, very much reliant on the guidance of competent management. Thus, the presumption appears to be quite natural that X-efficiency is one of the more promising candidates for assessing the likelihood whether or not a bank reaches out for foreign markets.

The paper is organized as follows: In section 2 we introduce X-efficiency into the standard portfolio model of international banking in order to motivate the importance of management quality for becoming a financial company with an international orientation. In section 3 the dataset and the econometric approach used to test the impact of X-efficiency on FDI activities in banking are discussed. Further, the Data Envelopment Analysis (DEA) approach applied to measure X-efficiency in banking is outlined. Presentation and discussion of the empirical results conclude section 3. Section 4 sums up.

2. X-Efficiency and International Banking – A Supplement to the Standard Portfolio Model of Banking

As for motivation, we use the simple portfolio model set out in *Freixas – Rochet* (1998) and adapted by *Buch* (1999A, 1999B) to analyze foreign borrowing and lending decisions of banks. The model is built upon the mean-variance framework. Referring to a 2-country setting the representative bank i is to maximize the following expected utility as its objective function which, according to the chosen framework, is increasing in expected profits and decreasing in the profit's variance:

$$(1) \qquad U_i = U_i\left[E(\Pi_i), \sigma^2(\Pi_i)\right], \qquad U'_{E(\Pi)} > 0,\ U'_{\sigma^2(\Pi)} < 0$$

where $E(\Pi_i)$ stands for the expected profit and $\sigma^2(\Pi_i)$ for the variance of the profit of the i-th bank, respectively. As usual, U' denotes the first derivative. The bank is assumed to accept deposits at home and abroad and, likewise, grant loans, all of which is done in domestic currency terms, respectively. Further, in addition to making loans the bank can also invest in a riskless security, but cannot borrow at the riskless rate. All expected rates are taken by the banks as given, that is to say, the banks are assumed to operate under perfect competition. The banks are considered to be risk-averse (due to reasons such as the presence of risk-based capital requirements or positive costs of insolvency), and have to choose their optimal portfolio for one period at the beginning of the period. Finally, the representative bank is supposed to optimize the objective function (1) subject to a standard balance sheet restriction:

$$(2) \qquad W_t + D_t + D_t^* = L_t + L_t^* + R_t\,,$$

where W denotes initial wealth, D domestic deposits, $D*$ foreign deposits in domestic currency terms, L domestic loans, $L*$ foreign loans in domestic currency terms, and R is the riskless asset[1]). With $\bar{r}_i$ denoting the vector of net excess returns (that is, domestic and foreign net loan rates and domestic and foreign net deposit rates, respectively), and $x_{i,m}$ denoting the vector of the respective portfolio shares, the expected profit of the i-th bank is

[1]) A detailed presentation of the structure of this model is given, among others, in *Buch* (2004).

$$(3) \qquad E[\Pi_i] = \bar{r}_i \, x_{i,m} ,$$

and the variance of the profit is

$$(4) \qquad \sigma^2(\Pi_i) = \sum_{m=1}^{4} x_{i,m}^2 \sigma_m^2 + 2 \sum_{m=1}^{4} \sum_{\substack{n=1 \\ m \neq n}}^{4} x_{i,m} x_{i,n} COV_{mn} ,$$

where σ_m^2 is the variance of the net excess returns, and COV stands for the covariance of the net returns. Note that the structure of the model implies that the volatility of the foreign net returns as measured by its variances may also be caused by exchange rate fluctuations.

Maximizing the objective function (1) subject to the standard balance sheet restriction (2) with respect to $x_{i,m}$ yields the optimal portfolio structure of the bank i as given by the following equation:

$$(5) \qquad \hat{x}_i = \lambda_i V^{-1} \bar{r}_i ,$$

where λ_i represents the degree of the bank's relative risk aversion and V^{-1} is the inverse of the variance-covariance matrix of excess returns $\bar{r}_i$. Note that λ_i is strictly positive because of the presence of risk aversion.

