

Information Sharing and Bank Entry Mode: Evidence from Europe

Caterina GIANNETTI¹ Nicola JENTZSCH² Giancarlo SPAGNOLO³

October 14, 2010

Abstract

Information asymmetries may limit cross-border banking and affect bank entry mode, concentration and competition. This paper investigates how different forms of information sharing influence banks' decision how to enter a foreign market and the possible effects of this decision on that market. We build a new time-series cross-section data set for the EU-27 countries including detailed information on public and private credit registers and on the type of borrower information shared (positive, negative) between 1990 and 2007. Our results suggest that both types of registers increase the share of entry through branches relative to M&As, but that public registers have a slightly stronger effect than private ones. Public registers also appear to reduce bank concentration and improve competition indicators more consistently than private ones.

Keywords: credit registries, foreign entry, asymmetric information.

JEL Classification: F37, G21, G34, L13, O16.

¹*Corresponding author.* GSBC Jena. Email: caterina.giannetti@uni-jena.de

²DIW Berlin, Technische Universität Berlin. Email: njentzsch@diw.de

³University of Rome Tor Vergata, SITE Stockholm, EIEF. Email: giancarlo.spagnolo@uniroma2.it

The authors thank the European Credit Research Institute (ECRI) for research funding and Maria Gerhardt, Paul-Ugo Jean, and Marc Rothmund for excellent research assistance. Further, we would like to thank participants at the ACLE Conference (Amsterdam), 8th INFINITI Conference (Dublin), 16th Conference on Panel Data (Amsterdam), Econometric Society World Congress (Shanghai) for comments and suggestions, and the members of the European System of central banks, especially the national Central Banks, for providing us with statistical information.

1 Introduction

Asymmetric information on bank customers can constitute a severe barrier to entry for banks. This barrier could be overcome through mergers and acquisitions (M&As): rather than opening local branches or a subsidiary, a bank can enter by buying a pre-existing local bank with all its information on local clients. M&As, however, do not add additional market players as do other forms of bank entry (Claeys and Hainz (2007)). By influencing the preferred entry mode, information sharing has the potential to also affect bank market structure and competition. This paper is an attempt to empirically identify these possible effects in connection to the presence of credit registers and to the type of information these collect and make available.

Although credit registers have received more attention in recent research, there is still a remarkable lack of understanding of their impact on the international expansion strategies of banks and on banking industries. Public registers and private credit bureaus (henceforth we use the term ‘credit registers’ for both types of institutions) collect and distribute millions of profiles on individuals and companies in the European credit markets.

The focus here is on how the introduction, existence and design of public and private credit registers impact on banks preferred entry mode. Our main hypothesis is that were insufficient information sharing exist, the preferred mode of entry is M&A which allows access to the information pool on local borrowers in the target bank. Once there is adequate operation of either a public or private register, branching becomes more attractive as exogenous information asymmetries are lowered, which may make host markets less concentrated and more competitive.

To test this hypothesis we put together a new data set on the EU-27 countries for the years 1990-2007, which combines information on credit reporting systems and market entry by banks through M&As and branching. This time series cross-section data set allows us to conduct a difference-in-difference analysis to better understand what impact the establishment of credit registers has on banks’ mode of entry in a country, and which type of information exchange is needed in order to facilitate cross-border branching relative to M&As.

Using both univariate and multivariate analysis we find evidence that the establishment of a public credit register has a significant positive impact on cross-border branching and on its share of bank entry relative to M&As, but has no pronounced effects on M&As. Additionally, the introduction of a public register seems to reduce bank concentration, net interest margins and returns on equity, especially in highly concentrated markets.

The results for the establishment of private credit bureaus are a bit more ambiguous. We find a slightly positive effect on the share of entry through branches and on total cross-border branching when negative information is shared, and negative effects on net interest margins which are more pronounced when positive information is shared.

Theoretical analyses highlighted several ways in which information sharing through credit registers may contribute to credit market performance. With credit registers exogenous information asymmetries are reduced, borrower discipline is increased, and moral hazard as well as credit rationing decline (e.g. Jappelli and Pagano (1993); Padilla and Pagano (1997, 2000)). The intertwining of entry, market structure and information asymmetries in the banking industry has also been intensively studied, though not directly in relation to information sharing (e.g. Dell’Ariccia et al. (1999); Dell’Ariccia (2001); Hauswald and Marquez (2006); Claeys and Hainz (2007) and Sengupta (2007)). Our main hypothesis can be seen as following directly from these studies.

On the other hand, Lehner (2009) recently showed in a model of differentiated bank competition with entry costs that stronger asymmetric information may favour entry through branches over M&As; and Bouckaert and Degryse (2004, 2006) and Gehrig and Stenbacka (2007) showed that information sharing may be used strategically by banks to deter entry and reduce competition. This contrast makes the test of our hypothesis interesting also from a theoretical point of view.

Finally, since we consider the type of information shared, our work is also related to Van Cayseele et al. (1995) who analyzed at the equilibrium market structure with either positive or negative information sharing, finding that in the case of negative information fewer banks tend to enter with more outlets.

On the empirical side, several analyses of the determinants of banks’ choice to go abroad emphasize the role of corporate taxes, lower regulatory restrictions, inefficiencies occurring in local banks as well as bank-specific variables and greater profit opportunities (see e.g. Hryckiewicz and Kowalewski (2008); Buch and Lipponer (2007); Berger et al. (2004); Focarelli and Pozzolo (2001)). Other studies stressed the role of advantages in processing information due to greater use of technology and specialized skills (Claessens and van Horen (2008); Claeys and Hainz (2007)). In our multivariate regressions we integrate as controls the most important determinants of bank entry identified by this literature (see Buch and DeLong (2008) for a review).

Closely related to our work are studies of the effects of credit bureaus and of banks’ modes of entry. On the effects of credit bureaus, recent evidence shows that they are associated with an increase in bank lending, a reduction in bank risk, an increase in credit availability and a reduction of the cost of credit for firms (Jappelli and Pagano (2002); Jentzsch (2007b); Brown et al. (2009), and Houston et al. (2010)). It has also been shown that credit registers and legal creditor rights protection are partly substitutes in facilitating credit, and that credit registries help curbing corruption in bank lending (Djankov et al. (2007) and Barth et al. (2009) respectively).

Some empirical studies on bank entry mode have focused on the choice between branches

and subsidiaries (which include both greenfield investment and M&As), finding - among other things - that subsidiaries are preferred when the host country is large and offers higher profit opportunities and lower taxes (Focarelli and Pozzolo (2005, 2008) and Cerutti et al. (2007)). Claeys and Hainz (2007) have compared greenfield investments to M&As finding that the first mode of entry reduces interest rates relative to the second. Bofondi and Gobbi (2006) have looked at the interaction of informational barriers and market entry in local Italian markets, finding that default rates are lower for banks that enter opening local branches rather than lending from outside of the local market.

Our contribution is across to these strands of literatures, as we focus on how information asymmetries and their reduction through credit registers affect bank entry mode, and through this local market structure and outcomes. To address information asymmetries and market outcomes we compare branches with M&As rather than with subsidiaries, since the latter include both greenfield investments and M&As which have opposite informational implications and effects on market structure.¹ Finally, we recently became aware of the simultaneous and independent work by Tsai et al. (2010) that looks at the expansion strategies of the top 100 multinational banks, though not at the effects on local markets. They find opposite results than ours, as private rather than public registers appear associated with higher bank entry rates. They also analyze the effects on banks' entry mode finding mixed results: private and not public credit registers are associated with a higher share of entry through branches, but when the quality of the information shared is high private credit bureaus foster entry through subsidiaries. The different results appear mainly driven by the very different data sets studied, and perhaps by the different econometric methodology.² However, their study focuses on subsidiaries, which include both M&As and greenfield investments, so it is not obvious how to interpret their findings in terms of informational barriers and credit registers and how to compare them with ours.

The remainder of the paper is organized as follows: Section 2 discusses the development of credit registers in Europe, Section 3 presents the data set (variable definitions and summary of the data), and Section 4 discusses the determinants of bank entry modes and the (univariate and multivariate) interaction of credit registers and entry modes as well as competition indicators.

¹As for branches, and opposite to M&As, entry through a greenfield investment establishing a new subsidiary does not buy local information for the entrant and adds a new player to the local market.

