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Information Sharing and Cross-border Entry in European Banking

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Abstract

Information asymmetries can severely limit cross-border border expansion of banks. When a bank enters a new market, it has incomplete information about potential new clients. Such asymmetries are reduced by credit registers, which distribute financial data on bank clients. We investigate the interaction of credit registers and bank entry modes (in form of branching and M&A) by using a new set of time series cross-section data for the EU-27 countries. We study how the presence of public and private credit registers and the type of information exchanged affect bank entry modes during the period 1990-2007. Our analysis shows that the existence of both types of registers increases the share of branching in the overall entries. Additionally, the establishment of public registers reduces concentration ratios, and some banking competition indicators (such as overhead costs/assets). The introduction of a private credit bureau, on the other hand, has no effect on concentration ratios, but positively contributes to competition (by decreasing interest rate margins). This suggests that credit registers facilitate direct entry through a reduction of information asymmetries, which in turn intensifies competition.

Keywords: credit registries, foreign entry, asymmetric information.

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

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1 Introduction

Asymmetrically distributed information on bank customers can constitute a severe barrier for a bank to enter a foreign retail banking market. Compared to the incumbent banks, the entrant has an informational disadvantage with respect to the potential risk of new clients. This disadvantage may force a bank to enter through merger and acquisition (M&A) to obtain access to a local pool of information on bank clients. Such an entry mode, however, does not necessarily lead to intensified competition, as it does not even add an additional market player. Institutions that reduce information asymmetries such as credit registers can encourage entry through branches and may be important for the strengthening of competition in retail banking. This fact puts them into the center of focus of this research. Although credit registers have received more attention in research recently, there is a remarkable lack of understanding their impact on banking competition and international expansion strategies of banks. 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. Where credit registers enable foreign banks to access credit histories on an equal footing compared to local incumbents, they lower exogenous information asymmetries between bank and borrower. These exogenous asymmetries refer to 'hard information' on borrowers, such as their repayment history and defaults. Endogenous asymmetries, on the other hand, refer to 'soft information' stemming from relationship lending. Despite credit reporting, they continue to persist, as no soft information (such as income) is in general reported through credit registers. Our main question is how the existence and the design of credit registers impact on market entry modes of banks. Our 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 ought to become more attractive, if not the preferred entry mode, as exogenous information asymmetries are lowered. Branching is specifically important in the retail banking business, where proximity to customers is key and thus competition ought to intensify.

We present a new 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&A 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 different modes of entry in these countries, and which type of information exchange is needed in order to facilitate cross-border branching versus cross-border M&A.

By using both univariate and multivariate analysis, we find evidence that the establishment of a public credit register has a positive impact on cross-border branching and share of branches in total cross-border entries, but no pronounced effects on M&A. Additionally, the introduction of a public register (sharing positive and negative information) has slightly negative effects on

net interest margins. The reductions in net interest margins and returns on equity are especially pronounced in highly concentrated markets. The results for the establishment of private credit bureaus, however, are more ambiguous. We find positive effects on cross-border branching, a slightly positive effect on the percentage of branches in overall entries, and negative effects on net interest margins, which are more pronounced when positive information is shared.

To the knowledge of the authors, there are no theoretical works, which directly address the choice of entry modes (branching and M&A) under different information sharing regimes. However, theoretical considerations help to illuminate the economic interactions of information sharing and banking competition. For example, theoretical research shows a positive contribution of credit registers to credit market performance. Exogenous information asymmetries are reduced, borrower discipline is increased, and moral hazard as well as credit rationing decline (Jappelli and Pagano (1993); Padilla and Pagano (1997, 2000)). Jappelli and Pagano (1993) show that information sharing can arise endogenously in an adverse selection model, when banks are local monopolies and borrowers are mobile across (state) borders. The authors show that information sharing is more beneficial, the higher borrower mobility, the lower the costs of such exchange, and the greater the number of participants in the system. In Padilla and Pagano (1997) it is discussed that where entrepreneurs' success depends on the level of invested effort, banks may share information on the borrower's type, which increases the latter's incentives to exert effort when investing. Further, in Padilla and Pagano (2000), default information on borrowers can serve as a discipline device, which raises the incentive to perform.