The optimal portfolio shares $\hat{x}_i$ are meaningful, that is, the shares are positive for loans and negative for deposits when V is a positive definite matrix (that is, the covariance between the loan rates and deposit rates, domestic and foreign, is positive) and, in addition, there are positive net loan rates and negative net deposit rates. The latter part implies that the loan rate r_L be larger than the deposit rate r_D and the riskless rate r, respectively, with $r > r_D$ (for a proof of this result, see, *Freixas – Rochet*, 1998, pp. 237). The same applies with respect to the foreign rates, respectively.

This simple model has primarily been used to motivate the importance of excess returns obtained on foreign markets, market size and various risks (such as exchange rate risks) for launching international banking activities (see, i.e., *Buch*, 1999A, 1999B). Though the model is trivial and its results can hardly be taken as a surprise, *Buch* (2004) rightly stresses that the

model has a practical meaning in that, contrary to the well-known separation theorem, it allows for holding different portfolios among banks.

This particular feature of the model is further strengthened when X-inefficiency is added to its structure. A natural way to do this is treating X-inefficiency or managerial inefficiency as an extra cost factor allowing for different cost structures between otherwise possibly identical banks.

In our simple 2-country case, considering X-inefficiency as an additional slack factor the vector of excess returns $\bar{r}_i$ then gets the following representation:

$$\bar{r}_i = \begin{pmatrix} \bar{r}_{i,L} \\ \bar{r}_{i,D} \\ \bar{r}^*_{i,L} \\ \bar{r}^*_{i,D} \end{pmatrix} = \begin{pmatrix} r_L - c_{i,L} - s_{i,L} - r \\ r_D + c_{i,D} + s_{i,D} - r \\ r^*_L - c^*_{i,L} + \dot{e} - s_{i,L} - r \\ r^*_D + c^*_{i,D} + \dot{e} + s_{i,D} - r \end{pmatrix}, \tag{6}$$

where c_L, c_D denote variable costs of making loans and accepting deposits (i. e., back office costs, infrastructure costs etc.), and s_L, $s_D \geq 0$ represent the costs triggered by managerial inefficiency or slack. Needless to state that the more efficient the management the smaller is s, with s equal to zero in case the management is perfectly efficient. Exchange rate changes are denoted by $\dot{e}$, which is positive when the domestic currency depreciates. The exchange rate changes are assumed to be stochastic with a finite variance and exogenous to the bank. The characters with an asterisk superscript denote the respective foreign rates. Further, exchange rate changes $\dot{e}$ and variable costs c are assumed to be small enough so that the requirement of positive net loan rates and negative net deposit rates, domestic and foreign, is not violated.

Given this setting and, additionally, the requirement that the variable costs c for a bank be higher abroad than at home (which is certainly not implausible an assumption), then the model makes a clear-cut prediction with respect to a bank's geographical width of operation. The model simply holds that a domestic bank dares to undertake cross-border transactions if and only if s_L, s_D is small enough to allow for positive (negative) net foreign loan (deposit) rates. If the management of a bank causes slack too large for successfully launching international activities but small enough to sustain positive (negative) domestic net loan (deposit) rates then the bank remains domestic-oriented. Put differently, all things equal, the model maintains that the more efficient a bank's management, the more likely its international aspiration.

Finally, assuming both the attitude toward risk and the quality of the management be not directly observable by either the banks' owners nor other outsiders then the model states that there is room for sustainable differences between portfolios and profits within the banking sector (which certainly is the rule rather than the exception in the real world of banking).

3. Testing the Impact of X-Efficiency on International Banking – An Empirical Analysis of OECD Bank Level Data

The simple model discussed in the previous section provides a straight rationale for cross-border lending and borrowing of banks, that is, for international banking activities carried out from the home base. Setting up affiliates overseas to service foreign markets is sure too complex a strategy to be explored with the help of this model. FDI activities clearly indicate the highest level of commitment to a foreign market (much higher than cross-border lending, or running a representative office overseas or even setting up a foreign branch). Thus, since FDI decisions are one of the most demanding management decisions to make it appears even more natural that the level of X-inefficiency has an influential role in whether a bank is likely to build a physical foothold overseas or not. Efficient management certainly belongs to those indispensable preconditions to be given when economies of scale opened up by foreign establishments are to be reaped.

