Determinants of Cross-Border Bank Acquisitions in Transition Economies: A Latent Class Analysis

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Abstract

We analyze the microeconomic determinants of cross-border bank acquisitions in 16 transition economies over the period 1996-2006. By using a latent class discrete choice model we explicitly incorporate the macroeconomic and institutional heterogeneity of the transition economies into our analysis. We find that foreign banks target relatively large and efficient banks when they enter transition economies with weak institutions. This evidence provides support for the market power hypothesis. However, when foreign banks enter more developed transition economies that have made progress in economic reform, they acquire less efficient banks. This result is in line with the efficiency hypothesis.

JEL Code: G21, G34, E44, F21.

Keywords: cross-border bank acquisitions, latent class logistic model, transition economies.

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1. Introduction

During the last decade, foreign investors acquired many banks in former socialist transition countries. As a consequence, the share of foreign banks in the total assets of the banking sector in these countries has increased substantially. In the Central and Eastern European countries (CEEC), foreign bank presence has soared from 11% in 1995 to more than 75% in 2005 (EBRD, 2005). In contrast, cross-border bank mergers and acquisitions in advanced economies are rare compared to domestic takeovers (Buch and DeLong, 2004).

What makes banks in transition economies lucrative targets for foreign investors? In most of the previous studies, cross-border bank acquisitions have been analyzed at the aggregate (macro) level (see De Haan and Naaborg, 2004). Variables like geographical distance, language and cultural similarities with the home country, and regulatory and supervisory structures are important determinants for the decision of foreign banks to enter a country (Berger *et al*., 2001). Also the level of economic development of the host country seems to play a role in cross-border takeovers (Focarelli and Pozzolo, 2001; Buch and DeLong, 2004). Banks located in countries with a stable macroeconomic environment are more likely to be targeted by foreign investors than those in countries with an unstable environment. For the transition economies, economic reforms are also argued to affect the intensity of foreign bank entry (Lensink and De Haan, 2002).

More recent studies focus on the individual characteristics of target and acquiring banks in transition economies. These micro-level studies show that characteristics of target banks, including size, performance, and efficiency, are important variables predicting the likelihood of a takeover (Bonin *et al*., 2005; Lanine and Vander Vennet, 2007, Williams and Liao, 2008). Claessens and van Horen (2008) report that banks enter those countries where they have an institutional competitive advantage over competitor banks.

Although it is now widely acknowledged that both country-level and bank-level variables influence cross-border bank acquisitions, the importance of bank-level factors

conditional on country-level determinants has not been treated systematically in previous work.[1] Such an analysis is especially important for the transition countries as they not only have diverse economic environments but they are also very different with respect to institutions and culture. Some of the transition countries have become members of the European Union (EU) and have high economic growth rates, while others have been less successful in their economic development. This implies that the impact of microeconomic characteristics of a domestic bank on the likelihood of being taken over by a foreign bank may be subject to variation depending on the characteristics of the host country.

This paper addresses this issue by using a latent class discrete choice framework. Unconditional latent class estimations lend support to the view that the relative strength of microeconomic factors determining cross-border bank takeovers varies across different groups of countries. Hence, pooled estimates of the logistic model for all transition countries, as used by, for instance, Lanine and Vander Vennet (2007), might provide misleading results. Using macro and institutional characteristics of transition countries as latent class covariates, we find that foreign banks are targeting relatively large and efficient banks in transition economies with weak institutions, thus providing support for the market power hypothesis according to which banks are acquired with the objective to increase market power of the acquiring bank. However, when entering more developed transition economies that have made progress in economic reform, foreign banks acquire relatively less efficient banks, supporting the efficiency hypothesis according to which banks are acquired with the objective of upgrading the efficiency of the target bank.

[1] Lensink *et al.* (2008) examine the impact of the quality of institutions on the foreign ownership-bank efficiency relationship for a broad sample of commercial banks in 105 countries. Another paper that comes close to ours is the recent study by Claessens and van Horen (2008), who examine to what extent institutional similarities between host and home country affect bank entry. In contrast to the present analysis, these papers do not focus on transition countries. They also do not examine whether the influence of bank-level factors is conditional on country-level determinants, which is the focus of our analysis.

The remainder of the paper is structured as follows. Section 2 describes the empirical methodology and the data used. Section 3 discusses the estimation results. The final section concludes.