We diverge from these approaches in focusing on the interaction of market entries and credit information systems. Bofondi and Gobbi (2006) discuss the interaction of informational barriers and market entry for 95 local Italian markets. Informational disadvantages contribute significantly to the entrants' higher share of defaulting loans.[1] The default rate is lower for banks that enter with local branches in these markets (compared to players who lend from a position outside of the local market). As proxy for the 'knowledge of local markets', the authors take a banks' initial share of the local loan market. Since most of the banks are connected to a credit reporting system, this ought to lower levels of exogenous information asymmetries. Although this paper is related to ours, we focus on EU-27 markets, as it can be expected that information asymmetries are even more severe across international borders. Sengupta (2007), for example, models bank competition between asymmetrically informed principals who face a borrower's unobservable risk, which is known only to the incumbent (from the previous relationship) and a borrower's observable risk, which is common knowledge. The author points out that foreign banks tend to serve larger firms (which are more transparent), while domestic banks lend to riskier and more opaque market segments.

Closely related to our work is Van Cayseele et al. (1995) whose interest is the market structure

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[1]The intertwining of market structure in the banking industry and information asymmetries is discussed by Dell'Ariccia (2001) and Hauswald and Marquez (2006), although without information sharing.

evolving in the equilibrium in the presence of either a positive or negative register. Banks maximize profits by choosing the optimal number of outlets (Cournot competition). In the case of a negative register, less banks enter the market and banks have more outlets, in the case of a positive register more banks enter the market, but banks have less outlets - that is a higher number of smaller banks emerges.

Related work in industrial organization focuses on the trade-off between greenfield and acquisition entry. Raff et al. (2006) and Raff et al. (2009) present models, where a firm's decision between greenfield investment and acquisition depends on the differences in the marginal costs of foreign and domestic firms. Other analyses of the choices to go abroad emphasize corporate taxes, lower regulatory restrictions and inefficiencies occurring in local banks. Some papers have highlighted the banks' decision to go abroad as being affected by advantages in processing information due to greater use of technology and specialized skills (Claessens and van Horen (2008); Claeys and Hainz (2007)). In others, informational costs are understood as differences in language and culture. In the international finance literature, information costs refer to geographical distance as well as difference in language, culture or customer expectations. In this paper, we use the term informational costs to refer to the existence of a public and private credit register as well as the type of information exchanged.

Other drivers for cross-border entries identified in the literature are bank-specific variables, greater profit opportunities abroad and regulation as well as taxation (Hryckiewicz and Kowalewski (2008); Buch and Lipponer (2007); Berger et al. (2004); Focarelli and Pozzolo (2001)). In our multivariate regressions, we have integrated the most important determinants, identified by several authors, as controls (see Buch and DeLong (2008) for a review of the literature). These are a variety of factors, but not exogenous information asymmetries.

There seem to be also very few empirical papers relevant to our main question of how existence and design of credit registers impact on cross-border entry modes. Only a few studies empirically analyze the choice of banks to go abroad either by opening a branch or a subsidiary. In this context, it ought to be noted that a subsidiary is a separately incorporated and capitalized entity, whereas a branch is not.Under EU law, banks can provide services across borders through branches, which fall under the supervision of the home country. A subsidiary is supervised by the host country. Other empirical research as in Djankov et al. (2007) has shown the potential substitutability between credit registers and the protection of creditor rights in legal proceedings. These results are based upon cross-sectional time regressions with a set of 129 countries.

Our insights are informative for policy makers who strive for increased credit market integration and for the creation of a level playing field in banking competition across Europe. In fact, while banks might use credit registers for strategic foreclosure of foreign competitors (see, for example, Bouckaert and Degryse (2006) and Gehrig and Stenbacka (2007)), the opposite holds if potential information barriers are lowered leading to intensified competition. This paper is organized as

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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.

2   Credit Bureaus in Europe

In the past decades, credit registers have evolved very differently across European countries, as highlighted in the following discussion. While some countries have both types of registers (public and private), others have only a public register or private credit bureaus. In our empirical strategy, we account for the difference in types of institutions and information shared.

Public credit registers are non-profit institutions in the ownership of the central bank and part of the supervisory and reporting structure. They are used for off-site bank supervision or compilation of statistics and exist in 14 countries. The majority has been established in the 1990s, except for the German central bank register (Evidenzzentrale fuer Millionenkredite) which has existed since 1934. Private credit bureaus, on the other hand, are for-profit institutions which exist in all Member States, according to our broader definition of private credit bureaus. This definition 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 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). Development, regulation and institutional design of credit reporting systems are discussed in Jappelli and Pagano (1993, 2003) and Jentzsch (2007a,b). A recent overview has also been published by the European Commission (DG Internal Market and Services 2009).