²In their data set host countries are very heterogeneous, the US - which has no public register - and countries with poor public sector management play an important role, and information on credit registers is only available for four years (for the other two years considered data are discretionally imputed). We study instead a very long panel for EU-27 markets with detailed information on credit registers, a rather homogeneous sample of countries, a high average quality of institutions and public sector management, excluding the US.

2 Credit Bureaus in Europe

In the past decades, credit registers have evolved very differently across European countries, with some countries ending having now both types of registers (public and private) and others having only one of the two.

Public credit registers are typically owned by the central bank and are part of the supervisory and reporting structure. They are used for off-site bank supervision or compilation of statistics and as of today exist in 14 countries of our sample. The majority of them has been established in the 1990s, except for the German central credit register (Evidenzzentrale fuer Millionenkredite) which has existed since 1934.

Private credit bureaus, on the other hand, are for-profit institutions which now exist in all Member States, at least according to our broad definition that includes business and consumer reporting agencies, some of which conduct both activities. They are typically voluntary information exchanges with reporting thresholds for loans below the ones of public registers. In commercial lending, they are used for creditworthiness assessment and on-going borrower monitoring. They are now an integral part of the retail lending process, where credit scores are also used in downstream securitization. Many of the private credit bureaus were founded in the 1990s and 2000s, although earlier establishments were founded in Sweden (1890) and Germany (1927).³

Both types of institutions can hold information on companies and individuals. So far, there has been no harmonization of credit reporting systems in Europe and differences continue to exist in terms of reporting thresholds and data types collected. Table (1) presents the situation in terms of existence of credit registers as well as types of information collected as of 2009. The only cross-border exchange of credit information between registers takes place among a sub-group of public credit registers and mainly on legal persons (i.e. businesses).

INSERT Table 1 here.

Variety also exists in the types of information shared. Positive information covers contractually compliant behavior and includes information about types of credit, outstanding amounts of loans and repayment patterns in general. Negative information consists of statements about defaults or arrears and bankruptcies. In France, Denmark, Finland, Latvia, Malta, and Spain only negative information is collected on individuals (as of 2008). In other countries, both positive and negative information is collected and distributed (examples are United Kingdom, Germany and Ireland).

³Development, regulation and institutional design of credit reporting systems are discussed in Jappelli and Pagano (1993, 2003) and Jentzsch (2007b,a). A recent overview has also been published by the European Commission (DG Internal Market and Services 2009).

At the European level, credit registers are subject to the EU Data Protection Directive (Directive 95/46/EC) and the Consumer Credit Directive (Directive 2008/48/EC). At the national level, they are regulated either by bank laws or the central bank act as well as data protection laws. The concern that private credit bureaus could be used for discrimination of foreign banks trying to enter a market is reflected in the Consumer Credit Directive, where it is held in Article 9 that each Member State should ensure that *‘in the case of cross-border credit (...) access for creditors from other Member States to databases used in that Member State for assessing the creditworthiness of consumers (...) shall be non-discriminatory.’*

Lastly, the diversity of credit reporting systems in Europe has attracted the attention of DG Competition of the European Commission. In its Retail Banking Sector Inquiry of 2006, the Commission held that three key aspects were relevant with respect to such systems: unfair and discriminatory access conditions for foreigners, partial information sharing and regulatory barriers. For instance, barriers of international access to the register could exist, if an entity must have a physical presence in the country or comply with reciprocity principles in order to access the credit register.

3 The Data

Empirical research on information sharing and bank competition has not kept pace with theoretical work, but there is now a noticeable trend to greater sophistication in terms of data sets and econometric techniques used.

Many studies use data from the World Bank’s Survey on Credit Registers, which has been compiled from 1999 on and is now partially integrated in the Doing Business Database. One of our contributions is that we present a new data set. A main advantage of our data set is the cross-sectional time series character with respect to credit registers and bank entry mode. Our empirical analysis uses data from the World Bank, the Heritage Foundation, the ECB, the SDC Platinum database and the European Credit Research Institute (ECRI). In the following, we explain our data collection strategy, the main variables used in the empirical investigation, and the summary statistics.

Together with ECRI we have collected data on credit bureaus in the EU-27 countries including detailed information on the major market players (excluding niche credit bureaus), the year when they started to operate in the market and what data items they store. Table (2) presents the variables included in the data set and then used in our econometric analysis with descriptions and data sources.

INSERT Table 2 here.

For example, a private credit bureau is defined as a company that collects and distributes

credit information on consumers and/or businesses. In addition, we collected information on public credit registers from the national central banks. In order to capture the type of the information shared (positive or negative), we applied the definitions of the Report of the EU Expert Group on Credit Histories (2009) constructing four indicators: POSITIVE_PRIV, NEGATIVE_PRIV, POSITIVE_PUB, NEGATIVE_PUB.

POSITIVE_PRIV and POSITIVE_PUB are equal to 2 if a private credit bureau (PRIV), or a public register (PUB), reports positive information for both consumers and firms, 1 if it reports positive information either for consumers or firms, and 0 if it does not provide positive information. Similarly, NEGATIVE_PRIV and NEGATIVE_PUB are equal to 2 if a private credit bureau or a public register reports negative information for both consumers and firms, 1 if the register reports negative information either for consumers or firms, and 0 if the registers does not provide negative information. Table (3) reports correlation among these variables.

INSERT Table 3 here.

Except for POSITIVE_PUB (that reflects almost the same variability of the public register dummy), these variables seem to provide different information on the structure of credit reporting systems. To obtain a variable on more mature credit reporting markets, we construct a variable (SECOND) to map the year of the introduction of the second large private bureau in each country. In competitive credit reporting markets, the effects of information sharing might be more pronounced than in monopoly systems. We also collected information on the number of the largest private credit bureaus in each country (NO_CREDIT_BUREAU) to have an indicator of the structure of the private credit reporting industry.

To assess how foreign banks enter new markets, together with ECRI we collected data on foreign bank activity in each of the EU-27 banking markets. We took into account the number of branches of foreign banks, and the number of mergers and acquisitions per year from 1990-2007. The data on branches were obtained from national central banks and the ECB Statistical Data Warehouse.

To measure entry through branches for each country and year, and to make it comparable with entry through M&As, we differentiated the total number of branches over two consecutive periods. In case of a negative variation, we assume zero entry. We are aware that this way of proceeding might not give the exact numbers, but two reasons justify this choice: firstly, when using total branches variation (i.e. net entry through branches) we know the direction of the potential bias, i.e. underestimating the role of information sharing in fostering direct entry; secondly, if we had compared the total number of branches with the total number of foreign subsidiaries, we would have also mistakenly captured some entry through greenfield investments. In any case, we have performed various analyses relying on different measures and estimators to check the robustness of our indicators. Information on M&As is taken from

the SDC Platinum database.

In order to capture intervening variables that could be of importance, we used information on legal origin, per-capita GDP, inflation, and population (from the IMF), as well as information on concentration of (the largest) banks and bank performance indicators (from the World Bank), and an index of the overall economic freedom (from the Heritage Foundation).

A country's legal origin has proven to be an important determinant for creditor rights (Djankov et al. (2007); La Porta et al. (1998)). In particular, Djankov et al. (2007) find a strong legal origin effect on credit market institutions with common law countries exhibiting a sharply higher number of creditor rights than French civil law ones. By introducing such a variable, therefore, we can account for heterogeneity among country credit markets induced by origin of commercial law. We have four legal origins: French, English, German, and Scandinavian. As in Djankov et al. (2007), we classify the Baltic and East European countries according to their pre-World War II law.⁴

The macroeconomic variables we have chosen will account for market features, such as market size (population) and monetary stability (inflation), that might influence bank entry mode in a country. More precisely, we expect that better macroeconomic conditions would make stronger commitments (i.e, entry through branches) less risky. The Heritage Foundation index, which is the average of 10 scored economic freedoms (such as fiscal freedom, financial and banking freedom, government size), we aim to capture a country's institutional environment.

Our (unbalanced) dataset covers 27 Member States of the European Union, over 18 years, ranging from 1990 to 2007.⁵ The countries in our sample can be subdivided in Member States prior to the enlargement (in 2004) and New Member States, thereafter indicated with EU-15 and New-EU.⁶

INSERT Table 4 here.

