

Research Report

Information-Sharing and Cross-Border Entry in European Banking

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The **European Credit Research Institute (ECRI)** is a research institution based in Brussels. Established in 1999 for the study of banking and credit in Europe, ECRI focuses on institutional, economic and legal aspects related to retail finance and credit reporting. The institute provides expert analysis and academic research for a better understanding of the economic and social impact of credit. ECRI supports and funds independent academic research projects. The institute monitors markets and regulatory changes and looks at their impact nationally and internationally.

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1. Introduction

Asymmetrically distributed information and adversely selected pools of borrowers constitute severe barriers for foreign banks when they enter new markets. In many instances, these problems force banks to either form ‘alliances with incumbents’ or simply enter through mergers and acquisitions (M&As). Yet such entry modes do not automatically lead to intensified competition as they may leave the number of competitors unchanged. Thus, institutions that reduce information asymmetries in credit markets (thereby encouraging entry through branches) may be very important if the objective is strengthening competition in addition to market integration. Recently, these institutions – credit registers – have received greater attention among academics and policy-makers in Europe, although there is still a remarkable lack of understanding of their empirical impact on banking.

Information sharing through public registers or private credit bureaus (we use the term ‘credit registers’ for both) collect and distribute millions of profiles (credit histories) on individuals and companies in European credit markets. Their contribution to credit market performance is typically rated positively in the economic literature: information asymmetries are reduced, as are moral hazard and credit rationing, among other problems plaguing credit markets. For these reasons, credit-reporting systems play an essential role in banking, related to transparency, banking system stability, and the reduction of screening and monitoring costs for banks as well as competition.

While there are many studies on the main drivers of the cross-border expansion of banks, less is known about the effects credit registers have on international banking in terms of their ability to facilitate cross-border market entry. This is of special interest, because in the past, extensive literature has identified a broad variety of factors that have an impact on cross-border expansion – except for information asymmetries on borrowers. Where credit registers enable foreign banks to access data on an equal basis with local incumbents, they reduce exogenous information asymmetries through the exchange of ‘hard information’ on borrowers. Endogenous asymmetries, on the other hand, are based upon ‘soft information’ from relationship lending in a market and despite credit reporting, they continue to persist.

Banks can choose to penetrate another market in different ways, among them cross-border service provision or the setting-up of a ‘commercial presence’. The latter can take place through branching, an M&A, a *de novo* (greenfield) investment or the opening of a representative office. This report focuses on M&As and branching (*de novo* investments and representative offices are not subjects of our analysis). A branch is defined as an unincorporated entity without independent legal status that is wholly owned by the parent company.¹ An M&A, on the other hand, is here defined as the strategy of penetrating a market by buying another legal entity in the target jurisdiction (whereas a *de novo* or greenfield investment is setting up a wholly new entity). Although domestic M&As in financial services have increased steadily over the past two decades, the number of cross-border M&A deals in the euro area has declined from 2004 to

¹ Derived from ECB, Guideline of the European Central Bank of 1 August 2007 on monetary, financial institutions and markets statistics (recast) (ECB/2007/9), OJ L 341/1, 27.12.2007.

2008. In general, for all modes of cross-border movements of banks, information asymmetries are of great importance. When potential newcomers are unable to access the credit histories of borrowers in a target market, they incur the risk of incorrectly estimating a borrower's credit risk, which may result in the incorrect pricing of the services offered. Credit histories, for instance, could be inaccessible on a cross-border basis if there is no national presence or in cases where a non-bank financial institution needs to obtain a bank license in order to access information from the database. These situations put them at a competitive disadvantage compared with the incumbents. Furthermore, monitoring and scoring technologies are in many cases not exportable because of the different information environments that render various predictors for creditworthiness. Depending on the severity of the problem, an entrant might choose to enter by acquiring a local bank or in the extreme case may choose not to enter at all.

Credit registers exist in every EU member state, but the credit reporting systems have evolved quite differently across Europe. This has been documented in earlier work of the European Credit Research Institute (ECRI) by Jentzsch (2007) and San Jose Riestra (2002), as well as in Jentzsch & San Jose Riestra (2006). While public credit registers are typically in the ownership of a central bank and are part of its supervisory and reporting structure, private credit bureaus are for-profit institutions used for commercial lending, creditworthiness and affordability tests as well as ongoing borrower monitoring.

It is important to note this distinction between credit bureaus as profit-maximising private-sector entities and public credit registers, which are part of the central banks. Both kinds of institutions can hold information on companies and individuals, and co-exist in countries such as Germany, Austria and Italy. There are further differences in terms of reporting thresholds and the kinds of data collected. Positive information covers contractually compliant behaviour and includes (depending on the country) information about outstanding types of credit, the amounts of loans and repayment patterns. Negative information generally consists of statements about default or arrears and bankruptcy. For instance, in France, Denmark, Finland, Latvia, Malta and Spain, only negative information is collected on individuals. In such regimes, market newcomers can only observe an adversely selected pool of borrowers from the negative data. In other countries, both positive and negative information is collected and distributed (examples are the UK, Germany and Ireland).