Most empirical work in international banking has so far focused on determinants of FDIs made up of location-specific factors of the host country such as market size, trade relations, regulatory and judicial standards (see, for example, *Buch*, 2004, for a competent review of the relevant literature in this field). Many of these studies stress the tendency of banks to follow their customers abroad as one of the most important reasons why banks decide to make FDIs. Firm-specific factors have so far been given less attention in empirical work on FDI in banking, mostly due to the difficulty of obtaining data on such factors. In the following sections of this paper we dare to work this very virgin soil by attempting to take a closer look at one of the supposedly most important firm-specific drivers of FDI in banking.

3.1 Data and Variables

The main source of the dataset used in the empirical analysis is the BankScope database of the London-based International Bank Credit Analysis Ltd (IBCA)[2]). This database contains a broad set of both, quantitative and qualitative information of banks all over the world. However, in order to compose a meaningful sample we have to impose a number of requirements to be met by the data. First, in order to maintain a high level of data quality, as to the proprietary (or parent) banks studied, the geographical coverage is restricted to 24 OECD countries. There are no geographical restrictions imposed as to the coverage of foreign subsidiaries (or affiliates) run by these OECD-based banks. Second, in order to qualify as a bank with FDI activities we require that a bank hold at least a 50 percent stake at a foreign bank's stock (stockholdings of less than 50 percent are discarded as foreign portfolio investments). Third, the data coverage encompasses the years from 1996 to 2000 because data prior to this period appear to be of lesser quality. Fourth, in order to get sufficiently comparable data for all 24 OECD countries, we narrow the range of bank types down to

[2]) I am very grateful to Sina Scannelli who smoothed the way for getting easy and timely access to this valuable database.

commercial banks, savings banks, cooperative banks and mortgage banks. Fifth, by the same token we adopt the broad variable definition as suggested by IBCA BankScope in order to minimize data bias due to different accounting standards in the OECD countries. Finally, we discard all banks which report inconsistent or incomplete business data in one of the years investigated. As a result, the dataset gained by this data selection mechanism covers more than 1,000 banks each year of the investigation period. Table 1 shows some descriptive statistics of the bank sample drawn.

The broad set of individual bank data is mainly composed of drawings from non-consolidated income statements and balance sheets corresponding to the years 1996 to 2000. These data are reported in real 2000 terms and converted into US-Dollar by using the local GDP deflator and the purchasing power parity (PPP) rate as computed by the OECD, respectively.

Table 1: Descriptive Statistics for Sample Banks 1998

	Number of banks	Total assets in mn USD at PPP 2000			
		Mean	Maximum	Minimum	Standard deviation
Australia	20	27,192	116,311	3,140	35,317
Austria	42	9,294	104,338	179	17,809
Belgium	25	22,016	136,607	370	35,916
Canada	1	3,364	3,364	3,364	–
Denmark	8	19,042	65,692	113	22,628
Finland	5	17,782	52,514	2,471	18,206
France	120	19,371	344,233	182	49,223
Germany	173	26,872	479,386	64	59,236
Greece	8	16,973	54,519	1,187	15,612
Iceland	1	1,984	1,984	1,984	–
Ireland	2	5,467	5,934	5,000	467
Italy	93	21,042	239,699	85	35,768
Japan	206	32,658	574,907	3,214	75,679
Luxembourg	42	8,817	32,382	204	8,847
Netherlands	8	12,347	63,820	116	20,222
New Zealand	7	13,688	22,094	3,134	7,750
Norway	11	9,494	32,942	210	9,929
Portugal	21	13,578	61,344	615	15,254
Spain	67	14,540	105,006	602	22,521
Sweden	12	26,941	74,986	1,909	24,426
Switzerland	82	11,847	544,751	25	60,866
Turkey	7	13,012	50,429	3,213	15,917
United Kingdom	27	18,151	69,310	795	19,247
USA	224	19,380	307,479	3,116	33,077
OECD (24)	1,212	21,189	574,907	25	49,359

S: BankScope, own calculations.

For measuring X-inefficiency the Data Envelopment Analysis (DEA) approach is used. To be exact, the X-efficiency measures, denoted by $XEFF$, are derived from an input-oriented slacks-based DEA model due to Tone (2001).