2. Methodology and data

2.1 Latent class logistic regression model

We use a latent class logistic regression model (LCL) to examine the impact of bank-specific factors driving the cross-border bank takeovers in transition economies conditional on their macro and institutional characteristics.[2] Similarly to the logistic regression model – used for studying cross-border bank acquisitions, among others, by Focarelli and Pozzolo (2001, 2008), Focarelli *et al.* (2002), Lanine and Vander Vennet (2007) - the latent class modeling approach is based on the principle of likelihood maximization. However, it is more general as it allows separating the sample into unobservable segments and nests the simple logistic regression as a particular case when the number of classes is equal to 1. In addition, the LCL provides a flexible tool for identifying variability of predictors across classes and enables explaining variation in class probabilities by the means of the covariates.[3] Each segment contains cases homogenous on certain characteristics.[4] The cases within classes are assumed to be independent, while there is a possibility for dependence of cases across classes.[5]

[2] A detailed description of the LCL methodology is available in Vermunt and Magidson (2005). An alternative to the discrete choice modeling approach is an event-study methodology used by Williams and Liao (2008), among others. Haselman (2006) suggests another alternative approach. He estimates a model for the lending behavior of banks to examine their strategy and concludes that the decision of foreign banks to enter the CEE economies seems to be driven by long-term strategic goals. This conclusion is based on the absence of a relationship between the macroeconomic conditions in the foreign banks' country of origin and their loan supply.

[3] An alternative statistical method for grouping cases based on their characteristics is known as cluster analysis. However, nowadays there is a growing consensus that the latent class approach for grouping observations is a superior methodology, as it enables to conduct statistical testing and provides more flexible tools for analyzing data segmentation (see Lattin *et al*., 2003).

[4] In our setting, the cases are individual banks.

[5] It is important to notice that due to the longitudinal nature of our data, each case contains repeated observations over time.

Our dependent variable (y_{it}) is a dummy that takes a value of one at the time when a cross-border bank acquisition was made. The general specification of the LCL is:

$$f\left(y_{it} \mid z_i^{\text{cov}}, z_{it}^{pred}\right) = \sum_{x=1}^{K} P\left(x \mid z_i^{\text{cov}}\right) f\left(y_{it} \mid x, z_{it}^{pred}\right), \tag{1}$$

where *i* and *t* are indexes corresponding to individual banks and time, respectively, *x* is the unobserved variable varying up to *K* classes, z^{cov} is the set of covariate variables affecting the probability of being in a particular class, and z^{pred} is a set of variables influencing the dependent variable in each of the unobserved classes.

In the above specification, *f(.)* is the likelihood function and *P(.)* is the function determining the probability of belonging to a particular class. The *P(.)* multinomial probability function is specified as:

$$P\left(x \mid z_i^{\text{cov}}\right) = \pi_{x|z_i^{\text{cov}}} = \frac{\exp(\eta_{x|z_i^{\text{cov}}})}{\sum_{x'=1}^{K} \exp(\eta_{x'|z_i^{\text{cov}}})}, \tag{2}$$

where $\eta_{x|z_i}$ is a linear term referred to as baseline-category logistic model. It is important to notice that in the case of unconditional logistic regression, the latent class covariates z^{cov} are equal to zero and grouping of cases into classes is not based on class-specific characteristics of the data.

When using one of the classes $m=1,2,...M$ as a reference category, we get the following expression for the linear term $\eta_{x|zi}$:

$$\eta_{m|z_i^{\text{cov}}} = \log\left[\frac{P(y=m \mid z_i^{\text{cov}})}{P(y=m' \mid z_i^{\text{cov}})}\right] = \gamma_{m0} + \sum_{p=1}^{P} \gamma_{mp} z_{ip}^{\text{cov}}, \tag{3}$$

where the coefficients γ measure the importance of particular covariates *p* in determining the probability of belonging to a certain unobserved class.

In our case, the dependent variable is discrete, so the function *f(.)* is also expressed in terms of a logistic function:

$$f\left(y_{it} \mid x, z_{it}^{pred}\right) = \pi_{y|x,z_{it}^{pred}} = \frac{\exp(\eta_{y|x,z_{it}^{pred}})}{\sum_{y'=0}^{1} \exp(\eta_{y'|x,z_{it}^{pred}})} \quad . \tag{4}$$

The only difference is that now we use a set of predictor variables to explain the class-specific variability in the binary dependent variable by the means of a linear function determining the odd's ratio:

$$\eta_{m|x,z_{it}^{pred}} = \log\left[\frac{\mathrm{P}(y_{it}=1 \mid x, z_{it}^{pred})}{\mathrm{P}(y_{it}=0 \mid x, z_{it}^{pred})}\right] = \beta_{x0} + \sum_{q=1}^{Q} \beta_{xq} z_{itq}^{pred} , \tag{5}$$

where the coefficients β_x measure the importance of a particular predictor q in determining the dependent variable for a certain unobserved class x.