Table (4) presents pooled summary statistics of the main variables used in the econometric analysis. Tests for the mean, computed for each year (not reported), suggest that there are significant differences among the two subgroups of countries concerning our indicators on the type of information shared by private bureaus, POSITIVE_PRIV and NEGATIVE_PRIV, whereas the differences on the information shared by public registers, POSITIVE_PUB and

⁴Latvia has German civil law, Lithuania is influenced by the French law, whereas the former communist countries - with the exception of Romania following the French legal tradition - follow the German legal tradition.

⁵The European Union comprises the following 27 countries: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, and United Kingdom.

⁶The New Member States are Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

NEGATIVE_PUB, either tend to disappear over time or are never significant. There are instead significant differences in the number of private registers, which also tend to disappear towards the end of the sample.

Concerning bank entry mode, tests for the mean do not evidence significant differences among the EU-15 and New-EU subgroups of countries, especially for the variable measuring entry through branches, and towards the end of the sample. As regards the banking sector performance, banks in the New-EU sample have on average higher returns than EU-15 banks (slightly on ROA, ROE, and significantly on NIM), whereas a clear pattern cannot be identified when looking at cost indicators (overhead costs and costs over income). The amount of domestic credit provided by the banking sector (over GDP) is significantly higher in EU-15, while there are no significant differences in the main bank concentration index (CR3). No significant differences exist in terms of population size, however, there are significant differences in per-capita GDP (*p_gpd*) and inflation indicators.

4 Empirical Models and Results

In this section, we study the effects of the characteristics of credit reporting systems on bank entry mode, concentration and competition indicators for the banking sector performing univariate and multivariate analyses. We further check the robustness of our results performing various regressions taking into account the nature of our dependent variable (i.e. limited dependent variable).

4.1 Impact of Credit Reporting: Univariate Methodology

Relying on univariate difference-in-differences analysis, some preliminary insights on the impact of credit reporting on bank entry mode, market structure and competition can be obtained. We focus on variations in the share of entry through branches and various indicators of market concentration and competition. To measure the share of entry into foreign markets through branches, we compute the share of branches in the following way:

$$Entry_ratio = Tot\ BranchEntry / (Tot\ Branch\ Entry + Tot\ M\&A\ Entry). \quad (1)$$

In (1), the total for cross-border entry in the parenthesis consists of the total number of cross-border mergers and cross-border entry through branches. In order to measure variations in the market structure before/after the introduction of a credit register, we rely on the sum of market shares of the three largest banks (CR3) as an indicator of market concentration. Indices of market structure do not always capture the degree of competition in banking markets (see Claessens and Laeven (2004)), therefore, we use as proxy indicators of competition bank net interest margins (NIM), returns on assets (ROA) and equity (ROE), and bank

overhead costs over total assets as well as costs over income.

To perform a difference-in-differences analysis, two groups of countries have to be identified: a treatment and a control group. The treatment group comprises countries that introduced either a private credit bureau or a public register in the period of the analysis that is from 1990 to 2007. To capture maturity in private credit reporting markets, we use the introduction of the second private bureau in each country. This exercise will capture the effect of an increase in competition in the credit reporting industry besides that of an increase in the degree of information sharing.

To study the effect of credit registers on the share of entry through branches we further split the sample in *low* and *high*-concentration country group according to the value of the CR3 (CR3>/<60%). As a matter of definition, we assume that markets with a CR3 above 60% are highly concentrated.⁷ We then compare the difference before/after the introduction of a credit register for the two groups of countries using the high-concentration group of countries as a "control group". By doing so, we remove biases that could be the result of permanent differences between countries that are related to the level of concentration. We expect a positive difference-of-differences, that is, less entry through branches after the introduction of credit registers in more highly concentrated markets.

Assume that $\Delta Entry_ratio(i) = Entry_ratio(i, after) - Entry_ratio(i, before)$ is the change in the average of the *Entry_ratio* in country *i* after the introduction of a credit register, and $\overline{\Delta Entry_ratio}(low_conc)$ be the average of the change in entry ratio in the low-concentration group of countries. The same can be computed for the high-concentration group. The average effect of an information-sharing institution is equal to the difference of the change in the mean of the two country groups, that is

$$Average\ Effect = \overline{\Delta Entry_ratio}(low_conc) - \overline{Entry_ratio}(high_conc). \quad (2)$$

In (2) the average difference over time in the high-concentration group is subtracted from the average difference in the low-concentration group to remove biases associated with a common trend as well as bias associated with systematic differences in concentration between the two groups.

To investigate the effects of the introduction of a credit register on the concentration index CR3, similarly to Djankov et al. (2007) the control group is composed of countries that did not introduce a public register in a five-year window around the year of the introduction in the treated country.⁸ For a country introducing a private bureau we follow the same procedure. We chose this specification because if the control group comprises countries that ‘never

⁷We also tried a threshold of 50%, as well as the value of the index in year t-1, without qualitative changes in results.

⁸For instance, Bulgaria introduced a public register in 1998. The control group comprises all countries that did not introduce a public register from 1993 to 2003.

introduced a credit register in the same time window', the sample is considerably reduced. Further, the five-year time window allows comparability with Djankov et al. (2007) results and to control for serial correlation (Bertrand et al. (2004)). However, we check results for different control-group and time-window specification, and results do not change qualitatively.

More precisely, let $\Delta CR3(i) = CR3(i, after) - CR3(i, before)$ be the change in the average share of the main banks in country i in a five-year window around the year of the reform in the treated country, and let $\Delta CR3(treated)$ be the average of the change in CR3 in the treated country group. The same can be computed for the control group. Obviously, $\Delta CR3(control, i)$ can be computed for each country that introduced a register. Similarly, let $\Delta \overline{CR3}(control)$ be the average change in CR3 in the overall group of countries that did not introduce a register during the five-year window around t . In this case, the average effect of an information-sharing institution is equal to

$$Average\ Effect = \Delta \overline{CR3}(treated) - \Delta \overline{CR3}(control). \quad (3)$$

In (3) the average difference over time in the control group is subtracted from the average difference in the treatment group to remove biases associated with a common trend unrelated to the introduction of a register as well as bias associated with systematic differences that are constant within the two groups.

4.2 Univariate Results

The results from the univariate difference-in-difference analysis are consistent with the hypothesis that the introduction of a credit register has an impact on the cross-border entry mode of banks. Table (5) reports the average effects on branches share, separately for public and private registers, where countries have been grouped according to high and low level of concentration.

INSERT Table 5 here.

After the introduction of a public credit register, we can observe a significant increase in the share of entry through branches in countries with a low level of market concentration (+12% significant at 5% level). Also, the difference between high and low concentration countries is positive and significant (+24% significant at 1% level). To see whether there are any differences related to the accession to the European Union, we additionally present results for the new EU Members only.

A similar pattern can be observed for the introduction of a private credit bureau (see also Table 5). In this case, we can observe a positive effect on entry through branches (+20% significant at 10% level) in case the sample comprises all countries. There is even a greater positive effect when it comprises New Member States only (+52% significant at 5% level). These preliminary results suggest that there is more entry through branches after the introduction of

a credit register in countries with a low level of concentration.⁹

INSERT Table 6 here.

The important role of a public register is confirmed in Table (6), where we analyze the variation in the concentration index CR3. To check robustness, we additionally allowed only new EU Members as control group. After the introduction of a public register, a significant reduction in the share of the three largest banks is observable. The average effect is -12% (significant at 1%-level), when the control group consists of EU-27. And it is -12% (significant at 1%-level), when using only New Member States in the control group. For private credit bureaus the direction of the effect is analogous (although not significant).

INSERT Table 7 here.

Table (7) reports the average effect on different indicators of performance, which are by and large consistent with the hypothesis of intensification of competition after the introduction of a credit register. The measures for profitability are expected to decline (ROA, ROE) as well as the net interest margin (NIM) and cost indicators (overhead, costinc). Although the impact of a private credit bureau on market structure may not seem strong, competition appears intensified, especially in highly concentrated markets. For example, after the introduction of a private bureau, there are indications of significant reductions in net interest margins (-1.8%), ROE (-5.9%) and ROA (-0.08%), particularly in highly concentrated markets. Cost indicators also decline, as it happens in particular in New Member States. A similar pattern can be observed for public credit registers.