The DEA model used to compute technical efficiency is the input-oriented SBM due to *Tone* (2001). In the most general form, the SBM has the following structure:

$$\min_{t,\lambda,s^-,s^+} \quad \tau = t - \tfrac{1}{m}\sum_{i=1}^{m}\frac{S_i^-}{x_{io}},$$

$$(8) \qquad \textit{subject to} \quad 1 = t + \tfrac{1}{s}\sum_{r=1}^{s}\frac{S_r^+}{y_{ro}},$$

$$tx_o = \mathrm{X}\Lambda + S^-,$$

$$ty_o = \mathrm{Y}\Lambda + S^+,$$

with $\mathrm{X} = \left(x_{ij}\right) \in \Re^{m\times n}$, $\mathrm{Y} = \left(y_{ij}\right) \in \Re^{s\times n}$ representing the set of inputs and outputs, respectively, $S^- = ts^- \geq 0,\ S^+ = ts^+ \geq 0,\ \Lambda = t\lambda,$ where t is a positive scalar variable and $\lambda \in \Re^n$, s^-, s^+ denote the total (that is, radial and non-radial) input and output slack vectors defined as $x_o = \mathrm{X}\lambda + s^-$ and $y_o = \mathrm{Y}\lambda + s^+$, respectively[3]). Note that input-orientation requires that the scalar variable t be set equal one. This DEA model is superior to the standard DEA approach due to its dealing with input excesses and output shortfalls by directly incorporating the information contained in the slacks into the objective function.

As to the definition of banks' inputs and outputs fed in the DEA model we apply the inter-mediation approach as suggested by the very recent empirical literature (see, among others, *Casu – Molyneux*, 2003). We specify an intermediation-oriented model that consists of the output variables 'total loans' and 'other earnings' and of the input variables 'total costs' covering interest expenses, non-interest expenses and employee expenses, respectively and 'total deposits'.

As regressor in the econometric analysis, the X-efficiency measure as derived from the DEA model is accompanied by a ratio of capital and a ratio of profitability, respectively. These variables at the bank level are assumed to capture country-specific differences in banking regulation (capital ratio) and corporate governance culture (profitability ratio). The capital ratio of a bank, denoted by EOA, is measured by equity over total assets and the profitability ratio, denoted by ROA, is defined as return on total assets (see Data Appendix for further details). An extended version of the base model also includes two macroeconomic variables, $CREDIT$ and $TRADE$. In so doing, we control for country-specific differences in the strength of the banking sector and the overall trade orientation, respectively. The latter variable is supposed to capture the banks' tendency to follow their customers. $CREDIT$ equals the

[3]) For a definition and related illustration of radial and non-radial input slack, see, for example, *Fried –Schmidt – Yaisawarng* (1999), Figure 1.

value of credits by financial intermediaries to the private sector divided by GDP, and $TRADE$ is defined as exports plus imports of goods divided by GDP. Both variables are averaged over the period from 1995 to 2002. The expectation is that all four variables exert a positive impact on the degree of outward orientation of banks.

The used measurement of the FDI activities at the bank level, in short $INTB$, the dependent variable in the econometric approach, may appear as somewhat unique at first glance. Since FDI data in nominal terms at the firm level are not available in BankScope we instead construct a so-called count variable taking on integer values only corresponding to the number of foreign subsidiaries reported by OECD-based banks to IBCA BankScope[4]). According to the definition given above, this variable takes on a zero when a bank does not hold at least a share of 50 percent of a foreign bank's equity. Only holdings beyond this mark are counted (that is, holdings of 50 percent and above). The number of overseas subsidiaries run by an OECD-based bank has been gained by special queries supported by the user interface of BankScope. Table 2 gives some descriptive statistics of our sample of OECD-based banks with at least one foreign subsidiary.