2.2 Data

We obtain data from different sources to study cross-country bank takeovers in transition economies. The first is the Securities Data Company (SDC) mergers and acquisitions database produced by Thompson Financial, from which we obtain a list of takeovers during the 1996-2006 period. This dataset contains information on the announcement and effective dates of the acquisition, the names of the bidder and target banks, the country of their ultimate parents, and the percentage of shares owned after the acquisition. From this dataset, we select completed acquisitions that involve target banks in transition economies. In our analysis we only include cross-border acquisitions (i.e., parents of bidder and target banks are from different countries), which resulted in the control of ownership by the bidder bank exceeding 50% of the equity.

The second dataset is Bankscope maintained by Bureau van Dijk, from which we extract bank level balance sheet and income statement information. We retrieve information for all banks located in the 16 transition countries under research, including those that were and those that were not engaged in a takeover (target and peer banks, respectively). Our sample covers 185 banks and contains 1,200 observations.

Altogether, there have been 93 takeover events recorded. Table 1 provides the distribution of these events across countries and over time.

[INSERT TABLE 1 ABOUT HERE]

Third, we use different sources to obtain information on institutional and macroeconomic characteristics of the countries in our sample:

- To proxy the presence of a market economy, we use the overall score of the countries according to the economic freedom index of the Heritage Foundation. This index is calculated based on a set of policies conductive to economic freedom (trade policy, fiscal burden of government, government intervention in the economy, monetary policy, capital flows and foreign investment, banking and finance, wages and prices, property rights, regulation, and informal market activity);[6]
- To proxy economic reform we use the average of various EBRD indicators of economic reform (referring to small- and large-scale privatization, enterprise reforms, price liberalization, forex and trade liberalization, competition policy, banking and non-banking sector reforms, reforms in infrastructure);
- To proxy the political regime of a country we use the average of the governance indicators of Kaufman *et al*. (2007) that refer to different dimensions of the political system (voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption);
- Finally, we obtain information on various macroeconomic indicators and financial market conditions using the World Bank's Word Development Indicators.

Table 2 contains details of the datasets employed in our analysis.[7]

[INSERT TABLE 2 ABOUT HERE]

[6] More information is available at: http://www.heritage.org/Index/. De Haan *et al*. (2006) provide a critical survey of the literature using this and other indicators of economic freedom.
[7] All data are available on request.

3. Empirical results

3.1 The model of Lanine and Vander Vennet (2007)

The first step in our empirical investigation is to estimate the logistic regression model of Lanine and Vander Vennet (2007) using a more general latent class formulation. As the simple logistic regression is equivalent to the unconditional latent class logistic regression with the number of classes restricted to be equal to one, this exercise allows us to test whether extending the model by adding for more classes improves the fit of the model. The purpose of Lanine and Vander Vennet (2007) is to test two competing hypotheses explaining cross-border bank acquisitions, namely the efficiency and the market power hypothesis. According to the efficiency hypothesis, acquisitions are undertaken with the objective of upgrading the efficiency of the target banks. According to the market power hypothesis, acquisitions are used to gain access to a market and build up market share without improving the efficiency of the acquired banks. Following, Lanine and Vander Vennet (2007), we use three indicators of market power of a bank (i.e., the logarithm of a bank's total assets, and its share of loans and deposits of all banks), two indicators of efficiency (i.e., the cost-to-income ratio, and the non-interest expense ratio), and two variables measuring profitability (i.e., return on equity, and return on assets).[8] Table 3 provides details of the variables used in our analysis, Table 4 displays descriptive statistics, while Table 5 shows the Akaike information criteria (AIC) obtained for up to four latent classes.

[INSERT TABLES 3, 4 and 5 ABOUT HERE]

[8] The study of Lanine and Vander Vennet (2007) differs in various ways from our study. Whereas we focus on a sample of 16 transition countries over the period 1996-2006, Lanine and Vander Vennet's sample consists of CEEC only and covers the period 1995-2002. Furthermore, Lanine and Vander Vennet measure cross-border deals using their announcement date, while our measure is based on the date when the deal was completed.