In general, these descriptive results suggest that both types of credit registers may have an impact, not only on bank entry modes, but also on market structure and competition. For more sophisticated analysis, however, we have to control for a set of variables and take care of econometric problems such as country heterogeneity. In the next section, we present some more refined econometric estimations.

4.3 Multivariate Analysis: Methodology

We now turn to the investigation of the effects of credit reporting systems on bank entry mode, market structure and competition in a richer econometric framework. A multivariate regression approach allows us to control for the effects of many other independent variables that could as well impact on the dependent variable. These variables comprise traditional controls, such as legal origin or inflation, as well as specific indicators that we have constructed on the type of information shared by a credit register.

⁹The results do not arise because we observed more mergers in higher concentrated markets or because of the way we compute our indicators. In fact, by looking separately at entry through branches and mergers (results not reported), we can also observe an absolute number of mergers that is higher in low-concentrated markets compared to highly concentrated markets (the reverse is true for branches).

We study the effects of different features of credit reporting systems on entry through branches, and separately on mergers, in each country and year, as well as on the share of branches in total entry. Next, we present the impact of credit reporting systems on bank competition as measured by the NIM variable. To study bank entry mode and take into account country heterogeneity, we rely on a random coefficient Poisson model. This approach allows us to address the dependence of the observations at different levels, while taking into account that the dependent variable of the model is a non-negative integer. More precisely, the model is obtained by specifying the expected number of branches (μ_{it}^{Branch}) or the expected number of mergers ($\mu_{it}^{M\&A}$) in country i in year t , with a private bureau ($\zeta_{1i} \sim N(0, \psi^1)$) and public register ($\zeta_{2i} \sim N(0, \psi^2)$) random slope, and a random intercept for years ($\zeta_t \sim N(0, \theta)$). The random component ζ_{1i} and ζ_{2i} are shared across all years by country i , whereas ζ_t is shared by all countries in year j .

Formally,

$$\begin{aligned}
\ln(\mu_{it}) &= \beta_1 \cdot \text{PRIVATE_BUREAU}_{it} + \beta_2 \cdot \text{PUBLIC_REGISTER}_{it} + \beta_3 \cdot X_{it} + \zeta_{1i} \cdot \text{PRIVATE_BUREAU}_{it} + \\
&\quad \zeta_{2i} \cdot \text{PUBLIC_REGISTER}_{it} + \zeta_t \\
&= (\beta_1 + \zeta_{1i}) \cdot \text{PRIVATE_BUREAU}_{it} + (\beta_2 + \zeta_{2i}) \cdot \text{PUBLIC_REGISTER}_{it} + \beta_3 \cdot X_{ij} + \zeta_t.
\end{aligned} \tag{4}$$

$\text{PRIVATE_BUREAU}_{it}$ in (4) is equal to 1 in years after the introduction of a private credit bureau (in country i in year t) and $\text{PUBLIC_REGISTER}_{it}$ is equal to 1 in the years after the introduction of a public register. X_{ij} is a vector of other variables reflecting the characteristics of a country's credit reporting system. Specifically, X_{ij} contains a dummy variable equal to 1 in years after the introduction of the second private bureau (denoted as `SECOND`), the number of private credit bureaus (`NO_PRIVATE_BUREAU`), and four indicators summarizing different aspects of information sharing: `POSITIVE_PRIV`, `NEGATIVE_PRIV`, `POSITIVE_PUB`, `NEGATIVE_PUB`.

The variable `SECOND` maps the introduction of a second large private credit bureau, and is introduced to be in line with the univariate difference-in-differences analysis, where we use it to account for more mature credit reporting markets. The four indicators summarize the type of the information shared, whereas the number of private bureaus should capture the degree of competition/structure in the private bureau market (see above section 3).

INSERT Table 8 here.

Table (8) and (9) report results for the random Poisson model for the total entry through branches and mergers in each country.

INSERT Table 9 here.

The best way to interpret these estimations is to form intervals within which 95% of slopes

are expected to lie, and to interpret coefficients as *incidence rate ratio* ($exp(\beta)$) for a unit increase of X_i . An incidence rate greater than 1 suggests a positive effect, whereas a rate lower than 1 suggests a negative effect (Rabe-Hesketh and Skrondal (2008)). The effect of private bureau is variegated. Private bureaus appear to have a negative effect on branches. However, this result turns positive when negative information is shared. For example, in column *b*, the coefficient on the introduction of a PRIVATE_BUREAU only, sharing negative information on consumers and firms is equal to $exp(\beta_1 * PRIVATE_BUREAU \pm 1.96 \cdot sd(PRIVATE_BUREAU) + \beta_3 \cdot (NEGATIVE_INFO = 2))$, that is $exp(-1.456 \pm 1.96 \cdot 0.012 + .761 * 2)$, and the effect of the introduction of a private credit bureau is expected to lie between 1.044 and 1.094, meaning 4.4% and 9.4% in terms of branches. Contrary to Tsai et al. (2010) the overall effect of a public register is in most cases positive and significant, especially when positive information is shared (see Table 8).

For mergers, on the other hand, in line with Tsai et al. (2010), the effect of a public register sharing positive information does not appear to be significant. The overall effect of private credit bureaus is positive and significant, although a negative impact arises from the introduction of a private bureau sharing negative information. The coefficient on the variable mapping the number of major private credit bureaus (although not significant) also suggests that the greater the number of major bureaus, the lower the number of cross-border bank mergers.

Results are confirmed by adding other country control variables, with the only exception of the number of major private bureaus variable. Other controls are country legal origin of commercial laws (German, French, English, and Scandinavian) and a country's per-capita GDP, inflation and population (see columns b in the different Tables).

Most of the controls have the expected direction of the effect associated with them. Interestingly, they are significant in the Poisson regression for mergers. Greater and more developed markets (an incidence rate ratio greater than 1 for population and *p_gdp*) are associated with a greater number of mergers, whereas worse macroeconomic conditions (such as a greater level of inflation) are associated with a lower number of mergers. Finally, to account for a country's institutional environment we add in columns c of the different Tables, the Index of Economic Freedom and domestic credit provided by the banking sector as percentage ratio of GDP. Despite obtaining a smaller sample (the Index is available only from 1995 on), results are practically unchanged. One would perhaps have expected a positive effect of the freedom variable, which we do not find in the case of branches.

To study the effects of credit reporting systems on the share of branches in this multivariate setting we estimate a random Tobit model, which takes into account that the dependent variable - the share of entry through branches - is a censored variable (that is partly continuous with a positive probability mass at zero and one). Table (10) presents results for the Tobit

Model.

INSERT Table 10 here.

Reported estimations are the average of marginal effects. These regressions suggest a positive role of private credit bureaus on the share of entry through branches (overall the effect of a credit bureau is positive and significant).

In this multivariate analysis we also studied the effect of credit reporting systems on net interest margins (NIM). We chose to present results on this indicator instead of the CR3, because it is a good proxy for competition and raises fewer econometric issues.¹⁰ Table (11) presents regressions with country fixed-effects and time dummies.

INSERT Table 11 here.

These results suggest that the introduction of a second credit bureau fosters competition in the banking sector as net interest margins decline. The same is true for the establishment of public credit registers, which share positive and negative information, and for a private credit bureau sharing positive information.

To check for the robustness of our results we rely on a fractional model for panel data for the share of branches in total entry. In recent years, several empirical studies explained fractional response variables. For example, Hausman and Leonard (1997) applied fractional logit to panel data on television ratings of National Basket Association games; and Wagner (2003) analyzes a large set of firms to explain the export-sales ratio. In both papers, firm-specific intercepts are included in regressions, without suffering from an incidental parameters problem. In Hausmann and Leonard, there is no incidental parameters problem as long as T grows large ($T \rightarrow \infty$), whereas in Wagner such strategy is possible as long as the entire population is observed. As in our panel the time dimension is relative large, we follow Hausmann and Leonard, by estimating a fractional logit model including fixed-effects in the regressions.¹¹ The average of marginal effects is reported in Table (12).

INSERT Table (12).

The results basically confirm our previous ones in Tab (10) which shows an overall positive effects of private bureaus, especially when negative information is shared, whereas no strong effects emerge for the introduction of a public register.

¹⁰The CR3 indicator is a fractional (bounded) variable, which is hard to handle in a TSCS setting. Recently, Papke and Wooldridge (2008) propose an estimator for fractional response variables for panel data set with a large cross-sectional dimension and relatively few time periods. However, this estimator is not suitable for our data set, which has a large time dimension. See also below.