Both types of institutions can hold information on companies and individuals and co-exist in countries such as Austria, Germany, Spain or Italy. 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) shows the existence of credit bureaus as well as types of information collected as of 2009. The only cross-border exchange of credit information takes place among a sub-group of public credit registers and mainly on legal persons (i.e. businesses). The reason is that companies are better identifiable and demand greater loans, which increases the need of banks to share exposure information on them.

INSERT Table 1 here.

Variety also exists in the types of information shared. For example, 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 such regimes, market newcomers can only observe an adversely selected pool of borrowers once entering the reporting mechanism. In other countries, both positive and negative information is collected and distributed (examples are United Kingdom, Germany and Ireland).

The impact of credit registers on banking market integration remains a controversial subject matter. Cross-border credit reporting is in a nascent state for household credit and much further developed for loans to companies. Some private credit bureaus do have cross-border bilateral contracts with counter-parts in other countries (such as Germany, Austria, Netherlands and Belgium or Sweden, Finland and Denmark). Volume of cross-border exchange of credit histories on individuals is low and exists practically only where a common language is shared (e.g. Germany and Austria). In addition, private business reports are distributed throughout Europe through different private sector networks (FEBIS, BigNet, and D&B).

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 credit bureaus could be used for discrimination of foreign banks 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.'*

The competitive dimension played a role in a case in Spain. In 2006, the European Court of Justice ruled on the compatibility of the credit register in Spain with Community competition law. In the ruling, the Court stated that compatibility depended on economic conditions in the relevant market, specific characteristics of the system (its purpose and access conditions) and the type of information exchanged. The Court argued that in principle information exchange on borrowers is permissible if the relevant market is not highly concentrated, the system does not allow lenders to be identified and conditions of access to the system are 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 banking 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 (see, for example, Brown et al. (2009); Djankov et al. (2007); Luoto et al. (2007)). Until recently it has been standard to work with country-level information (see Jappelli and Pagano (2002, 1993); Van Cayseele et al. (1995); Focarelli and Pozzolo (2001)). Many of these 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. Due to the limited years for which these data are available, most of the authors used country-level cross-sectional regressions and not time series analysis. One of our contributions is that we present a new data set. In the following, we explain our data collection strategy, the main variables used in the empirical investigation, and the summary statistics.

One of the main advantages of our data set is the cross-sectional time series character with respect to credit registers and bank entry modes, which enables us to draw some (cautious) conclusions also about causality. This compensates for the reverse causality problems, which may plague other research (acknowledged in Jappelli and Pagano (2002)). 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 particular, ECRI provided a database on credit bureaus in the EU-27 countries with 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 that have been 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. We have more than 400 observations on this variable. In addition, we collected information on public credit registers from the national Central Banks. In order to capture the quality of the information shared, we applied the definitions of the Expert Group on Credit Histories constructing four indicators on the type of information shared, either positive or negative: 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 seems 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 private bureau in each country. In competitive credit reporting markets, the effects of information sharing ought to be stringer than in monopoly systems. Greater competition among credit bureaus leads to greater population coverage and more information categories collected. 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, we used 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 are based on ECRI compilations from national Central Banks and the ECB Statistical Data Warehouse. More precisely, to find the total number of entries through branches for each country and year, and to make it comparable with the number of entries 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 there are 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 entries through de novo 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 collected 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); 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 sharply higher number of creditor rights than French civil law. 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.[2]

Finally, the macroeconomic variables we have chosen will account for market features, such as

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[2]Latvia 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 - follows the German legal tradition.

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.[3] 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.[4]

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 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 modes, tests for the mean do not evidence significant differences among the two 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.

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[3]The 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, United Kingdom.

[4]The New Member states are Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia.

4 Empirical Model 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 dataset (i.e. time-series cross-section data).

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:

$$Entry\_ratio = Tot\ BranchEntry/(Tot\ Branch\ Entry + Tot\ M\&As\ Entry) \qquad (1)$$

In (1), the total number of cross-border entries in the parenthesis consists of the total number of cross-border mergers and cross-border entries 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 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 information-sharing industry besides that of an increase in the degree of information sharing (new private registers typically cover additional segments of borrowers).