It is clear that in most cases, the two-class model has the best fit as indicated by the lowest AIC values. The one-class model, corresponding to the simple logistic regression as used by Lanine and Vander Vennet (2007), provides the best fit in only one of the specifications. We therefore conclude that application of the one-class model can tell us little about the exact nature of the relationship between the observed bank acquisitions and their bank- and country-level determinants.

In what follows, we analyze the institutional and macroeconomic country characteristics that are likely to be conditioning this relationship. Unlike Lanine and Vander Vennet (2007), we use a more direct measure of bank efficiency in our testing strategy. For this purpose, we use the stochastic frontier methodology, according to which the efficiency of individual banks is identified by benchmarking their performance against a common frontier determined by the best-performing banks in the sample. We utilize the time-varying bank-specific efficiency scores (EFF) instead of the proxies employed by Lanine and Vander Vennet to test for the efficiency hypothesis (see Appendix 1 for further details). Unlike the cost-to-income ratio, the inefficiency score provides a direct measure of relative performance of the particular bank in comparison to its peers. In particular, it compares the actual level of bank cost to its optimal level (cost frontier) given the volume of output produced and input prices. The variables describing market power are the same as in Lanine and Vander Vennet, i.e., the logarithm of the bank's total assets (SIZE), and its share of loans (MS_D), and its share of deposits (MS_L).

3.2 Testing for differences between latent classes using an unconditional model

To identify different classes of banks, we run unconditional latent class logistic regressions using our measure of cost efficiency obtained from the stochastic frontier model (EFF) and three measures of market power (SIZE, MS_D, and MS_L). The AIC suggests that for all three specifications the best fit is obtained for the model with two classes. Table 6 contains the estimation results of the three unconditional latent class logit models.

[INSERT TABLE 6 ABOUT HERE]

In model (1), the distribution of all observations across the classes is 51% and 49%, respectively. The efficiency variable EFF is insignificant in both classes, while SIZE turns out to be significant and positive for the second class. The impact of EFF is not significantly different across classes, while the impact of SIZE is as indicated by the Wald test.

However, the SIZE variable is not a perfect indicator of target bank's market power since it is an absolute measure and it does not take into account the value of assets of peer banks. The other two indicators utilized in models (2) and (3) - the share of loans (MS_L) and deposits (MS_D) - are more precise. They are relative measures of two main outputs of banks as they take the outputs of peer banks into account.

The estimation results based on these two measures as shown in models (2) and (3) are quite similar. The sample is subdivided into two classes of the size of about 85% and 15% of the sample, respectively. In both models, the Wald test statistics are significant for all independent variables, implying that their effects differ significantly across the two classes.

To summarize, unconditional latent class estimation results based on a direct measure of banking efficiency suggest that there are two distinct classes of banks with contrasting results in terms of the cross-border bank acquisition determinants. Consequently, an interesting question arises to which extent certain country-specific characteristics of banks' home countries influences the likelihood of a bank being in one of the clusters or another. We address this issue in the next section, in which we add country-specific macro and institutional covariates to predict class membership.

3.3 Introducing country-specific class covariates - a conditional latent class logit model

To identify country-specific classes, we add three institutional variables and three macroeconomic variables as covariates into our latent class logistic specification.[9] As institutional covariates, we include the average of nine EBRD reform indices (EBRD), the average of the six Kaufman *et al*. (2007) governance indicators (KAUF), and the score of the country in terms of the economic freedom indicator of the Heritage foundation (HERIT). All indices have the advantage that they are time varying, which implies that they take into account the dynamics of institutional developments observed in these countries.

The macroeconomic variables utilized in our analysis include the real GDP growth rate (GDP_GR), the logarithm of real per capita GDP expressed in US dollars (GDP_PC), and the private sector share in GDP (PRIV). These variables indicate economic performance of the country (GDP_GR), its living standards (GDP_PC), and the role of the private sector in the economy (PRIV). Since these variables are directly related to the economic benefits foreign investors might expect after entering the country, they may affect the decision of foreign banks in terms of the motivation for their entry (either efficiency or market power).