¹¹We acknowledge, however, that is not yet studied how to handle fractional response variables with time series cross-section data, where the value of time observations, T , is rather high in relation to the number of units N . In this respect, one usually distinguishes TSCS data from panels found in microeconomic applied analysis, which are characterized by a large N and small T as estimators for panel data can induce problems when applied to TSCS data (Beck and Katz (1995)).

5 Conclusions

Financial market integration and a level playing field in competition among banks has been a major objective in policy making in Europe in the past decades. Therefore, an answer to the question how credit registers affect international entry pattern appears to be long overdue. In this paper, we study whether the presence of credit registers (public and private) impacts on bank entry mode in Europe. Additionally, we look at the effects of credit registers on indicators of banking market concentration and competition. We constructed a novel data set that exploits the differences in credit reporting systems across EU-27 Member States over the years 1990-2007. Univariate differences-in-difference analysis shows that public credit registers increase the proportion of entry through branches, have a significant negative effect on market concentration (CR3), and contribute to the intensification of competition (measured by different indicators). These latter effects appear more pronounced for highly concentrated markets or in the New Member States. Private credit bureaus, on the other hand, do not show significant effects on market structure, though just as in the case of public registers, they positively contribute to the share of bank entry through branching. There are also indications that they may also contribute to intensification of competition, particularly for highly concentrated markets and New Member States. In the multivariate analysis, we applied different econometric estimation procedures to account for the time-series cross-country characteristic of the data and the different types of information shared. We found that once we account for a selection of other influence factors, the establishment of a public credit register in our specifications maintains a significant positive impact on cross-border branching, but not on cross-border M&As, and it reduces net interest rate margins (our proxy for competition) for all types of information shared. The picture for private credit bureaus is more ambiguous. We find a positive effect on cross-border branching and a negative one for cross-border mergers for a private credit bureau sharing negative information. However, we do obtain negative significant effects on net interest margins for a private bureau sharing positive information, and for the introduction of the second bureau in the market. Contrary to the case of public register, it seems to be more important what type of information is exchanged through private credit bureaus, which are typically a voluntary information sharing mechanism (such that not all lenders in a country participate). Taken together, our results suggest that the introduction of credit bureaus tends to facilitate cross-border entry through branches and thereby make national banking markets more contestable. In particular, our analyses suggest the important role of a public register, for all the types of information shared, and for a private credit bureau sharing negative information. Results for a private bureau sharing positive information are more mixed and deserve further investigation. Countries that would like to strengthen competition in the banking sector, therefore, could consider setting up a public credit register. There are only 14 countries in Europe that currently have such regis-

ters. Also, from a financial stability point of view and for off-site bank supervision purposes, these registers are considered to be useful (this is the usually the main reason why they are introduced by central banks). The slightly more ambiguous effects of private bureaus also suggests that policy-makers may have to ensure that the information they share is complete and up-to-date, and that these registers are not used in a discriminatory way to the detriment of foreign banks. A number of open questions about the empirical effects of credit registers on banking remain. For instance, in some theoretical works it is suggested that banks could strategically use credit registers to deter direct entry. This, however, would only be possible for private credit bureaus, as the exchange through a public credit register is mandatory and deviant behavior of participants would be sanctioned by the central bank. Also, private bureaus have limited incentives to sanction violations, because of their conflicts of interest (as banks are not only reporting institutions, but also their clients). Future research could contribute to a better understanding of the horizontal and vertical relations that arise from credit reporting and whether they can be used to strategically decrease the quality of market access for competitors. Also, the possibility to facilitate prudential regulation and monitoring of systemic risk by using credit registers ought to be better analyzed in the face of the current crisis. Improved data collection by European policy makers on credit registers is essential to enable a better informed discussion about their (empirical) effects.

References

- Barth, J. R., Lin, C., Lin, P., Song, F. M., 2009. Corruption in bank lending to firms: Cross-country micro evidence on the beneficial role of competition and information sharing. *Journal of Financial Economics* 91 (3), 361 – 388.
- Beck, N., Katz, J., 1995. What to do (and not to do) with time-series cross-section data. *American Political Science Review* 89 (10), 634–647.
- Beck, T., Demirguc-Kunt, A., Levine, R., 1999. A new database on financial development and structure. Tech. Rep. 2146, The World Bank.
- Berger, A. N., Buch, C. M., DeLong, G., DeYoung, R., 2004. Exporting financial institutions management via foreign direct investment mergers and acquisitions. *Journal of International Money and Finance* 23 (3), 333–366.
- Bertrand, M., Duflo, E., Mullainathan, S., 2004. How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics* 119 (1), 249–275.
- Bofondi, M., Gobbi, G., 2006. Informational barriers to entry into credit markets. *Review of Finance* 10 (1), 39–67.
- Bouckaert, J., Degryse, H., 2004. Softening competition by inducing switching in credit markets. *Journal of Industrial Economics* 52 (1), 27–52.
- Bouckaert, J., Degryse, H., 2006. Entry and strategic information display in credit markets. *Economic Journal* 116 (513), 702–720.
- Brown, M., Jappelli, T., Pagano, M., 2009. Information sharing and credit: Firm-level evidence from transition countries. *Journal of Financial Intermediation* 18 (2), 151–172.
- Buch, C. M., DeLong, G. L., 2008. Banking globalization: International consolidation and mergers in banking. IAW Discussion Papers 38, Institut für Angewandte Wirtschaftsforschung (IAW).
- Buch, C. M., Lipponer, A., 2007. FDI versus exports: Evidence from German banks. *Journal of Banking & Finance* 31 (3), 805–826.
- Cerutti, E., Dell’Ariccia, G., Martinez Peria, M. S., 2007. How banks go abroad: Branches or subsidiaries? *Journal of Banking & Finance* 31 (6), 1669–1692.
- Claessens, S., Laeven, L., 2004. What drives bank competition? Some international evidence. *Journal of Money, Credit and Banking* 36, 563–583.

- Claessens, S., van Horen, N., 2008. Location decisions of foreign banks and institutional competitive advantage. DNB Working Papers 172, Netherlands Central Bank, Research Department.
- Claeys, S., Hainz, C., 2007. Acquisition versus greenfield: The impact of the mode of foreign bank entry on information and bank lending rates. Working Paper Series 210, Sveriges Riksbank (Central Bank of Sweden).
- Dell’Ariccia, G., 2001. Asymmetric information and the structure of the banking industry. *European Economic Review* 45 (10), 1957–1980.
- Dell’Ariccia, G., Friedman, E., Marquez, R., 1999. Adverse selection as a barrier to entry in the banking industry. *The RAND Journal of Economics* 30 (3), pp. 515–534.
- Djankov, S., McLiesh, C., Shleifer, A., 2007. Private credit in 129 countries. *Journal of Financial Economics* 84, 299–329.
- Expert Group on Credit Histories, 2009. Report available at. Tech. rep.
 URL http://ec.europa.eu/internal_market/consultations/docs/2009/credit_histories/egch_report_en.pdf
- Focarelli, D., Pozzolo, A. F., 2001. The patterns of cross-border bank mergers and shareholdings in OECD countries. *Journal of Banking & Finance* 25 (12), 2305–2337.
- Focarelli, D., Pozzolo, A. F., 2005. Where do banks expand abroad? an empirical analysis. *Journal of Business* 78 (6), 2435–2464.
- Focarelli, D., Pozzolo, A. F., 2008. Cross-border m&as in the financial sector: Is banking different from insurance. *Journal of Banking & Finance* 32 (1), 15–29.
- Gehrig, T., Stenbacka, R., 2007. Information sharing and lending market competition with switching costs and poaching. *European Economic Review* 51 (1), 77–99.
- Hausman, J. A., Leonard, G. K., 1997. Superstars in the national basketball association: Economic value and policy. *Journal of Labor Economics* 15 (4), 586–624.
- Hauswald, R., Marquez, R., 2006. Competition and strategic information acquisition in credit markets. *Review of Financial Studies* 19 (3), 967–1000.
- Houston, J. F., Lin, C., Lin, P., Ma, Y., 2010. Creditor rights, information sharing, and bank risk taking. *Journal of Financial Economics* 96 (3), 485 – 512.
- Hryckiewicz, A., Kowalewski, O., 2008. Economic determinants and entry modes of foreign banks into Central Europe. SSRN eLibrary.