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% as concentrated.[5] We then compare the difference before/after the introduction of a credit register for the two groups of countries using the high-concentration group 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. In line with the European Court of Justice analysis,

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[5] We also check results for a threshold of 50%, as well as the value of the index in year t-1.

we would expect a positive difference-of-the-differences, that is, less entry through branches after the introduction of credit register 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 $\Delta \overline{Entry\_ratio}(low\_conc)$ 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 as well. 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

$$Average \;\; Effect = \Delta \overline{Entry\_ratio}(low\_conc) - \overline{Entry\_ratio}(high\_conc) \qquad (2)$$

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.[6] 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 introduced a credit register in the same time window', the sample is considerably reduced. Due to low cross-country variability, this would imply for the private credit bureau variable a control group of inferior quality. Further, the five-year time window allows comparability with Djankov et al. (2007) results. However, we check results for different control-group and time-window specification, and results do not change substantially.

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

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

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

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[6]For 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.

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 variation in the share of entry through branches that is statistically significant: the share of entry through branches increases significantly after the introduction of a public credit register in countries with a low level of market concentration. 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). In line with the European Court of Justice analysis, these results tentatively suggest that we can observe higher entry through branches after the introduction of a credit register in countries with a low level of concentration.[7]

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). Although the impact of a private credit bureau on market structure may not seem

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[7]These 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).

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%), though particularly in highly concentrated markets. Cost indicators (overhead, costinc) are also expected to decline, as it happens after the introduction of a credit register 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 study 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.

We study the effects of different features of credit reporting systems on the total number of entry through branches, and separately on mergers, in each country and year, as well as on the share of branches on total entries. Next, we present the impact of credit reporting systems on bank competition (to measure bank competition we use the NIM variable). In order to study the number of entries through branches and mergers 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 firm i, whereas ζ_t is shared by all firms in year j.

Formally,

$$
\begin{aligned}
ln(\mu_{it}) \quad = \quad & \beta_1 \cdot \text{PRIVATE\_BUREAU}_{it} + \beta_2 \cdot \text{PUBLIC\_REGISTER}_{it} + \beta_3 \cdot X_{it} + \zeta_{1i} \cdot \text{PRIVATE\_BUREAU}_{it} + \\
& \zeta_{2i} \cdot \text{PUBLIC\_REGISTER}_{it} + \zeta_t \\
= \quad & (\beta_1 + \zeta_{1i}) \cdot \text{PRIVATE\_BUREAU}_{it} + (\beta_2 + \zeta_{2i}) \cdot \text{PUBLIC\_REGISTER}_{it} + \beta_3 \cdot X_{ij} + \zeta_t
\end{aligned}
$$

(4)

where 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 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 quality of the information shared , whereas the number of private bureau 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 number of entries through branches and mergers in each country. Coefficients can be interpreted as the log of the ratio of the expected counts (irr). A coefficient greater than 1 suggests a positive effect, whereas a coefficient lower than 1 suggests a negative effect.

INSERT Table 9 here.

The best way to interpret these estimations is to form intervals within which 95% of slopes are expected to lie (Rabe-Hesketh and Skrondal (2008)). For example, the coefficient on the introduction of a PRIVATE_BUREAU only, sharing positive information on consumers and firms, is equal to $\beta_1 * $ PRIVATE_BUREAU $\pm 1.96 \cdot sd($PRIVATE_BUREAU$) + \beta_3 \cdot ($POSITIVE_INFO $= 1)$, that is $0.14 \pm 1.96 \cdot 0.13 + 1.40$, and the effect of the introduction of a private bureau is expected to lie between 1.51 and 1.78, meaning 51% and 78% in terms of branches. The overall impact of a public register is also positive and significant (see Table 8).[8]

For mergers, on the other hand, the effect of a public register sharing positive information does not appear to be significant. The overall effect of private bureau is positive and significant, although a negative impact comes from the introduction of a private bureau sharing negative information. The coefficient less than 1 for the number of major private bureau variable, although not significant, also suggests that the greater the number of major private 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. Inter-

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[8]These numbers might look large but we have to consider that the average mean for branches is 1.2

estingly, they are significant in the Poisson regression for mergers. Greater and more developed markets (a coefficient 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 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 marginal effects computed at the mean level for continuous variables, and for a discrete change for dummy variables. Overall, these regressions seem to suggest a positive role of private credit bureaus in affecting the share of entry through branches (overall the effect of credit bureau is positive and significant). However, these regressions do not provide strong indications. We will deal in the next section with other data problems that may affect the results.