At the EU level, credit registers are subject to the EU Data Protection Directive (95/46/EC) (European Council, 1995) and the Consumer Credit Directive (2008/48/EC) (European Council, 2008). At the national level, they are subject to bank laws or the central bank act along with any further data protection laws. The concern that credit bureaus could be used to discriminate against foreign banks is reflected in the Consumer Credit Directive, with Art. 9 stating 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". In 2006, the European Court of Justice (ECJ) ruled on the compatibility of the data exchange system in Spain with Community competition law. In the ruling, the Court stated that compatibility depends on the economic conditions in the relevant market, the specific characteristics of the system (its purpose and access conditions) and the kind of information exchanged. It argued that information exchange on borrowers is permissible if the relevant market is not highly concentrated, the system does not allow lenders to be identified and the conditions of access to the system are non-discriminatory. Only recently, the diversity of credit reporting systems in Europe has attracted the attention of Directorate-General (DG) for Competition of the European Commission. In its retail banking inquiry of 2006, the Commission held that three key aspects are relevant: unfair and discriminatory access conditions for foreigners, partial information sharing and regulatory

barriers. For instance, barriers to the register are deemed to exist if an entity must have a physical presence in the country or comply with reciprocity principles in order to access the credit register.

Cross-border credit reporting is in a nascent state for consumer credit, but is much further developed for cross-border wholesale loans, where it falls under the Memorandum of Understanding (MOU) for public credit registers of the European Central Bank (European Central Bank, 2003). As of 2009, there was no exchange of information on retail lending under this agreement, although the MOU covers both. The reason is that companies are better identifiable and demand greater loan volumes, which increases the need for banks to share exposure information. To find ways to facilitate cross-border data exchange on individuals, the European Commission mandated the Expert Group on Credit Histories to make suitable recommendations, collated in a report published in 2009.

Some private credit bureaus do have cross-border bilateral contracts with their counterparts in other countries (such as Germany, Austria, the Netherlands and Belgium, or Sweden, Finland and Denmark). The volumes of cross-border exchanges on individuals are low and occur almost solely in areas that share a common language (e.g. Germany and Austria). In addition, private business reports are distributed Europe-wide through assorted private-sector networks.

Although there has been rising interest among academics and policy-makers in information sharing, there has been little to no research shedding light on credit reporting and bank entry modes (branching and M&As) in Europe. This interaction is of importance as it could guide policy-making intended to further EU banking integration. We hope to close this knowledge gap at least partly by presenting a new dataset on 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. We then use it to understand what effects the establishment of credit registers has had on different modes of entry in these countries, and which kind of information exchange is needed to foster cross-border branching versus cross-border M&As.

Our working hypothesis is that where insufficient information-providing institutions exist, the preferred mode of entry will be an M&A, which allows with the acquisition of the target bank simultaneous access to the information the latter has on the local pool of borrowers. Once adequate mechanisms of information exchange are available, branching ought to become the more attractive if not preferred entry mode, as information asymmetries diminish.

The remainder of this ECRI research report is organised as follows. In section 2, we provide a brief snapshot of the state of integration in the EU banking market. Section 3 outlines the role of credit reporting in Europe. Section 4 discusses the interrelation between credit reporting and bank competition. Section 5 discusses the latest theoretical and empirical advances on analysing the subject matter. Section 6 presents the dataset and section 7 the econometric analysis. Section 8 concludes.

2. A snapshot of integration in European banking

In this section, we provide a brief overview of the current state of banking integration in the euro area. We discuss the measurement of financial integration and explain why some of the modes of cross-border service provision were excluded from this study. Financial integration in Europe is uneven across market segments.² According to the ECB, banking markets encompass interbank (wholesale), capital market-related and retail banking activities. The first two show

² Financial markets encompass money markets, bond markets, equity and banking markets. In this section, we concentrate on the latter.

signs of increased integration, whereas the latter remain rather fragmented (European Central Bank, 2009).

The integration of retail banking services can take place in different ways (see Box 1), for instance through either direct provision of services across borders or foreign direct investment (FDI), which is discussed further below. For the purpose of this study, of the four modes in Box 1, only one is important: commercial presence. The other modes can be excluded given that we are interested in cross-border M&As and branches.

Box 1. International financial services provision

Credit reporting can have a differential impact on financial market integration. Practically, retail financial services can be provided in one of the following modes:

- cross-border service provision, i.e. crossing borders *during provision* (such as cross-border Internet banking);
- consumption abroad, i.e. consumers who travel to another member state to use the services provided there (short-term consumption of services);
- commercial presence, i.e. FDI in terms of establishing a local presence (M&As, *de novo* investments, branches of providers and representative offices); and
- the presence of natural persons, i.e. individuals who travel abroad to offer a service in another country (such as consultants or credit brokers).