- Jappelli, T., Pagano, M., 1993. Information sharing in credit markets. *Journal of Finance* 48 (5), 1693–1718.
- Jappelli, T., Pagano, M., 2002. Information sharing, lending and defaults: Cross-country evidence. *Journal of Banking & Finance* (10), 2017–2045.
- Jappelli, T., Pagano, M., 2003. Public credit information: A european perspective. In: *Credit Reporting Systems and the International Economy*. MIT Press, Margaret Miller (ed.), pp. 81–115.
- Jentzsch, N., 2007a. Do we need a european directive for credit reporting? CESifo DICE Report, 48–54.
- Jentzsch, N., 2007b. *Financial privacy: an international comparison of credit reporting systems*. Berlin, Heidelberg, New York: Springer.
- La Porta, R., de Silanes, F. L., Shleifer, A., Vishny, R. W., 1998. Law and Finance. *Journal of Political Economy* 106 (6), 1113–1155.
- Lehner, M., 2009. Entry mode choice of multinational banks. *Journal of Banking & Finance* 33 (10), 1781 – 1792.
- Padilla, A. J., Pagano, M., 1997. Endogenous communication among lenders and entrepreneurial incentives. *Review of Financial Studies* 10 (1), 205–236.
- Padilla, A. J., Pagano, M., 2000. Sharing default information as a borrower discipline device. *European Economic Review* 44 (10), 1951–1980.
- Papke, L., Wooldridge, J. M., 2008. Panel data methods for fractional response variables with an application to test pass rates. *Journal of Econometrics* 145, 121–133.
- Rabe-Hesketh, S., Skrondal, A., 2008. *Multilevel and longitudinal modeling using Stata (Second Edition)*. Stata Press.
- Sengupta, R., 2007. Foreign entry and bank competition. *Journal of Financial Economics* 84 (2), 502–528.
- Tsai, H., Chang, Y., Hsiao, P., 2010. What drives foreign expansion of the top 100 multinational banks? the role of credit reporting system. *Journal of Banking and Finance*.
- Van Cayseele, P., Bouckaert, J., Degryse, H., 1995. Credit market structure and information-sharing mechanisms. In: *Market evolution: competition and cooperation*. Kluwer Academic Publishers, A. van Witteloostuijn, pp. 129–145.
- Wagner, J., 2003. Unobserved firm heterogeneity and the size-exports nexus: Evidence from German panel data. *Review of World Economics* 139, 161–172.

Table 1: OVERVIEW OF PUBLIC AND PRIVATE CREDIT REGISTERS IN EUROPE

Country	Public Credit Register (PCR)	PCR Neg Info	PCR Pos Info	Credit Bureau* (CB)	CB Neg Info	CB Pos Info
Austria	yes	no	yes	yes	yes	yes
Belgium	yes	yes	yes	yes	n/a	n/a
Bulgaria	yes	..	..	yes	..	..
Cyprus	no	n/a	n/a	yes	yes	yes
Czech Republic	yes	yes**	yes**	yes	yes	yes
Denmark	no	n/a	n/a	yes	yes	no
Estonia	no	n/a	n/a	yes	yes	yes
Finland	no	n/a	n/a	yes	yes	no
France	yes	yes	no	yes	n/a	n/a
Germany	yes	no**	yes**	yes	yes	yes
Greece	no	n/a	n/a	yes	yes	yes
Hungary	no	n/a	n/a	yes	yes	no
Ireland	no	n/a	n/a	yes	yes	yes
Italy	yes	yes	yes	yes	yes	yes
Latvia	yes	yes	yes	yes	yes	yes
Lithuania	yes	yes	yes	yes	yes	no
Luxembourg	no	n/a	n/a	yes	..	..
Malta	no	n/a	n/a	yes	yes	no
Netherlands	no	n/a	n/a	yes	yes	yes
Portugal	yes	yes	yes	yes	yes	yes
Poland	no	n/a	n/a	yes	yes	yes
Romania	yes	..	..	yes	yes	yes
Slovakia	yes	yes	yes	yes	yes	yes
Slovenia	yes	yes	yes	yes	..	..
Spain	yes	yes	yes	yes	yes	yes
Sweden	no	n/a	n/a	yes	yes	yes
United Kingdom	no	n/a	n/a	yes	yes	yes

*Broad definition, includes business reporting and consumer reporting. Luxembourg is served from companies located outside of the country. 'Neg' denotes negative information, 'Pos' denotes positive information for consumer or mortgage loans to households. '..' denotes 'no information'. 'n/a' denotes 'not applicable'. ** Only on legal entities. Source: DG Internal Market and Services (2009) and Jentzsch (2007a).

Table 2: VARIABLE DESCRIPTION

Variable	Description
Branch	The number of branches of foreign credit institutions in each EU-27 Member State for the period of 1990-2007. A branch is an unincorporated entity established by a company legally incorporated in another country. It has no independent legal status and is wholly owned by its parent company. Source: own compilation from national authorities and the ECB Statistical Warehouse.
Mergers and acquisitions (M&A)	This variable identifies the number of mergers and acquisitions per year (1990-2007). Domestic and cross-border M&A are taken into account separately. Source: SDC Platinum database.
Private bureau	The variable indicates the existence of a private credit bureau between 1990 and 2007. It equals 1 in case a bureau is operating, 0 otherwise. Depending on national legislation, private bureaus may store positive and negative information. Source: ECRI.
Public credit register	The variable indicates the existence of a public credit register between 1990 and 2007. It equals 1 in case a public register is operating, 0 otherwise. Public registers are mostly established at a country's Central Bank or supervisory authority, and store credit information on consumers and companies. Source: ECRI.
Negative_Priv and Negative_Pub	Negative information in general consists of statements about defaults or arrears and bankruptcies (i.e. facts of contractual non-compliant behaviour). It may also include statements about lawsuits, liens and judgments that are obtained from courts or other official sources. The indicating variables are Negative_Priv and Negative_Pub, respectively. Negative_Pub (Negative_Priv) is equal to 2 if a private credit bureau (a public register), reports negative information for both consumers and firms, equal to 1 if the register reports negative information either for consumers or firms, and equal to 0 if it does not provide negative information. Information covers 1990-2007. Source: ECRI.
Positive_Priv and Positive_Pub	Positive information covers facts about contractually compliant behaviour. It consists of detailed statements about outstanding types of credit, amount of loans and repayment patterns. The indicating variables are Positive_Priv and Positive_Pub, respectively. Positive_Priv (Positive_Pub) is equal to 2 if a private credit bureau (a public register) reports positive information on both consumers and firms, to 1 if it reports positive information either on consumers or firms, and to 0 if they do not provide positive information. Information covers 1990-2007. Source: ECRI.
No_Private_Bureau	The number of the dominant (largest) private credit bureaus in each country. Source: ECRI.
CR3	The three largest banks' assets to total banking sector assets (Beck et al. (1999)) Source: Beck et al. (1999), World Bank.
Return on assets (ROA)	Bank net income over total assets. For most countries, this information spans from 1990-2007. Source: Beck et al. (1999), World Bank.
Return on equity (ROE)	Bank net income over equity. For most of the countries in the sample, this information spans from 1990-2007. Source: Beck et al. (1999), World Bank.
Net interest margin (NIM)	Is the difference between bank interest income and the amount of interest paid out to deposits relative total assets. For most of the countries in the sample, this information spans from 1990-2007. Source: Beck et al. (1999), World Bank.
Overhead	Bank overhead costs over total assets. Source: Beck et al. (1999), World Bank.
Costinc	Bank costs over income. Source: Beck et al. (1999), World Bank.
p_gdp	Country per capita gdp measured at current price Source: IMF.
Population	Country population. Source: IMF.
Inflation	Average consumer prices (Annual percent change). Source: IMF.
Legal origin	A dummy variable that indicates the origin of each country's Company law or Commercial code, which may be of English, French, German, Nordic or Socialist origin. Source: Djankov et al. 2007) and the CIA World Factbook 2008.
Credit_Bank	The amount of domestic credit provided by the banking sector over GDP. Source: World Bank.
Overall Freedom	It is a simple average of 10 scored economic freedoms: business freedom, trade freedom, fiscal freedom, government size, monetary freedom, investment freedom, financial freedom, property rights freedom from corruption, labour freedom. Information covers 1995-2007. Source: Heritage Foundation.