[INSERT TABLE 7 ABOUT HERE]

Table 7 presents the estimation results for the conditional latent class logistic model. Lower AIC for all three models in comparison to the unconditional models lends support for the explanatory power added to the model by the inclusion of the latent class covariates. The distribution across the classes is less equal in comparison to the unconditional model (about 90% and 10%, respectively). When SIZE is used as a

[9] Like in the unconditional logit model, the Akaike information criteria indicate that the optimal number of classes is equal to 2, which confirms the presence of two distinct groups of banks with different characteristics in our sample.

measure of market power, the coefficients of the SIZE and EFF variables for the first class are insignificant. For the second class, the coefficient of EFF remains insignificant, but the SIZE coefficient is significant and negative. The significant Wald test statistic suggests that the impact of the market power indicator is significantly different across classes, which is not the case for the efficiency variable. These results suggest that when we measure market power based on the asset value of banks, both the market power and the efficiency hypotheses are rejected for banks clustered in the first class, and no evidence supporting the market power hypothesis is found for the second class. Further, our analysis shows that banks clustered in the first class are located in countries with lower economic freedom (negative and significant coefficient of HERIT) and weaker governance indicators (significant and negative coefficient of KAUF). Both class covariates are significantly different across classes at the 10% confidence level, as indicated by the Wald test statistic. The index of economic reforms (EBRD) does not have a significant impact. Also the macroeconomic variables do not significantly influence the distribution of the data across countries. These results are confirmed by the insignificant Wald test statistic.

The distribution across classes becomes stronger and qualitatively similar when the other two indicators of bank market power (MS_D and MS_L) are used in the estimations. In both models, the first class can be labeled as the "market power" class, since both the efficiency and market power variables are significant and positive. The picture is completely opposite for the second class (both variables are significant and negative), which can be termed the "efficiency" class. Similarly, the only significant country-specific characteristics conditioning the first class are the two institutional characteristics (economic freedom and governance), while the macroeconomic variables remain insignificant. These results suggest that for the majority of the sample (more than three quarters) foreign banks were targeting banks in transition economies with a high level of efficiency and a large share in the loan and deposit markets, which is in line to the results of Lanine and Vennet (2007). The former finding can also be explained in the vein of the "cream-skimming" effect discussed in Poghosyan and

Borovicka (2007), according to which foreign banks when entering the transition markets are targeting the best-performing banks.

However, for a smaller group of countries foreign investors followed a different entry strategy. For countries with a better institutional environment and significant progress in economic reforms, the primary motivation for the entry was to upgrade the efficiency of the acquired bank. Ignoring the existence of hidden classes and testing the competing hypotheses on a total sample might lead to a biased inference with respect to the motivation for foreign entry when one of the classes dominates another in size.

4. Conclusions

We analyze the microeconomic determinants of cross-border bank acquisitions in 16 transition economies over the period 1996-2006. By using a latent class discrete choice model we explicitly incorporate the macroeconomic and institutional heterogeneity of the transition economies into our analysis. Using macro and institutional characteristics of transition countries as latent class covariates, we find that foreign banks are targeting relatively large and efficient banks in transition economies with weak institutions, thus providing support for the market power hypothesis according to which banks are acquired with the objective to increase market power of the acquiring bank. However, when entering transition economies that have made progress in economic and institutional reform, foreign banks acquire relatively less efficient banks, supporting the efficiency hypothesis according to which banks are acquired with the objective of upgrading the efficiency of the target bank.

Our findings suggest that the concerns of Lanine and Vander Vennet (2007) regarding the limitations with respect to the commonly accepted view that foreign entry will contribute to the competitiveness and efficiency of banking systems in transition are only partially justified. We show that these concerns are not valid for a small subsample of target banks located in transition economies that have made significant progress in terms of institutional development and the restructuring of their economies. Foreign investors enter these countries with the aim of upgrading the efficiency of the

acquired bank and utilizing the unexploited profit opportunities. In contrast, foreign investors seem to be hesitant in entering transition countries lagging behind in terms of economic reforms. For this type of countries, foreigners pursue “cream-skimming” type of policies, aiming at acquiring better performing institutions with a high share in the domestic market. This strategy is less likely to contribute to further efficiency improvements in the domestic banking sector.