Although credit reporting can potentially affect all of these modes, we focus our analysis on the commercial presence and regard the other modes of minor relevance.

Financial integration is typically measured by a number of banking indicators that are either price- or quantity-based (Adam et al., 2002) and infrastructure indicators for payment systems. These show that retail banking essentially remains fragmented along national borders. The integration in this market segment has been described as one of the “biggest disappointments of European integration” for policy-makers (Lannoo, 2008). For instance, market structures still differ; savings, credit, and investment attitudes follow diverse patterns; consumer and investor protection measures vary; and language and habits diverge. Nevertheless, before embarking on a deeper investigation of bank commercial presence, it is also worth noticing the integration trends in the provision of cross-border services.³

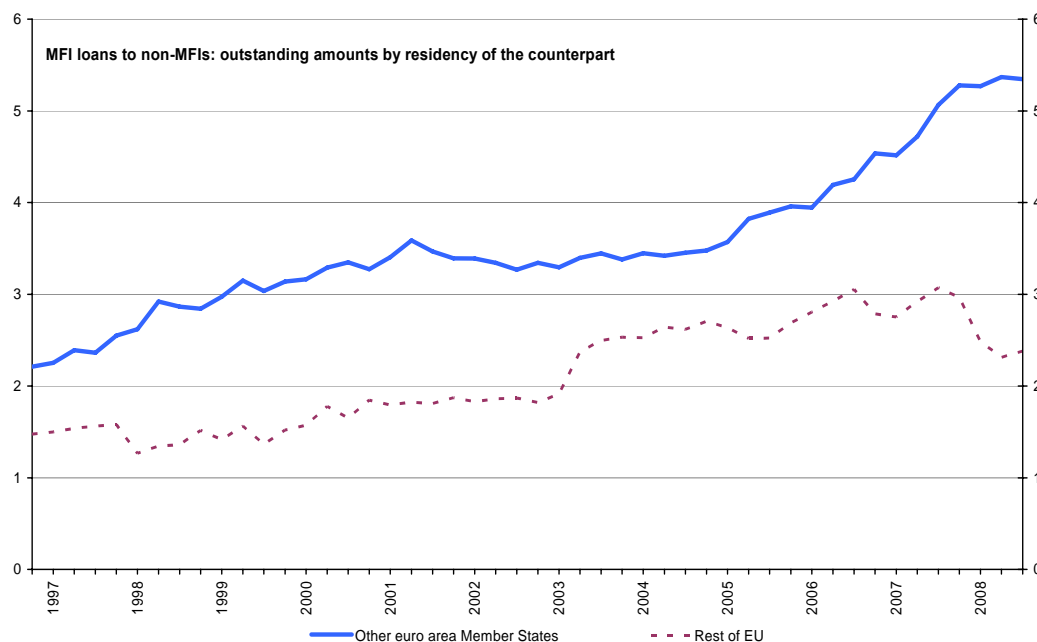
2.1 Cross-border provision of financial services

The cross-border provision of financial services has increased in the past few years in Europe. The ECB reports this as a “medium-term gradual trend towards integration, but [it] also show[s] signs of a setback in the second half of 2008, in particular in the interbank components” (European Central Bank, 2009, p. 40). Figure 1 shows that the share of cross-border MFI loans in the euro area that have been granted to non-MFIs has risen from above 2% of total loans in 1997 to 5.3% by December 2008, according to the numbers of the ECB. This measure is aggregated and it represents loans to the private sector (corporate and household loans) and to governments. The corporate segment makes up the larger share of the overall number compared with the share of lending to households.⁴

³ In the following discussion, only data for the euro area are provided (Belgium, Germany, Ireland, Greece, Spain, France, Italy, Cyprus, Luxembourg, Malta, the Netherlands, Austria, Portugal, Slovenia and Finland), as no other data were available in a consolidated format.

⁴ Disaggregated information is not available.

Figure 1. Cross-border MFI loans to non-MFIs – Outstanding amounts by residency of the counterpart (%)



Source: ECB (2009).

The lack of market integration in retail banking in the euro area reflects the local business character of retail banking, where proximity to clients is key and demands a pervasive branch network.

Clients typically choose a bank close to where they work or live, and tend to cluster services at one provider, although within borders the latter tendency decreases. The local character of retail banking places an increased importance on entering through branches or M&As. Such an entry mode allows the establishment of a local presence to gain proximity to customers.