Table 2: Descriptive Statistics for Sample Banks with Subsidiaries Abroad 1998

	Number of banks	Total assets in mn USD at PPP 2000			
		Mean	Maximum	Minimum	Standard deviation
Australia	9	49,851	116,311	4,645	42,536
Austria	30	8,993	104,338	179	20,092
Belgium	13	10,759	95,941	370	24,857
Denmark	7	18,735	65,692	113	24,175
Finland	1	2,471	2,471	2,471	–
France	34	38,012	344,233	182	79,395
Germany	55	56,326	479,386	64	94,900
Greece	6	18,857	54,519	1,187	17,553
Iceland	1	1,984	1,984	1,984	–
Italy	40	20,871	149,694	85	32,105
Japan	19	158,405	574,907	4,302	159,069
Luxembourg	26	8,202	32,382	204	9,673
Netherlands	3	486	1,041	116	400
New Zealand	2	14,870	20,478	9,262	5,608
Norway	4	14,340	32,942	210	13,877
Portugal	11	14,929	61,344	615	19,052
Spain	30	14,646	81,527	602	18,641
Sweden	6	43,298	74,986	1,909	22,992
Switzerland	61	13,768	544,751	25	70,457
Turkey	2	27,412	50,429	4,394	23,017
United Kingdom	9	25,355	69,310	795	26,804
USA	10	37,234	108,350	4,055	32,612
OECD (24)	379	31,668	574,907	25	73,372

S: BankScope, own calculations.

4) To the best of our knowledge, FDI data at the firm level are not made publicly available in OECD countries due to legal provisions of protection of data privacy.

Table 3 provides some distributional features of the indicator $INTB$. According to our calculation method, nearly one third of the banks considered in the data sample is counted as maintaining at least one foreign subsidiary. The majority of OECD-based banks in our sample runs between 1 and 10 relevant foreign operation units, most of which are head-quartered within the EU.

Table 3: Number of Sample Banks with Domestic and Foreign Activities 1998

	Number of banks with		
	No subsidiary abroad	1 to 10 subsidiaries abroad	11 and more subsidiaries abroad
Australia	11	8	1
Austria	12	23	7
Belgium	12	11	2
Canada	1	0	0
Denmark	1	7	0
Finland	4	1	0
France	86	27	7
Germany	118	48	7
Greece	2	6	0
Iceland	2	1	0
Italy	53	36	4
Japan	187	17	2
Luxembourg	16	24	2
Netherlands	5	3	0
New Zealand	5	2	0
Norway	7	4	0
Portugal	10	9	2
Spain	37	30	0
Sweden	6	5	1
Switzerland	21	54	7
Turkey	5	2	0
United Kingdom	18	9	0
USA	214	10	0
OECD (24)	833	337	42

S: BankScope, own calculations.

The Data Appendix gives further details on the definition of the variables and the data sources used in the following econometric analysis.

3.2 Econometric Methodology and Results

Since the dependent variable is count dependent, discrete and censored a count model seems to be a natural choice for the model of these data. The preponderance of zeros in the data would even suggest the usage of a model which explicitly accounts for zero-inflation such as the zero-inflated Poisson model (see for a discussion of these models, among others, *Greene*, 2003). However, the construction of the indicator suggests to interpret the proposed measure of FDI activities in banking as an ordinal rather than a cardinal variable. By stressing

the ordinal nature of this indicator the ordered multiple choice-setting which is inherent to our problem is distinctively brought to the fore.

By design, the proposed FDI indicator not only is a quantitative measure, measuring the absolute frequency of (relevant) physical presence in foreign markets, but also conveys a qualitative information, reflecting the banks' tendency either to remain more domestic (and, most likely, low grade-international oriented) or to step up their international business orientation. This reading of the measure is also due because, per construction, a zero count does not necessarily indicate that the respective bank do not bank internationally at all[5]). Moreover, since we do not control for the size of FDI operations a count in the lower single digits does not necessarily always indicate a significantly lower level of international sophistication than a count in the upper single digits. However, parent banks which run twenty and more foreign subsidiary banks may rightly consider themselves to be playing in a different league. Hence, we regard the proposed measure of international banking activities to be closer in spirit to an ordinal ranking variable, such as a ordinal response measure based on the results of an opinion survey, than to a cardinal variable, such as a count measure.

As a result, given the ordinal nature of the dependent variable we consider a model for ordered choices as the most appropriate analytical tool to study the impact of X-efficiency on FDI activities in banking. To be specific, as our base model we use an ordered probit model built on a latent regression model.