Appendix 1

Obtaining individual bank cost efficiency scores using the stochastic efficiency frontier model

Following a recent stream of the literature (e.g., Bonin *et al*., 2005; Fries and Taci, 2005; Poghosyan and Borovicka, 2007), we apply frontier analysis for modeling cost efficiency of banks in transition economies. For the stochastic cost frontier, we follow the modified production approach (see Berger and Humphrey, 1991) and use two types of bank outputs: total loans ($y_{1,it}$) and total deposits ($y_{2,it}$). The banks provide their services using two inputs, i.e., physical capital and labor. Accordingly, the price of physical capital is measured as a ratio of non-interest expenses to total assets ($w_{1,it}$), while the price of labor is proxied by the ratio of total personnel expenses to total assets ($w_{2,it}$). The production technology might also be influenced by the technological progress, for which we control by using a time trend (t). The dependent variable in the frontier is the total cost of a bank (c_{it}), which includes both interest and operating expenses. To account for the country-specific environmental characteristics that might have an impact on the bank's technology, we augment the frontier by introducing real GDP growth (GDP_GR), real GDP per capita in US dollars (GDP_PC), and the share of domestic credit in GDP (CRED) variables. The final translog specification for the cost function takes the following form:

$$\ln\frac{c_{it}}{w_{it,1}} = \alpha + \sum_{k=2}^{K}\beta_k \ln\frac{w_{it,2}}{w_{it,1}} + \sum_{l=2}^{L}\gamma_l \ln y_{it,l} + \frac{1}{2}\sum_{k=2}^{K}\sum_{l=2}^{K}\delta_{kl}\ln\frac{w_{it,k}}{w_{it,1}}\ln\frac{w_{it,l}}{w_{it,1}} +$$
$$+\frac{1}{2}\sum_{k=1}^{L}\sum_{l=1}^{L}\varphi_{kl}\ln y_{it,k}\ln y_{it,l} + \frac{1}{2}\sum_{k=2}^{K}\sum_{l=1}^{L}\theta_{kl}\ln\frac{w_{it,k}}{w_{it,1}}\ln y_{it,l} + \rho_1 t + \frac{1}{2}\rho_2 t^2 + \quad , \quad (6)$$
$$+\sum_{k=2}^{K}\rho^{w}{}_{k}\, t\ln\frac{w_{it,k}}{w_{it,1}} + \sum_{l=1}^{L}\rho^{y}{}_{k}\ln y_{it,l} + \psi_1 GDP\_GR + \psi_2 GDP\_PC + \psi_3 CRED + \nu_{it} + u_{it}$$

where *i* and *t* are bank and time indices, respectively. The linear homogeneity restrictions are satisfied by expressing all variables in terms of a ratio with respect to

one of the input prices, and inefficiency is modeled as a function of time using Battese and Coelli (1992) specification:

$$u_{it} = u_i^{\eta(t-T)}, \tag{7}$$

where u_i is the bank-specific inefficiency term that is assumed to have a non-negative truncated normal distribution with zero mean and variance σ^2_u, and T is the last period in the sample. The overall inefficiency of each individual bank, u_{it}, is varying over time at the exponential rate η to be estimated. The intuition behind this parameterization is that the inefficiency term is assumed to be monotonically increasing (positive and significantη), monotonically decreasing (negative and significantη) or neutral (insignificantη) over time. To estimate the model using a maximum likelihood method we additionally assume that the random error term, v_{it}, follows a normal distribution with zero mean and constant variance, σ^2_v.

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Table 1. Cross-border bank acquisitions in transition countries, 1996-2006

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	Total
AL	0	0	0	0	0	0	0	1	1	0	0	**2**
BA	0	0	0	0	0	0	0	0	0	2	0	**2**
BG	0	0	0	0	0	0	0	0	0	3	1	**4**
CZ	1	0	1	1	1	0	1	0	0	0	1	**6**
EE	0	1	0	1	1	0	0	0	0	0	0	**3**
HR	0	0	0	1	0	1	1	0	0	1	2	**6**
HU	0	0	0	1	0	0	0	1	0	0	0	**2**
LT	0	0	0	0	2	0	0	0	1	0	0	**3**
LV	1	0	0	1	1	0	1	0	1	1	1	**7**
ME	0	0	0	0	0	0	0	0	0	1	0	**1**
MK	0	0	0	0	2	1	0	1	0	0	0	**4**
PL	4	4	2	5	5	2	1	0	3	1	0	**27**
RO	0	0	0	0	1	0	1	1	1	0	3	**7**
RS	0	0	0	0	0	0	0	0	1	4	4	**9**
SI	0	0	0	2	0	1	1	1	0	0	0	**5**
SK	0	0	0	0	1	2	1	0	1	0	0	**5**
Total	**6**	**5**	**3**	**12**	**14**	**7**	**7**	**5**	**9**	**13**	**12**	**93**

Note: AL=Albania, BA=Bosnia and Herzegovina, BG=Bulgaria, CZ=The Czech Republic, EE=Estonia, HR=Croatia, HU=Hungary, LT=Latvia, LV=Lithuania, ME=Montenegro, MK = Macedonia, PL = Poland, RO = Romania, RS = Serbia, SI=Slovenia, SK=Slovakia.