Anecdotal evidence suggests that the recent financial turmoil might have led to less eagerness on the part of banks to lend away from their home countries in other markets and limited interest from consumers in obtaining financial services in other countries.⁵

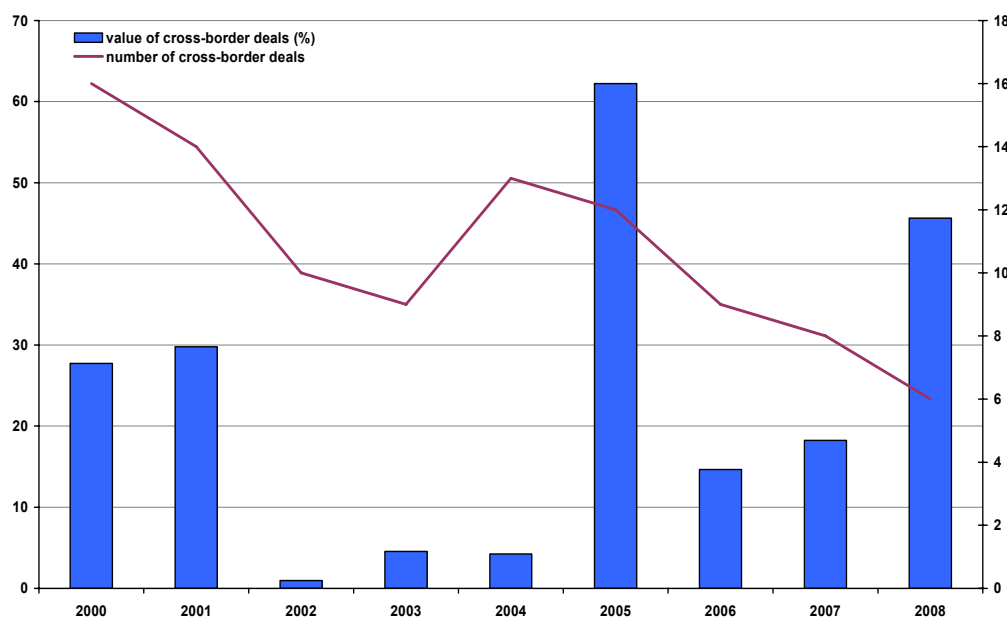
2.2 Commercial presence: Foreign direct investment

Commercial institutions have different options for entering foreign markets. FDI encompasses all the activities that lead to the establishment of a local presence in another country (i.e. M&As, *de novo* investments, branches and representative offices). Still, market entry in banking in Europe is primarily conducted through M&As. M&As differ from *de novo* (or greenfield) investments, in that they entail the purchase of an existing bank and not the set-up of a wholly new institution. The number of cross-border M&As is often seen as an indicator of more

⁵ Highly publicised cases such as the default of Icelandic banks that had attracted foreign depositors might have had an impact on consumers' perceptions of the risks of conducting business with institutions located in another country.

integrated markets, together with the indicator on the development of foreign branches and subsidiaries of euro area banks (credit institutions) within euro area countries. M&As are typically conducted to obtain the client portfolio and with it access to client information, but also to acquire the branch network and the proximity to clients. Figure 2 shows the value and numbers of cross-border deals in the euro area.

Figure 2. M&A activity among cross-border banks in the euro area



Notes: Cross-border bank M&A activity in the euro area as a percentage of the total value of euro-area banking sector M&As (left-hand scale) and in absolute numbers (right-hand scale).

Source: ECB (2009).

It remains an open question whether the current financial crisis has increased the number of M&A deals as weak institutions have sought greater stability offered by the better-capitalised banks. Another mode of entry for national presence is setting up bank branches. Branches are unincorporated entities without independent legal status, wholly owned by their parent.⁶ Branches located in the euro area of institutions that do not have a registered office in the euro area are also subject to the euro system's minimum reserve requirements. Any number of places of business set up in the same member state by a credit institution with headquarters in another member state is regarded as a single branch (Directive 2006/48/EC). In addition, a host country may establish more requirements for opening a foreign branch than for a foreign-controlled subsidiary. Subsidiaries are separate incorporated entities in which another entity has a majority or full participation (ECB/2007/9). They can either be the result of a merger or a *de novo* investment. They are defined in Arts. 1 and 2 of Directive 83/349/EEC as an entity in which the parent has a majority of shares or member's voting rights. Among other aspects, subsidiaries are often the result of crisis-related acquisitions (Cerutti, Dell'Araccia & Martinez Peria, 2007).

⁶ ECB (2007), op. cit.

In Europe, for example, the concept of a single banking license for branches within the EU, along with the principles of home-country control and home-country deposit insurance, make it possible to have competing banks in one country that have different deposit insurance coverage and are subject to different rules by home country law and regulation (Goldberg et al., 2005). Competition between banks subject to different rules is consistent with the principle of mutual recognition (of regulation and legislation).

Dermine (2006) asserts that “it appears that [a] European bank operating abroad, exclusively with branches, is currently a myth”. He identifies eight reasons to explain the choice of subsidiary structure: four that are temporary in nature (protection of original brand, management trust, nationalistic feelings and shareholder approval), two that stem from an incomplete process of European integration (corporate tax and deposit insurance), and one with a permanent character (asymmetric information and risk shifting, listing and flexibility). Among the most common additional requirements are “the approval of the home-country foreign bank regulator, restrictions on specific activities (e.g. mortgage transactions) or on dealing with host-country residents, and a statement of the applicant foreign bank that it will be responsible for all branch claims” (Cerutti, Dell’Ariccia & Martinez Peria, 2007).