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, in addition of being a good proxy for competition, it presents less econometric issues to be accounted for. In fact, the CR3 indicator is a fractional (bounded) variable, which is hard to handle in a time-series cross-sectional setting. From an econometric standpoint, CR3 is not probabilistic outcome, but it has both two corner solutions and continuous values in the interval (0,1). Consequently, most standard models are inappropriate for estimation with a substantial number of observations at either 0 or 1.[9] 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 fostered competition in the banking sector, where net interest margin decline. The same is true for the establishment of public credit registers which share negative or positive information, and for a private bureau sharing positive information.

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[9]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. Differently from Wagner (2003), we can not explicitly include firm-specific intercepts either, as we do not observe the entire population. However, results on GLM estimators with correlated error terms (not reported) are in line.

4.4 Multivariate Analysis: Robustness Checks

Testing hypotheses regarding the effects on credit registers on bank entry modes with the presented data set involves the problems typically related to the use of time-series cross-section data sets (TSCS). TSCS consist of a sequence of time series observed for different units - as in a panel data set - 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)).

There is no clear cut rule. In general terms, one-digit panel data set for T is considered. Nevertheless the notations are equal and the distinction between these two types of data sets appears relevant, since it allows us to neglect some issues which are related to panel data analysis while creating new concerns to which attention must be paid. In particular, in this section we deal with two methodological problems: heterogeneity of panel data, and cojoint inclusion of time-invariant variables and fixed effects.

In addition, we perform our regression relying only on those observations that are greater than zero or less than one in order to avoid censoring problems related to the way we have constructed our variables. We are aware that also this way of proceeding potentially introduces a bias. However, in the robustness check we want to take into account concerns related to nature of our (TSCS) data set. We have already accounted for censoring in the previous section.[10] The inclusion of country fixed effects precludes the inclusion of time-invariant or slowly changing variables as independent variables. Distinguishing between their influence and the influence of omitted country-specific variables might be difficult. If fixed effects are not included in the model, the time-invariant variables will carry the weight of all country-specific factors. To overcome this problem, Plümper and Troeger (2007) propose a procedure for analyzing the effect of time-invariant variables in a model including fixed effects. Their procedure has three stages: *(i)* estimate a fixed-effect model; *(ii)* regress the unit effects on the time-invariant variables; and *(iii)* re-estimate the first stage by pooled OLS including the error term of the second stage (XTFEVD procedure). Their Monte Carlo experiments suggest that the fixed effect vector decomposition (XTFEVD) estimator is the most efficient estimator when time-variant and time-invariant variables are correlated with the unit effects.[11] We adopt this procedure to account for the fact that POSITIVE_PRIV, NEGATIVE_PRIV, POSITIVE_PUB, NEGATIVE_PUB. , and NO_PRIVATE_BUREAU are slowly changing variables. Results are reported in Table (12).

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[10]Unfortunately, it is not yet studied how to handle, fractional response variables with slow-changing regressors at the same time. See also footnote 9. However, this subsample is better suited, as explained below, for the vector decomposition we are going to apply in this section. Even in this case, (regressions are not reported) we check results for the full sample relying on GML estimators with correlated errors.

[11]More precisely, the vector decomposition techniques produces more reliable estimates than the fixed-effect model when the between variation is larger than the within variance of all regressors of interest, and the higher the correlation between rarely changing variable and the unit effects. A high ratio between the within and between variations should help the researcher on the choice of variables to include among the slow-changing regressors.

INSERT Table 12 here.

These results basically confirm our previous ones. In particular, they allow drawing stronger conclusions on the role of a private credit bureau, which shares also positive information, suggesting a positive effect on the share of cross-border bank entry through branches.

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 years. 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 also look at the effects of credit registers on banking market concentration and on indicators of competition in banking. We find proof that information asymmetries indeed can constitute a severe barrier for foreign banks to enter markets. These asymmetries may force banks into M&A rather than allowing them to enter through branching. M&As, however, are likely to have different effects in terms of market structure and competition compared to branching, were the former does not add an additional market player to the number of players that already exist in the market. We have constructed a new data set that exploits the differences in credit reporting systems across EU-27 Member States over the years 1990-2007. The establishment of this data set is one of our main contributions. It is a cross-sectional time series data set on credit registers, which enables us to draw some (cautious) conclusions also about causality based upon application of a difference-in-differences analysis. The data set merges data from the World Bank, the Heritage Foundation, the ECB, the SDC Platinum database and ECRI. It covers the EU-27 Member States over the years 1990-2007. It allowed us to apply more advanced econometric techniques such as univariate difference-in-difference analysis and a number of multivariate estimations.