The base model has the following specification:

$$(7) \qquad INTB_{i,t}^{*} = \beta_0 + \beta_1 XEFF_{i,t} + \beta_2 ROA_{i,t} + \beta_3 EOA_{i,t} + \varepsilon_{i,t},$$

$$INT\_B_{i,t} = 0, \quad if \ INTB_{i,t}^{*} = 0,$$

$$= 1, \quad if \ 0 < INTB_{i,t}^{*} \leq \mu,$$

$$= 2, \quad if \ \mu < INTB_{i,t}^{*},$$

where $INTB_{i,t}^{*}$ is a measure reflecting $i-th$ bank's tendency to become more international or remain more domestic oriented at time t. We assume that $INTB_{i,t}^{*}$ be not directly observable but sufficiently well detected by the observable indicator $INTB_{i,t}$

[5]) As a matter of fact, almost all banks covered in our sample are, in one way or another, present in the international arena, either as cross-border lenders, portfolio investors or as parents of foreign subsidiaries.

depicting the foreign activities of bank i as measured by the number of overseas subsidiaries run by the respective bank according to the definition given above. This indicator is then transformed into the rank variable $INT\_B_{i,t}$ according to the threshold parameter μ. Though μ is usually supposed to be unknown and estimated with β, in the given context by fixing this cut point we are capable of transforming the count variable $INTB$ into the wanted ordered rank (or response) variable. Technically, the cut point μ is taken to be 10 since this number of foreign subsidiaries is considered by many experts as a good mark for drawing a line between banks with a vivid international orientation and banks with a very strong international presence. Accordingly, the dependent variable is categorized as 'primarily domestic' if $INTB$ equals zero (that is, $INT\_B_{i,t} = 0$), as 'low-grade international' when $INTB$ counts from 1 to 10 ($INT\_B_{i,t} = 1$), and as 'high-grade international' when $INTB$ exceeds the integer 10 ($INT\_B_{i,t} = 2$).

Further, as usual we assume that the stochastic term is normally distributed across the observations with mean and variance normalized to 0 and 1, respectively, that is, $\varepsilon_i \sim N[0,1]$. Since in the given model context the marginal effects of the regressors $x' = (1, XEFF, ROA, EOA)$ are not equal to the estimated coefficients we calculate, for the three probabilities $\Pr[y = j]$ with $j = 0,1,2$, the marginal or partial effects as follows (for details, see, *Greene*, 2003):

$$\frac{\partial \Pr[y=0]}{\partial x} = -\phi(\beta' x)\beta,$$

$$\frac{\partial \Pr[y=1]}{\partial x} = [\phi(-\beta' x) - \phi(\mu - \beta' x)]\beta, \tag{8}$$

$$\frac{\partial \Pr[y=2]}{\partial x} = \phi(\mu - \beta' x)\beta,$$

with ϕ representing the standard normal density and β the parameter vector of equation (7). As for the computation of the partial effects, we evaluate the marginal effects at every observation and use the sample average of the individual marginal effects as slopes.

Table 4 and Table 5 present the estimated coefficients and marginal effects for the ordered probit model, respectively. In order to save space, we only report the findings for the year 1998. The complete set of results covering the period from 1996 to 2000 is made available on request. For robustness reasons, the results of three specifications are reported: Model A shows the results with $XEFF$ as a single regressor, Model B the results of the base model as presented in equation (7), and Model C the results of the base model extended by the macroeconomic variables $CREDIT$ and $TRADE$, respectively.

Table 4: Ordered Probit Estimates of International Banking Activities 1998

Dependent Variable: *INT_B*						
	Maximum Likelihood Estimates					
Independent Variable	Model A		Model B		Model C	
XEFF	0.753	***	0.989	***	1.027	***
	(0.180)		(0.181)		(0.168)	
ROA			0.026	**	0.040	***
			(0.011)		(0.013)	
EOA			0.024	***	0.023	***
			(0.005)		(0.005)	
CREDIT					0.006	***
					(0.001)	
TRADE					0.016	***
					(0.001)	
Constant	–0.535	***	–0.827	***	–2.163	***
	(0.040)		(0.064)		(0.167)	
μ	1.347	***	1.394	***	1.557	***
	(0.072)		(0.072)		(0.075)	
Number of observations	1,212		1,212		1,212	
Y = 0 count	833		833		833	
Y = 1 count	337		337		337	
Y = 2 count	42		42		42	
Percent correctly predicted	0.677		0.693		0.725	
Log-likelihood	–878.468		–853.462		–768.779	
Restricted log-likelihood	–884.930		–884.930		–884.930	
R^2_{ZM}[1])	0.449		0.466		0.523	