Cerutti, Dell’Ariccia & Martinez Peria (2007) develop a *host-country regulation* index to take into account differences in host-country requirements for foreign branches and subsidiaries compared with the home country for Latin American and Eastern European countries.

As noted earlier, given that these are the main cross-border modes of integration, we focus on M&As and branching. It is not possible to include data on cross-border loans from MFIs for the econometric part of this study.⁷ These statistics are only available at the level of the counterpart (MFIs versus non-MFIs) and not at the country level. Therefore, it is not possible to identify the nationality of the bank and the nationality of the receiver of the financial service (ECB Regulation ECB/2001/13).

3. The role of credit reporting in Europe

Credit registers exist in almost every European country and play an important role in national credit markets. In this section, we discuss their role in cross-border lending as well as the assessment made by the European Commission (DG Competition) in its retail sector inquiry.

As noted earlier, in this report we subsume private credit bureaus and public credit registers under the term ‘credit register’. For private credit bureaus, we hereby employ a broad definition (institutions that conduct business reporting, consumer reporting and use debt collection activities in combination with credit reporting). Public credit registers are typically in the ownership of the central bank and part of its supervisory structure (Jappelli & Pagano, 2002; Jentzsch, 2007; Jentzsch & San Jose Riestra, 2006). Central banks use them for off-site bank supervision, whereas commercial banks may use them for borrower monitoring. The threshold for reporting loans varies across European countries (see European Commission, 2009, for an overview). Public credit registers exist in 14 countries in Europe.⁸

Private credit bureaus, on the other hand, exist in all member states. Credit bureaus are primarily voluntary information-sharing mechanisms with reporting thresholds below those of public

⁷ MFIs are defined as central banks, resident credit institutions and other resident financial institutions; see also the ECB’s “Explanatory notes on statistics on the Monetary Financial Institutions sector”, ECB, Frankfurt (2001).

⁸ The majority of these registers were founded in the 1990s; Germany’s central bank register *Evidenzzentrale fuer Millionenkredite* has existed since 1934 for the prevention of systemic crisis in the banking sector.

registers. Private bureaus are used for commercial lending, creditworthiness and affordability tests as well as borrower monitoring (Crook, Thomas & Edelman, 2002; Thomas, 2000). They have become an integral part of the lending process (Brown, Jappelli & Pagano; 2008, Jappelli & Pagano, 2002).

Credit scores are also used in downstream securitisation (Keys et al., 2008). Although they serve different purposes, public registers and credit bureaus have frequently been compared in the literature in the past in terms of their design and functions (Miller, 2003; Jentzsch, 2007). Both kinds of institutions can hold information on companies and individuals.

At the EU level, credit registers are subject to the EU Data Protection Directive (95/46/EC), the Consumer Credit Directive (2008/48/EC). At the national level, they are subject to bank laws or the central bank act and any other data protection laws. The Consumer Credit Directive holds in Art. 9 that each member state shall ensure that access for creditors from other member states to databases used for assessing creditworthiness is granted on non-discriminatory conditions. In light of Art. 81(1) of the EC Treaty, discrimination is to “apply dissimilar conditions to equivalent transactions with other trading parties, thereby placing them at a competitive disadvantage”.⁹ It is important to note that once there are different types of credit registers, depending on the coverage of loans in terms of reporting thresholds and the kinds of data collected, there might be market segments where reports from both sources (public and private) are substitutes from a lender’s perspective.

Credit reporting systems strongly differ in terms of the information collected. For instance, in France, Denmark, Finland, Latvia, Malta and Spain only negative information is collected on private individuals. In such regimes, market newcomers can only observe an adversely selected pool of borrowers as negative data is information on defaults, delinquencies or bankruptcies. Incumbent banks have the advantage of also processing positive information on their clients. In other countries, positive and negative information is collected and distributed (the UK, Germany and Ireland). Recently, the European Commission drew attention to credit registers in its retail banking inquiry.¹⁰ The Commission held that three aspects are relevant concerning credit registers: unfair and discriminatory access conditions for foreigners, partial information sharing and regulatory barriers (see also Box 2).

Box 2. Credit registers in the DG Competition’s retail sector inquiry

The Commission stated that with regard to access, the following aspects are of special interest when considering the role of credit registers:

- the kind of activity that an institution must conduct to be able to enter the information-sharing mechanism,
- the condition of holding a bank license,
- physical presence in the country,
- compliance with reciprocity,
- compliance with data protection laws, and
- fee structure (joining fees, membership fees and transaction fees).

⁹ Likewise, similar conditions can be applied to dissimilar institutions, which may also qualify as discriminatory practice.

¹⁰ See the European Commission report on the retail banking sector inquiry, the Commission Staff Working Document accompanying the Communication on Sector Inquiry under Article 17 of Regulation 1/2003 on retail banking (Final Report) (COM(2007) 33 final), SEC(2007) 106, Brussels (2007a).