Table 2. Data sources

Variable	Definition	Source
Cross-border bank acquisition	A dummy variable changing its value from 0 to 1 at the time when the acquisition took place	Thompson Financial
Bank financial indicators	Balance sheet items and income statements	Bankscope of Bureau van Dijk
Reforms	Indices ranging from 1 (worst) to 4 (best) and indicating the progress of reforms in the following nine areas: small- and large-scale privatization, enterprise reforms, price liberalization, forex and trade liberalization, competition policy, banking and non-banking sector reforms, reforms in infrastructure.	EBRD Transition Reports
Governance	Indices ranging from -2.5 (worst) to 2.5 (best) and indicating the progress of governance in following six areas: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law, control of corruption.	Kaufman *et al.* (2007)
Economic freedom	The score of the country based on its progress in terms of economic freedom in the following nine areas: business, trade, fiscal, government size, monetary, investment, financial, property rights and corruption.	Heritage Foundation
Macro data	Real GDP growth, GDP per capita (real, USD) and share of private sector in GDP.	World Bank World Development Indicators, EBRD

Table 3. Data used in the model of Lanine and Vander Vennet

Variable	Description	Formula
Profitability		
ROA	Return on assets (before taxes)	(Pre-tax profit)/(Total assets)
ROE	Return on equity (before taxes)	(Pre-tax profit)/(Total equity)
NIM	Net interest margin	(Net interest income)/(Earning assets)
Cost efficiency		
NIEXP	Non-interest expenses	(Non-interest expenses)/(Total assets)
CI	Cost-to-income ratio	(Total expenses)/(Total income)
Capital adequacy		
CAP	Capital adequacy ratio	(Total equity)/(Total assets)
Lending activity		
LTA	Net-loans-to-assets	(Net loans)/(Total assets)
Funding structure		
DEP	Deposit funding	(Total deposits)/(Total assets)
Size and market share		
SIZE	Size	Log(Total assets)
MS_L	Market share of net loans	Individual bank loans share in the total system loans
MS_D	Market share of total deposits	Individual bank deposits share in the total system deposits

Source: Bankscope of Bureau van Dijk.

Table 4. Descriptive statistics

	Mean	Median	St. Dev.	Min	Max	Skewness	Kurtosis
EFF	0.67	0.67	0.16	0.20	0.94	-0.36	2.50
SIZE	960,000	400,000	1,500,000	8,207	13,000,000	3.22	15.59
MS_D	6.59	2.76	11.14	0.00	100.00	3.65	19.75
MS_L	3.87	1.46	7.08	0.00	74.73	4.66	34.19
CI	72.66	67.52	36.81	11.73	528.43	5.09	45.44
NIEXP	5.72	4.57	4.85	0.28	92.40	6.79	97.02
ROE	8.10	9.67	29.86	-316.78	564.13	2.43	123.79
ROA	0.97	1.05	2.57	-31.95	15.92	-3.52	37.47
HERIT	0.76	0.75	0.35	0.08	1.43	0.03	1.88
EBRD	3.38	3.43	0.30	2.38	3.96	-0.64	3.10
KAUF	0.41	0.56	0.41	-0.67	1.05	-0.76	2.69
GDP_GR	0.04	0.04	0.03	-0.06	0.11	-0.59	4.72
GDP_PC	8.25	8.41	0.47	7.20	9.23	-0.50	3.18
PRIV	0.69	0.70	0.08	0.50	0.80	-0.13	1.90

EFF=cost efficiency of the bank, SIZE=total assets (in thousands of EUR), MS_D = share of bank deposits in total banking system deposits, MS_L = share of bank loans in total banking system loans, CI = cost to income ratio, NIEXP = non-interest expenses, ROE = return on equity, ROA = return on assets, HERIT = economic freedom index, EBRD = index of banking sector reforms, KAUF = governance index, GDP_GR = real GDP growth, GDP_PC = per capita GDP (in thousands of USD), PRIV = private sector share in the economy.