Table 3: CORRELATION AMONG CREDIT-REGISTER VARIABLES

	PRIVATE_BUREAU	PUBLIC_REGISTER	SECOND	POSITIVE_PRIV	NEGATIVE_PRIV	POSITIVE_PUB	NEGATIVE_PUB	NO_PRIVATE_BUREAU
PRIVATE_BUREAU	1							
PUBLIC_REGISTER	.29550625	1						
SECOND	.72368838	.40833356	1					
POSITIVE_PRIV	.62665217	.39705262	.65674522	1				
NEGATIVE_PRIV	.79425825	.23741512	.69751489	.69054779	1			
POSITIVE_PUB	.27573988	.93311014	.38102018	.45053829	.25668087	1		
NEGATIVE_PUB	.22977167	.77755267	.31750085	.2581224	.09755316	.70477372	1	
NO_PRIVATE_BUREAU	.57703166	.34120662	.68245187	.80428468	.66214212	.37364914	.15915106	1

Table 4: SUMMARY STATISTICS

Variable	Mean	(Std. Dev.)	Min.	Max.	N
branches	1.202	(2.087)	0	26	391
mergers	2.593	(3.539)	0	24	486
PRIVATE_BUREAU	0.877	(0.329)	0	1	486
PUBLIC_REGISTER	0.383	(0.487)	0	1	486
SECOND	0.788	(0.409)	0	1	486
POSITIVE_PRIV	1.206	(0.723)	0	2	486
NEGATIVE_PRIV	1.492	(0.706)	0	2	486
POSITIVE_PUB	0.644	(0.877)	0	2	486
NEGATIVE_PUB	0.504	(0.824)	0	2	486
NO_PRIVATE_BUREAU	3.167	(2.062)	0	9	486
p_gdp	19.893	(10.688)	4.636	79.66	474
inflation	0.144	(0.646)	-0.011	10.612	469
population	18.196	(22.172)	0.35	82.540	474
CREDIT_BANK	91.052	(48.919)	11	280	463
OVERALL_FREEDOM	65.597	(7.472)	42.9	82.600	342
NIM	0.035	(0.023)	0.006	0.217	450
ROA	0.008	(0.013)	-0.102	0.079	448
ROE	0.099	(0.128)	-0.711	1.06	448
overhead	0.034	(0.02)	0.002	0.119	451
costinc	0.682	(0.191)	0.183	1.8	449
English	0.148	(0.356)	0	1	486
French	0.37	(0.483)	0	1	486
German	0.37	(0.483)	0	1	486
Scandinavian	0.111	(0.315)	0	1	486

Table 5: EFFECTS ON BRANCHING AFTER THE INTRODUCTION OF A CREDIT REGISTER

% BRANCHES	N	Before	N	After	After-Before ΔBranches
<i>All countries</i>					
Low Concentration	49	0.18	42	0.30	0.12**
High Concentration	130	0.46	82	0.34	-0.12**
Difference		-0.28***		-0.04	0.24***
<i>New Members</i>					
Low Concentration	16	0.14	10	0.25	0.11*
High Concentration	61	0.44	32	0.30	-0.14**
Difference		-0.30***		-0.05	0.25*
Private Bureau					
<i>All countries</i>					
Low Concentration	16	0.16	75	0.25	0.09
High Concentration	28	0.51	184	0.40	-0.11
Difference		-0.35***		-0.15***	0.20*
<i>New Members</i>					
Low Concentration	15	0.10	50	0.30	0.20***
High Concentration	2	0.75	117	0.43	-0.32
Difference		-0.65		-0.13**	0.52**

This table reports the average effects (*difference-in-differences*) of the introduction of a credit register on the share of entry through branches. The low-concentration group comprises countries with a CR3 index below 60%, whereas the high-concentration group comprises countries above this threshold.

Table 6: EFFECTS ON CR3 AFTER THE INTRODUCTION OF A CREDIT REGISTER

CR3	N	Before	N	After	After-Before ΔCR3
Public Register					
Treated	36	0.76	34	0.65	-0.11***
Control EU27	341	0.69	282	0.70	0.01
Difference		-0.07***		-0.05	-0.12***
Control New EU	136	0.72	87	0.73	0.01
Difference		0.04**		-0.08	-0.12***
Private Bureau					
Treated	31	0.77	57	0.74	-0.03
Control EU27	285	0.69	288	0.71	0.02*
Difference		0.08**		0.03***	-0.05
Control New EU	128	0.69	89	0.71	0.02
Difference		0.08**		0.06**	-0.05

The treatment group comprises countries that introduce either a *private credit bureau* or a *public register* in the period from 1990 to 2007. The control group is made up of countries that did not introduce a private credit bureau or a public register in a five-year window around the year of the reform in the treated country.

Table 7: COMPETITION INDICATORS BEFORE-AFTER THE INTRODUCTION OF A CREDIT REGISTER

Indicator	Concentration	ΔIndicator	
		EU 27	New EU
Private Bureau			
NIM	Low Conc	0.014**	-0.066**
	High Conc	-0.018***	-0.005
	Diff of Diff	0.032***	-0.061***
ROE	Low Conc	-0.027*	0.036
	High Conc	-0.059***	-0.042*
	Diff of Diff	0.031	0.078
ROA	Low Conc	0.01**	0.080
	High Conc	-0.008***	-0.010***
	Diff of Diff	0.019***	0.090***
Overhead	Low Conc	0.013**	-0.066**
	High Conc	0.002	0.015***
	Diff of Diff	0.011*	-0.081***
Costinc	Low Conc	0.115***	0.016
	High Conc	0.136	0.193***
	Diff of Diff	-0.021	-0.177***
Public Register			
NIM	Low Conc	0.003	-0.017***
	High Conc	-0.007***	-0.010***
	Diff of Diff	0.010***	-0.007
ROE	Low Conc	-0.0199*	-0.027
	High Conc	-0.034**	-0.014
	Diff of Diff	0.014	0.041
ROA	Low Conc	0.001	0.009
	High Conc	-0.004***	-0.004**
	Diff of Diff	-0.021	0.013***
Overhead	Low Conc	0.0016	-0.021***
	High Conc	0.0017	0.005
	Diff of Diff	-0.0001	-0.026***
Costinc	Low Conc	0.105***	-0.111
	High Conc	0.102***	0.108
	Diff of Diff	0.003	-0.219***

This table reports the average effects (*difference-in-differences*) of the introduction of a credit register on the net interest margin (NIM), return on equity (ROE), return on asset (ROA), overhead costs over total assets and costs over income. Countries have been grouped according to high (>60%) and low level of concentration (<60%).

Table 8: ESTIMATION RESULTS RANDOM POISSONDEPENDENT VARIABLE: BRANCHES

	a	b	c
PRIVATE_BUREAU	-1.9783*** (0.396)	-1.4557*** (0.467)	-1.8502*** (0.599)
PUBLIC_REGISTER	-1.7788** (0.907)	-2.0413** (1.009)	-1.3531 (0.989)
SECOND	0.2925 (0.299)	-0.0074 (0.321)	0.4727 (0.433)
POSITIVE_PRIV	0.3369** (0.164)	0.3094* (0.171)	0.2782 (0.208)
NEGATIVE_PRIV	0.7127*** (0.205)	0.7614*** (0.232)	0.9480*** (0.276)
POSITIVE_PUB	0.9597** (0.386)	1.0764*** (0.412)	0.7310* (0.438)
NEGATIVE_PUB	0.0919 (0.376)	0.2197 (0.433)	0.1133 (0.354)
no_PRIVATE_BUREAU	-0.0402 (0.070)	0.0267 (0.088)	-0.0108 (0.101)
p_GPD		0.0067 (0.009)	0.0287** (0.013)
Inflation		-0.0065 (0.089)	-0.0337 (0.104)
Population		-0.0071 (0.007)	-0.0024 (0.008)
English		-0.4266* (0.234)	
French		-0.2947 (0.209)	0.0281 (0.311)
German		-0.0839 (0.261)	0.1350 (0.352)
Scandinavian			0.2444 (0.301)
CREDIT_BANK			0.0008 (0.002)
OVERALL_FREEDOM			-0.0332** (0.016)
Constant	0.0327 (0.200)	-0.4046 (0.415)	0.6323 (1.040)
sd(time)	0.5615	0.5297	0.5835
sd(PRIVATE_BUREAU)	0.1255	0.0117	0.0317
sd(PUBLIC_REGISTER)	0.8756	1.1003	0.7817
cov(PRIVATE_BUREAU,PUBLIC_REGISTER)	0.99	0.99	1
ll	-628.2662	-556.0019	-436.4759
N	391	383	308