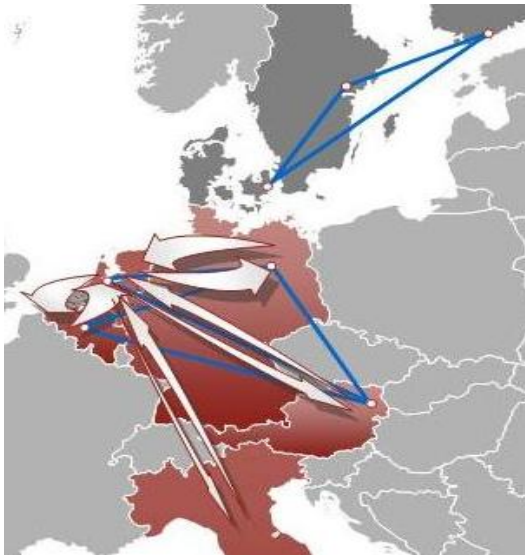
While some of these conditions are justifiable, others may lead to discriminatory access. It was stated that in most cases, members of credit registers are required to be credit providers. The requirement to hold a bank license and to be nationally present is adopted by some public credit registers (Austria, Spain, Portugal and Latvia). It automatically derives from the application scope of the relevant law (which is national and therefore, in essence, can only be applied to the territory of the state).¹¹ The cross-border exchange of credit reports (on individuals) between credit registers is very limited among private credit bureaus. Exchanges are far more common among public credit registers in Europe, although such exchanges only cover companies at present. Bilateral cross-border contracts among credit bureaus exists for companies in Germany, Austria, the Netherlands and Belgium, as well as in Sweden, Finland and Denmark (see Figures 3a and 3b).

In Figure 3a, some indications of cross-border reporting among private credit bureaus are provided. One of the highest volumes of exchanges is between Germany, the Netherlands and Belgium, owing to the cross-border traffic of natural persons that take up credit in the other country. Overall, the volumes of cross-border exchanges are low – around a few hundred reports per year – and occur especially where there is a common language (for instance, Germany and Austria).

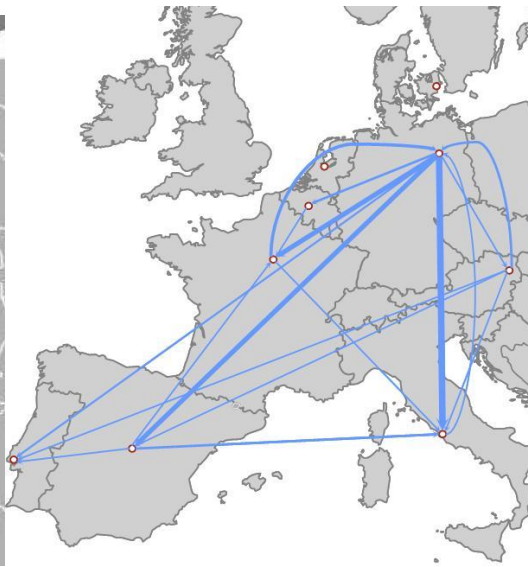
Figure 3. Cross-border reporting in Europe

Figure 3a. Reporting among private bureaus

Figure 3b. Public register reporting on companies



Source: ACCIS.



Source: Bank of Portugal.

¹¹ One notable exception is Germany: bank groups (e.g. a group located in Germany) are obliged to also report credits issued by subordinated members that can be located in other countries (e.g. Luxembourg).

In Figure 3b, the exchange between public registers under the ECB's MOU is presented.¹² Cross-border wholesale credit reporting exists under the MOU primarily for a sub-set of public credit registers. As of 2009, there was no exchange of information on retail lending, although the MOU covers both.¹³ The reason is that companies can be better identified and demand greater volumes of credit, which increases the banks' need to share exposure information across borders. The quality and costs for accessing credit data vary considerably across Europe. Moreover, while in some cases there is a legal obligation to report, in others reporting is voluntary.

4. Credit reporting and bank competition

Information sharing, market structure and competitive conduct are intrinsically linked in banking. According to the theoretical literature, banks are at a disadvantage when entering a new market because the incumbents have proprietary information about borrowers' characteristics that allows them to better cope with risk problems. In particular, 'soft information' on borrowers (so-called 'endogenous information') collected from the lending relationship encompasses income inflows on the account and expenditure outflows, i.e. information that is typically not reported through credit bureaus. Information on repayment behaviour and defaults is 'exogenous information' reported to other market participants through the credit bureau. The adverse selection problem is greater for entrants as their pool of applicants might include borrowers who were previously rejected by incumbents.