We obtained a number of interesting results. The univariate 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, but just as in the case of public registers, they positively contribute to entry through branching by raising their share in the overall cross-border entries. Some indications show that they may also contribute to intensification of competition, again more pronounced for highly concentrated markets and New Member States. In the course of our research, we had encountered a number of challenges in compiling information on private credit bureaus. This is an indication that policy makers in future should be pressing for more disclosure of information on private bureaus' activities. For instance, it ought to be possible for the public to obtain precise information on what information

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items are stored in the credit bureaus as well as what fee structures are applied. This would also enable better comparisons of the credit reporting systems in the different countries and to obtain better estimates on the costs of credit.

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 has a significant positive impact on cross-border branching. The establishment of a public register sharing positive information does not have a significant impact on cross-border M&As, whereas 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 obtain a positive effect on cross-border branching and a negative effect for cross-border mergers in the presence of 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 suggests the important role of a public register, for all the types of information shared, and for a private register 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 registers. 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 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 foreigners.

Another important policy recommendation in this respect is that policy-maker ought to obtain better information on the quality of data stored in the credit registers. In fact, we believe that data quality, which is of utmost importance for borrower risk assessment and banking competition, should be one of the main focuses in the supervision of credit registers in future. Unequal patterns of market entry of banks across Europe can probably be reduced by lowering exogenous information asymmetries once credit information systems are harmonized to a greater extent in terms of the information they collect. This would probably provide some scope of action for the European

Commission. But one of the main difficulties that policy makers encounter in doing so is the diversity of legal and business terms such as bankruptcy or delinquencies. 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.

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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 $\Delta\%Branches$
Public Register					
All countries					
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***
New Members					
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					
All countries					
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*
New Members					
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 $\Delta CR3$
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	ΔIndicator 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 POISSON DEPENDENT VARIABLE: BRANCHES

	a	b	c
PRIVATE_BUREAU	0.1383***	0.2332***	0.1572***
	(0.055)	(0.109)	(0.094)
PUBLIC_REGISTER	0.1688**	0.1298**	0.2584
	(0.153)	(0.131)	(0.256)
SECOND	1.3398	0.9925	1.6044
	(0.401)	(0.319)	(0.695)
POSITIVE_PRIV	1.4006**	1.3627*	1.3207
	(0.230)	(0.233)	(0.275)
NEGATIVE_PRIV	2.0395***	2.1417***	2.5805***
	(0.418)	(0.497)	(0.711)
POSITIVE_PUB	2.6110**	2.9353***	2.0771*
	(1.007)	(1.211)	(0.910)
NEGATIVE_PUB	1.0963	1.2458	1.1200
	(0.412)	(0.539)	(0.397)
no_PRIVATE_BUREAU	0.9606	1.0271	0.9892
	(0.068)	(0.090)	(0.100)
p_gdp		1.0067	1.0291**
		(0.009)	(0.013)
inflation		0.9935	0.9669
		(0.089)	(0.101)
population		0.9929	0.9976
		(0.007)	(0.008)
English		0.6528*	
		(0.153)	
French		0.7448	1.0285
		(0.156)	(0.320)
German		0.9196	1.1445
		(0.240)	(0.403)
Scandinavian			1.2769
			(0.385)
CREDIT_BANK			1.0008
			(0.002)
OVERALL_FREEDOM			0.9673**
			(0.016)
Constant	1.0332	0.6673	1.8819
	(0.207)	(0.277)	(1.957)
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

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Table 9: ESTIMATION RESULTS RANDOM POISSON DEPENDENT VARIABLE: MERGERS