*** ... Significant at the 1-percent level, ** ... significant at the 5-percent level; standard errors in parentheses. – 1) Pseudo R^2 due to *Zavoina – McElvey* (1975).

To begin with, the goodness-of-fit statistics appear to reflect a satisfactory fit given the simple structure of the models estimated. The pseudo R^2 measure due to *Zavoina – McElvey* (1975) is around 0.50 and the percent correctly predicted is about 70 on average. More importantly, the diagnostics show uniformly that the coefficients in all models are significantly different from zero and have the expected sign. As measured by the χ^2-statistics, the joint hypothesis that the coefficients on the variables considered are all zero is strongly rejected in all models and for all years under study.

The most critical results of the analysis are shown in Table 5. The derivatives of the three probabilities with respect to $XEFF$ measuring the partial effects of this variable are by far the largest indicating that managerial quality is the most important single factor in determining a bank's likelihood of turning international (or very international) or remaining primarily domestic. That is to say, the likelihood of becoming international increases with the quality of a bank's management. The impact of capital-oriented regulation (EOA), the corporate governance culture (ROA), the strength of the banking sector $(CREDIT)$, and

the overall trade orientation $(TRADE)$ on the response probabilities is sensible and meets our expectations, but is definitely much smaller in size than the impact of managerial quality depicted by $XEFF$.

Table 5: Marginal Effects for Ordered Probit
Extended Model for 1998

Variable	Y = 0	Y = 1	Y = 2
XEFF	–0,3514	0,3073	0,0442
ROA	–0,0137	0,0120	0,0017
EOA	–0,0079	0,0069	0,0010
CREDIT	–0,0022	0,0019	0,0003
TRADE	–0,0056	0,0049	0,0007
Constant	0,7403	–0,6473	–0,0930

These findings also hold true for the years under study not reported in this paper, that is, for 1996, 1997, 1999, and 2000[6]).

4. Concluding Remarks

Most empirical work in international banking has so far focused on determinants of foreign direct investments made up of location-specific factors of the host country such as market size, trade relations, regulatory and judicial standards. Many of these studies stress the tendency of banks to follow their customers abroad as one of the most important reasons why banks decide to build footholds overseas. Firm-specific factors have so far been given less attention in empirical work on international banking, mostly due to the difficulty of obtaining data on such factors. In this paper an attempt was made to take a closer look at one of the supposedly most important firm-specific drivers of international banking: managerial quality. A dataset covering more than 1,000 OECD-based universal banks over the period from 1996 to 2000 is used to empirically explore this supposition. Approximately one third of the banks covered are entities with foreign subsidiaries. Using the number of foreign subsidiaries run by a OECD-based bank as scale measure of international orientation we applied an ordered probit model to detect if managerial quality has a role in elevating the likelihood of becoming an international oriented bank. The empirical analysis shows very clearly that this indeed is the case. Managerial quality is the most important single factor in determining a bank's likelihood of turning international (or very international) or remaining primarily domestic oriented. That is, the higher the level of X-efficiency or managerial quality of a bank the larger the likelihood a bank becomes strongly international oriented.

6) As mentioned in the text, the estimation results for these years are made available on request.

References

Amemiya, T., Advanced Econometrics, Harvard University Press, Cambridge, 1985.

Banker, R. D., Charnes, A., Cooper, W. W., "Some Models for Estimating Technical and Scale Efficiencies in Data Envelopment Analysis", Management Science, 1984, (30), p. 1078-1092.

Buch, C. M., (1999A), "Capital Market Integration in Euroland – The Role of Banks", Working Paper, Kiel Institute of World Economics, 1999, (932).