Therefore, from the viewpoint of industrial organisation, the upstream industry organisation of credit reporting can affect banks' choice of entry modes, given that the elements characterising these systems determine the availability, the quality and the costs of access to crucial data by market participants. For instance, for cross-border credit reporting, reciprocity principles could be an obstacle: to avoid free-rider problems, credit registers require banks to supply their credit data concerning local borrowers (and sometimes national presence) as a condition for access to their data – a condition hard to meet for a foreign bank planning to enter a new market.¹⁴

As discussed above, banks can establish a presence in the target jurisdiction by establishing subsidiaries or branches. It can be argued that credit reporting as upstream information intermediation can have an impact on downstream competition among banks. If credit reporting affects the modes of entry of banks, it may well influence the intensity of competition among national providers. Different modes of entry will affect competition in varying ways. For example, entry through branching adds an additional player to the local incumbents, which is typically not the case for mergers, where ownership but not market structure changes (M&As involving more than one incumbent even reduce the number of competitors).

The above discussion shows that there are horizontal as well as vertical relations that arise from information sharing. Theoretically, financial service providers might use credit bureaus for the strategic foreclosure of international competitors. This issue has recently been on the agenda of

¹² See the ECB's Memorandum of Understanding on the Exchange of Information among National Central Credit Registers for the Purpose of Passing it on to Reporting Institutions (20 February 2003), ECB, Frankfurt.

¹³ As of October 2006, seven EU countries (Austria, Belgium, France, Germany, Italy, Portugal and Spain) had signed the MOU. The Czech Republic and Romania are interested in signing the MOU in 2009–10.

¹⁴ In the case of cross-border reporting, the Expert Group (European Commission) states that in the most simple configuration, the principle of reciprocity is fulfilled if a country (country A) shares credit data with another one (country B), provided that the latter shares credit data with country A or the credit registers of both countries are either prepared to or actually exchange credit data.

the European Commission. The Commission's inquiry stated that fee structures set by credit bureaus could weaken competition in retail banking through high joining fees, discriminatory volume-based transaction fees and high fixed-transaction fees. For instance, joining fees range from €0 to €75,000 in Europe, with the highest fees observed for surveyed bureaus where banks are the owners (European Commission, 2007(b), p. 33).¹⁵ Transaction fees also vary from €0 to €2, with an average of €0.46. Furthermore, partial data sharing occurs in two main situations:

- i) where there is low market coverage by the register, and
- ii) where information sharing is voluntary, institutions might have an incentive to strategically report incomplete information on their good clients to deter others from poaching them (Bouckaert & Degryse, 2006; Gehrig & Stenbacka, 2007).

Banks might have an incentive not to disclose their complete portfolio of borrowers. In this scenario, they might choose strategically to disclose only some information on their borrowers or only parts of their portfolio.

Cases of strategically incomplete reporting on borrowers have appeared in the US, where 14% of the consumers sampled had missing credit limits on one or more of their reported accounts and 47% had omissions that affected the credit records (Avery et al., 2004). Note that this would only be possible for private credit bureaus (and information exchange within associations). Strategic behaviour would not be possible within the network of public registers held by the central banks. The latter could punish such behaviour by providers by revoking the bank license.

Reporting to private credit bureaus, however, is largely voluntary as noted above. Hence, this arrangement could be more prone to strategic behaviour. Credit bureaus may be caught in a conflict of interest: while they want to guarantee information that is as complete as possible, banks are also their clients, whom they do not want to lose.

4.1 Horizontal relations

The exchange of market-sensitive information between competitors is considered a grey area of competition law located at the intersection of the legitimate exchange of business information and anti-competitive collusion (*Banker's Ideanet*, 2007). Horizontal relations arise where actual and potential competitors (located at the same level of the value chain) exchange knowledge on clients and potentially reduce market uncertainty with this exchange.¹⁶ Information exchanges can take place for different reasons, among them efficiency concerns, risk monitoring or collusion (Bouckaert & Degryse, 2006; Gehrig & Stenbacka, 2007). In general, such exchanges ought to be assessed in the light of their potential anti-competitive effects (Vives, 2006, 2007).

The European Commission (Obst, 2008) states that information sharing is a breach of Art. 81 of the EC Treaty if it reduces or abolishes uncertainty about market development and leads to a real or potential limitation of competition among companies. For instance, if financial institutions exchange information through an industry association, this could be regarded as 'concerted practice' under Art. 81(1) EC Treaty.

One example of association-based data exchange is in Italy (Consorzio per la Tutela del Credito). Other former associations have recently transformed into companies, such as ASNEF-Equifax in Spain, Schufa Holding AG in Germany and KSV1870 in Austria. In Belgium, the

¹⁵ Cost data are not available for a time series. The cost data provided by DG Competition are anonymised.

¹⁶ See the European Commission Notice – Guidelines on the applicability of Article 81 to horizontal cooperation agreements, OJ C 3, 6.1.2001.

Union Professionnelle du Credit transferred its data-sharing mechanism, the Mutuelle d'Information sur le Risque, to the central bank. Horizontally, such associations could be used for setting discriminatory access standards for foreign banks, which can increase costs for market entry. If databases are located at the upstream stage of the value chain, e.g. in an upstream company, anticompetitive vertical relations may arise.