Table 5. Testing for the presence of latent classes using Akaike information criteria

	Models											
Classes	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**
1	535.5	535.9	537.2	523.6	**528.2**	529.5	543.9	543.6	544.6	526.7	526.6	527.9
2	532.7	**522.6**	**519.9**	523.0	534.4	**528.7**	**522.4**	**518.1**	**519.6**	**519.1**	**517.3**	**523.0**
3	**529.2**	524.7	524.7	522.0	533.2	538.7	523.2	518.9	522.1	524.7	521.8	527.5
4	536.2	531.7	531.6	**521.1**	539.2	534.5	531.5	526.4	525.3	537.6	529.6	535.2

Note: numbers in bold indicate minimum values of Akaike information criteria for models up to for classes. Dependent variable is the bank acquisition dummy (aff). Models range from 1 to 12 depending on the explanatory variables as follows:

(1) aff = f(SIZE, CI)
(2) aff = f(MS_D, CI)
(3) aff = f(MS_L, CI)
(4) aff = f(SIZE, NIEXP)
(5) aff = f(MS_D, NIEXP)
(6) aff = f(MS_L, NIEXP)
(7) aff = f(SIZE, ROE)
(8) aff = f(MS_D, ROE)
(9) aff = f(MS_L, ROE)
(10) aff = f(SIZE, ROA)
(11) aff = f(MS_D, ROA)
(12) aff = f(MS_L, ROA)

Table 6. Unconditional latent class models

	Model 1			Model 2			Model 3		
	Class-1	**Class-2**	**Test of equality (p-value)**	**Class-1**	**Class-2**	**Test of equality (p-value)**	**Class-1**	**Class-2**	**Test of equality (p-value)**
Constant	-1.8	**23.7**	0.0180	**0.8**	**33.1**	0.0004	**0.9**	**14.9**	0.1200
EFF	-4.0	5.3	0.3451	**-3.9**	**39.0**	0.0000	**-3.9**	**17.2**	0.0000
SIZE	-0.2	**1.3**	0.0230	--	--	--	--	--	--
MS_D	--	--	--	**-0.1**	**0.9**	0.0002	--	--	--
MS_L	--	--	--	--	--	--	**-0.1**	**0.6**	0.0037
Statistics									
Class size	0.51	0.49		0.85	0.15		0.84	0.16	
AIC	651.1		--	639.3		--	645.2		--
R2	0.04	0.09	--	0.03	0.89	--	0.03	0.67	--

Note: numbers in bold indicate significance at 10% confidence level. Test of equality is a Wald test on the null hypothesis that coefficients in different classes are equal.

Table 7. Conditional latent class models

	Model 1			Model 2			Model 3		
	Class-1	**Class-2**	**Test of equality (p-value)**	**Class-1**	**Class-2**	**Test of equality (p-value)**	**Class-1**	**Class-2**	**Test of equality (p-value)**
Constant	**4.9**	**-13.2**	0.0190	**3.7**	**-8.6**	0.0000	**3.8**	**-9.1**	0.0000
EFF	0.5	-16.7	0.2200	**1.6**	**-27.2**	0.0130	**1.9**	**-27.9**	0.0004
SIZE	0.1	**-0.7**	0.0260	--	--	--	--	--	--
MS_D	--	--	--	**0.0**	**-0.4**	0.0001	--	--	--
MS_L	--	--	--	--	--	--	**0.0**	**-0.6**	0.0003
Covariates									
Constant	-38.6	--	0.3407	-30.1	--	0.2700	-27.8	--	0.3300
HERIT	**-37.7**	--	0.0350	**-4.3**	--	0.0270	**-4.1**	--	0.0300
EBRD	10.0	--	0.2310	4.2	--	0.2900	3.7	--	0.3600
KAUF	**-16.4**	--	0.0001	**-11.1**	--	0.0003	**-10.9**	--	0.0008
GDP_GR	11.6	--	0.9500	9.2	--	0.5600	9.5	--	0.5500
GDP_PC	10.1	--	0.1665	2.3	--	0.2200	2.1	--	0.2600
PRIV	17.0	--	0.1201	11.4	--	0.2900	12.1	--	0.2500
Statistics									
Class size	0.94	0.06	--	0.91	0.09	--	0.92	0.08	--
AIC	520.6		--	521.9		--	521.9		--
R2	0.0029	0.4040	--	0.0057	0.7223	--	0.0050	0.7335	--

Note: numbers in bold indicate significance at 10% confidence level. Test of equality is a Wald test on the null hypothesis that coefficients in different classes are equal.

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