	a	b	c
PRIVATE_BUREAU	1.2907	1.1590	1.2349
	(0.451)	(0.420)	(0.510)
PUBLIC_REGISTER	1.3573	0.9926	0.5081
	(0.504)	(0.444)	(0.395)
SECOND	2.8216***	2.4356***	1.7484
	(0.692)	(0.609)	(0.619)
POSITIVE_PRIV	1.5637**	1.4914**	1.1439
	(0.309)	(0.280)	(0.218)
NEGATIVE_PRIV	0.6709**	0.7277*	0.6382***
	(0.112)	(0.119)	(0.110)
POSITIVE_PUB	1.1990	0.9727	1.0839
	(0.236)	(0.187)	(0.322)
NEGATIVE_PUB	0.9975	0.9237	0.9931
	(0.179)	(0.172)	(0.302)
no_PRIVATE_BUREAU	0.9747	0.9413	1.0237
	(0.045)	(0.043)	(0.060)
p_gdp		1.0205**	1.0046
		(0.009)	(0.011)
inflation		0.4414**	1.0553
		(0.151)	(0.125)
population		1.0204***	1.0324***
		(0.006)	(0.008)
English		0.8328	
		(0.406)	
French		2.3997**	3.6478***
		(1.026)	(1.336)
German		1.5706	3.5326***
		(0.705)	(1.297)
Scandinavian			1.8273
			(0.760)
CREDIT_BANK			1.0014
			(0.002)
OVERALL_FREEDOM			1.0434***
			(0.013)
Constant	0.5197***	0.2835**	0.0175***
	(0.075)	(0.080)	(0.102)
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
			(0.013)
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: Regressions include year and country dummies. Cluster errors

Table 11: FE-Estimation results for net interest margin (nim)

Dependent variable: nim

	a	b	c
PRIVATE_BUREAU	-0.0112**	-0.0133***	0.0031
	(0.004)	(0.005)	(0.006)
PUBLIC_REGISTER	0.0283***	0.0346***	0.0397***
	(0.006)	(0.006)	(0.007)
SECOND	-0.0263***	-0.0209***	0.0018
	(0.003)	(0.003)	(0.006)
POSITIVE_PRIV	-0.0061*	-0.0071**	-0.0008
	(0.003)	(0.003)	(0.003)
NEGATIVE_PRIV	0.0015	0.0031	-0.0068**
	(0.003)	(0.003)	(0.003)
POSITIVE_PUB	-0.0096***	-0.0027	-0.0143***
	(0.003)	(0.003)	(0.003)
NEGATIVE_PUB	-0.0262***	-0.0312***	-0.0226***
	(0.003)	(0.003)	(0.004)
no_PRIVATE_BUREAU	-0.0002	0.0002	-0.0006
	(0.001)	(0.001)	(0.001)
p_gdp		0.0008***	0.0006**
		(0.000)	(0.000)
inflation		0.0091***	0.0049***
		(0.001)	(0.001)
population		-0.0003	-0.0003
		(0.001)	(0.001)
CREDIT_BANK			-0.0001**
			(0.000)
OVERALL_FREEDOM			-0.0005**
			(0.000)
Constant	0.0782***	0.0494**	0.0758**
	(0.005)	(0.025)	(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: ESTIMATION RESULT FOR FEVD Dependent variable: % branches

	a	b	c
PRIVATE_BUREAU	0.4757***	0.0172	0.0052
	(0.129)	(0.173)	(0.261)
PUBLIC_REGISTER	0.0194	-0.0668	-0.0000
	(0.137)	(0.140)	(0.174)
SECOND	0.0341	0.0127	0.0000
	(0.110)	(0.112)	(0.236)
POSITIVE_PRIV	0.0929*	0.2704***	0.5332***
	(0.049)	(0.086)	(0.141)
NEGATIVE_PRIV	-0.0156	0.1743*	0.1614
	(0.062)	(0.104)	(0.103)
POSITIVE_PUB	0.0188	-0.0376	-0.1576*
	(0.070)	(0.071)	(0.091)
NEGATIVE_PUB	-0.0797**	-0.0882	-0.1366*
	(0.039)	(0.057)	(0.069)
no_PRIVATE_BUREAU	-0.0330**	-0.1941***	-0.2817***
	(0.016)	(0.065)	(0.078)
eta	0.7926***	1.0000***	1.0000***
	(0.294)	(0.331)	(0.270)
p_gdp		-0.0004	-0.0001
		(0.003)	(0.005)
inflation		-0.0037	-0.0161
		(0.021)	(0.023)
population		0.0140**	0.0185***
		(0.005)	(0.006)
English		0.1585	1.6366***
		(0.153)	(0.422)
French		0.2602*	1.7841***
		(0.145)	(0.423)
German		0.4573***	1.9204***
		(0.124)	(0.447)
Scandinavian		0.3190**	1.8697***
		(0.153)	(0.430)
CREDIT_BANK			0.0004
			(0.001)
OVERALL_FREEDOM			-0.0228***
			(0.007)
ll			
N	121	120	95

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

η are second-stage errors