Buch, C. M., (1999B), "Why Do Banks Go Abroad? – Evidence from German Data", Working Paper, Kiel Institute of World Economics, 1999, (948).

Buch, C. M., Globalization of Financial Markets – Causes of Incomplete Integration and Consequences for Economic Policy, Springer, Kiel Studies, 2004, (328).

Canals, J., Universal Banking – International Comparisons and Theoretical Perspectives, Clarendon Press, Oxford, 1997.

Casu, B., Molyneux, P., "A Comparative Study of Efficiency in European Banking", Applied Economics, 2003, (35), p. 1865-1876.

Charnes, A., Cooper, W. W., Rhodes, E., "Measuring the Efficiency of Decision Making Units", European Journal of Operational Research, 1978, (2), p. 429-444.

Cooper, W. W., Seifried, L. M., Tone, K., Data Envelopment Analysis – A Comprehensive Text with Models, Applications, References and DEA-Solver Software, Kluwer Academic Publishers, London, 2000.

Freixas, X., Rochet, J. C., Microeconomics of Banking, MIT Press, Cambridge, 1998.

Fried, H. O., Schmidt, S. S., Yaisawarng, S., "Incorporating the Operating Environment into a Nonparametric Measure of Technical Efficiency", Journal of Productivity Analysis, 1999, (12), p. 249-267.

Greene, G. H., Econometric Analysis, 5th Edition, Prentice Hall, 2003.

Hefernan, S., Modern Banking in Theory and Practice, 2nd Edition, John Wiley and Sons, Chichester, 2004.

Hughes, J. E., MacDonald, S. B., International Banking: Text and Cases, Addison-Wesley, 2002.

Molyneux, P., Altunbas, Y., Gardener, E., Efficiency in European Banking, New York, John Wiley and Sons, 1996.

Siems, T. F., Barr, R. S., "Benchmarking the Productive Efficiency of U.S. Banks", Financial Industry Studies, Federal Reserve Bank of Dallas, 1998, (December), p. 11-24.

Smith, R. C., Walter, I., Global Banking, Oxford University Press, Oxford, 1997.

Tone, K., "A Slacks-based Measure of Efficiency in Data Envelopment Analysis", European Journal of Operational Research, 2001, (130), p. 498-509.

Wooldridge, J. M., Econometric Analysis of Cross Section and Panel Data, MIT Press, Cambridge, 2002.

Zavoina, R., McElvey, W., "A Statistical Model for the Analysis of Ordinal Level Dependent Variables", Journal of Mathematical Sociology, 1975, (2), p. 103-120.

Data Appendix: Variables and Sources

Variable	Definition	Source
Total deposits	Deposits of the non-financial sector	BankScope
Total loans	Claims on the non-financial sector	BankScope
Total costs	Interest expenses, non-interest expenses and employee expenses	BankScope
Other earnings	Net non-interest income	BankScope
GDP deflator	National currency, 2000 = 100	OECD
PPP	Purchasing Power Parities vis-a-vis USD of the year 2000	OECD
XEFF	Technical efficiency measure due to DEA	Own calculations
Net earnings	Net interest income plus net non-interest income plus net income from financial transactions	BankScope
Equity	Capital and reserves	BankScope
ROA	Net earnings as percent of total assets	BankScope
EOA	Equity as percent of total assets	BankScope
CREDIT	Claims on private sector by banking institutions as percent of GDP	IMF, OECD
TRADE	Exports of goods plus imports of goods as percent of GDP	IMF, OECD

Medieninhaber (Verleger), Hersteller: Österreichisches Institut für Wirtschaftsforschung • Wien 3, Arsenal, Objekt 20 • A-1103 Wien, Postfach 91 • Tel. (43 1) 798 26 01-0 • Fax (43 1) 798 93 86 • http://www.wifo.ac.at/ • Verlags- und Herstellungsort: Wien

Die Working Papers geben nicht notwendigerweise die Meinung des WIFO wieder

Verkaufspreis: EUR 8,00 • Download kostenlos:
http://publikationen.wifo.ac.at/pls/wifosite/wifosite.wifo_search.get_abstract_type?p_language=1&pubid=25480