* p<0.10, ** p<0.05, *** p<0.01

All random effect parameters are simultaneously significant

Table 9: ESTIMATION RESULTS RANDOM POISSONDEPENDENT VARIABLE: MERGERS

	a	b	c
PRIVATE_BUREAU	0.2552 (0.349)	0.1475 (0.362)	0.2109 (0.413)
PUBLIC_REGISTER	0.3055 (0.371)	-0.0075 (0.447)	-0.6773 (0.778)
SECOND	1.0373*** (0.245)	0.8902*** (0.250)	0.5587 (0.354)
POSITIVE_PRIV	0.4470** (0.198)	0.3997** (0.188)	0.1344 (0.191)
NEGATIVE_PRIV	-0.3991** (0.168)	-0.3179* (0.163)	-0.4490*** (0.172)
POSITIVE_PUB	0.1815 (0.197)	-0.0277 (0.192)	0.0807 (0.297)
NEGATIVE_PUB	-0.0025 (0.179)	-0.0793 (0.186)	-0.0069 (0.304)
no_PRIVATE_BUREAU	-0.0257 (0.046)	-0.0605 (0.046)	0.0235 (0.059)
p_GDP		0.0203** (0.009)	0.0046 (0.011)
Inflation		-0.8177** (0.343)	0.0538 (0.119)
Population		0.0202*** (0.006)	0.0319*** (0.008)
English		-0.1830 (0.488)	
French		0.8753** (0.428)	1.2941*** (0.366)
German		0.4515 (0.449)	1.2621*** (0.367)
Scandinavian			0.6028 (0.416)
CREDIT_BANK			0.0014 (0.002)
OVERALL_FREEDOM			0.0425*** (0.012)
Constant	-0.6546*** (0.195)	-1.2606** (0.565)	-4.0437*** (0.876)
sd(time)	0.3630	0.3820	0.4426
sd(PRIVATE_BUREAU)	0.8388	0.5655*	0.3630
sd(PUBLIC_REGISTER)	0.0280	0.5003	1.0844
cov(PRIVATE_BUREAU,PUBLIC_REGISTER)	0.0001	0.4423	0.0002
ll	-972.2869	-934.9379	-661.0947
N	486	469	335

* p<0.10, ** p<0.05, *** p<0.01

All random effect parameters are simultaneously significant

Table 10: TOBIT ESTIMATION RESULTS DEPENDENT VARIABLE % BRANCHES

	a	b	c
PRIVATE_BUREAU	-0.5585*	-0.7278*	-1.1516**
	(0.315)	(0.392)	(0.494)
PUBLIC_REGISTER	-0.4394	-0.1073	-0.0183
	(0.442)	(0.404)	(0.408)
SECOND	0.0193	-0.0991	0.1362
	(0.269)	(0.264)	(0.343)
POSITIVE_PRIV	-0.0288	-0.1606	-0.1658
	(0.176)	(0.152)	(0.166)
NEGATIVE_PRIV	0.5260***	0.3818**	0.5492***
	(0.181)	(0.181)	(0.204)
POSITIVE_PUB	0.1439	0.1344	0.1095
	(0.206)	(0.173)	(0.183)
NEGATIVE_PUB	0.0957	0.1012	0.1139
	(0.148)	(0.145)	(0.146)
no_PRIVATE_BUREAU	-0.0395	0.0311	0.0224
	(0.058)	(0.069)	(0.074)
p_GDP		-0.0002	0.0173*
		(0.006)	(0.009)
Inflation		0.0915	0.0568
		(0.080)	(0.082)
Population		-0.0053	-0.0057
		(0.004)	(0.004)
English		0.6710**	1.6235*
		(0.287)	(0.830)
French		0.2930	1.0573
		(0.301)	(0.746)
German		0.3719	1.2258
		(0.295)	(0.779)
Scandinavian		0.7940**	1.6610**
		(0.342)	(0.773)
CREDIT_BANK			0.0003
			(0.002)
OVERALL_FREEDOM			-0.0211
sigma_u			
Constant	0.2549**	0.1018	0.0000
	(0.101)	(0.147)	(0.180)
sigma_e			
Constant	0.8459***	0.8162***	0.8163***
	(0.067)	(0.065)	(0.071)
ll	-309.1181	-298.0917	-235.7769
N	307	304	250

* p<0.10, ** p<0.05, *** p<0.01

Note: Estimations are average of marginal effects.

Table 11: FE-ESTIMATION RESULTS FOR NET INTEREST MARGIN (NIM)

DEPENDENT VARIABLE: NIM

	a	b	c
PRIVATE_BUREAU	-0.0112** (0.004)	-0.0133*** (0.005)	0.0031 (0.006)
PUBLIC_REGISTER	0.0283*** (0.006)	0.0346*** (0.006)	0.0397*** (0.007)
SECOND	-0.0263*** (0.003)	-0.0209*** (0.003)	0.0018 (0.006)
POSITIVE_PRIV	-0.0061* (0.003)	-0.0071** (0.003)	-0.0008 (0.003)
NEGATIVE_PRIV	0.0015 (0.003)	0.0031 (0.003)	-0.0068** (0.003)
POSITIVE_PUB	-0.0096*** (0.003)	-0.0027 (0.003)	-0.0143*** (0.003)
NEGATIVE_PUB	-0.0262*** (0.003)	-0.0312*** (0.003)	-0.0226*** (0.004)
no_PRIVATE_BUREAU	-0.0002 (0.001)	0.0002 (0.001)	-0.0006 (0.001)
p_gdp		0.0008*** (0.000)	0.0006** (0.000)
inflation		0.0091*** (0.001)	0.0049*** (0.001)
population		-0.0003 (0.001)	-0.0003 (0.001)
CREDIT_BANK			-0.0001** (0.000)
OVERALL_FREEDOM			-0.0005** (0.000)
Constant	0.0782*** (0.005)	0.0494** (0.025)	0.0758** (0.031)
ll	1391.224	1422.371	1128.96
N	450	446	333

* p<0.10, ** p<0.05, *** p<0.01

Note: Regressions include year and country dummies.

Table 12: FRACTIONAL LOGIT ESTIMATOR: DEPENDENT VARIABLE % BRANCHES

	a	b	c
PRIVATE_BUREAU	-3.9237** (1.838)	-4.3126** (1.771)	-1.9426 (1.760)
PUBLIC_REGISTER	-2.9405* (1.632)	-2.9397* (1.712)	-1.5033 (2.030)
SECOND	-0.9551 (0.722)	-0.6267 (0.657)	1.1991 (1.831)
POSITIVE_PRIV	0.0717 (0.991)	0.0007 (0.838)	0.1494 (0.989)
NEGATIVE_PRIV	1.6709* (0.918)	2.0056** (1.006)	1.6285* (0.961)
POSITIVE_PUB	0.2917 (0.662)	0.5563 (0.751)	-1.2102 (0.905)
NEGATIVE_PUB	0.6424 (0.557)	0.6192 (0.574)	1.3730 (0.941)
no_PRIVATE_BUREAU	-0.0222 (0.231)	-0.0092 (0.241)	-0.1440 (0.274)
p_gdp		0.1248 (0.109)	0.0422 (0.110)
inflation		-0.0433 (0.128)	-0.2073 (0.150)
population		0.1822 (0.303)	0.2990 (0.362)
English		-17.1454 (19.530)	-21.2736 (24.193)
French		-4.2789 (7.607)	-7.8610 (9.701)
German		-2.9312 (5.293)	0.6812 (7.767)
Scandinavian		-4.5582 (4.936)	-3.2581 (6.878)
CREDIT_BANK			-0.0214** (0.009)
OVERALL_FREEDOM			0.0088 (0.062)
ll	-137.6162	-135.3527	-105.9065
N	307	304	250

* p<0.10, ** p<0.05, *** p<0.01