In the past, the Commission adopted a block exemption regulation for the insurance sector, applied to certain agreements that might otherwise be found in breach of the competition law. This exemption expires in March 2010; currently the Commission is seeking consultation on renewal. The present exemption applies to the calculation or tables referring to risks, number of claims and total amounts payable (Capobianco, 2004, p. 1273).

In *Asnef-Equifax v. Ausbanc* (23 November 2006),¹⁷ the ECJ issued a clarification of circumstances in which competitors may exchange information regarding the creditworthiness of their clients without infringing EU competition law (see also Houwen, 2008). “The case was referred by the Spanish High Court to the ECJ for a ruling on whether information exchange of the type in issue breached Article 81(1) EC and whether such an agreement could be authorised by a national competition authority under Article 81(3) EC if implementation of the agreement could benefit consumers” (OECD, 2008, p. 125). In particular, it was stated that the assessment of compatibility of the system (in Spain) with EU law must be judged based upon individual circumstances, including the economic conditions in the relevant markets, the characteristics of the system, the purpose and conditions of access, and the kind of information exchanged (see Box 3).

Box 3. ECJ ruling on credit registers

The ECJ ruled that information exchange such as that at issue in Spain is in principle permissible if

- relevant markets are not highly concentrated,
- the system does not allow lenders to be identified, and
- the conditions of access to the system are not discriminatory.

At the same time, the judgment also stresses that for doubtful cases “there is no substitute for a rigorous analysis of the affected market in light of the case law and general guidance from the Commission and national competition authorities, before engaging in any potentially controversial activity such as information exchange” (Houwen, 2008, p. 108).

It was held by the Court that the uncertainty associated with lending to customers is removed through information sharing in a way *actually favouring* competition. Our econometric results appear consistent with this claim.

The ECJ left it to the national court to determine whether the conditions for an exemption under Art. 81(3) EC have been met, but stated that negative and positive effects of the arrangement must be balanced under Art. 81(3). In May 2006, the Council of Ministers approved a block exemption regulation for the exchange of information on non-performing debt.¹⁸ There are a

¹⁷ See the Judgment of the Court (Third Chamber) of 23 November 2006 in Case C-238/05, *Asnef-Equifax, Servicios de Informacion sobre Solvencia y Credito, SL v. Asociacion de Usuarios de Servicios Bancarios (Ausbanc)*, [2006] ECR I-11125.

¹⁸ See the Royal Decree 602/2006 of 19 May 2006 approving a block exemption regulation for certain categories of agreements for the exchange of information on non-performing debt (Official State Gazette No. 129 of 31 May 2006).

number of conditions that are to be fulfilled for the register to qualify for an exemption. For instance, if the three main providers have a combined market share of over 50%, the exemption cannot be applied, as the level of competition would be regarded as low.

4.2 Vertical relations

Vertical agreements refer to those between two or more undertakings, each of which operate at a different level of the value chain for the purpose of the agreement.¹⁹ These agreements arise where data is shared with a credit bureau, which provides data collection and analysis services as an input for downstream retail banking. Banks that do not have access to the data pooled upstream may experience a worsening of their risk prediction capacity, as stated. In large portfolios, this can quickly turn into loan losses in the millions. Such a risk may discourage entry or make outside banks more willing to acquire shares in local banks. Once owned or managed by dominant players, a credit bureau could be used as ‘concerted practice’ to raise rivals’ costs. This can occur on two levels: downstream for market newcomers in banking, but also upstream for rival credit bureaus that cannot obtain data from banks. For instance, in Germany, bank data is only pooled by the Schufa Holding AG and there are several other countries where only one bureau pools information on bank clients (see European Commission, 2009, p. 12). Access to this ‘bottleneck input’ (i.e. *bank credit* data) could be denied or made difficult for competitors. For anti-competitive vertical foreclosure, however, parties need to have market power at the stage of the value chain in question. The potential anti-competitive effects of information sharing is exemplified by a Mexican case, where in the 1990s, the Mexican Bank Association formed a private credit bureau (Buro de Credito) in partnership with D&B and TransUnion. The two firms that have attempted to set up competing credit bureaus have found it impossible to obtain information from the banks. Essentially, banks became vertically integrated with a monopolistic credit bureau with which they had an exclusivity deal (Jappelli & Pagano, 2000).

5. Theoretical and empirical insights on information sharing

5.1 Theory

A thriving theoretical literature on information sharing and credit market performance has developed. These theoretical works are surveyed in this section, as they are the background for the empirical analysis in this ECRI report. As a qualification, we note that most of these papers were published before the onset of the financial crisis and therefore do not focus on the latest developments in the markets.

5.1.1 Information sharing and credit market performance

One of the earliest papers on the interaction of credit markets, competition and information sharing is Jappelli & Pagano (1993). The authors show how information sharing can arise endogenously in an adverse selection model, when banks are local monopolies and borrowers are mobile across (state) borders. Information sharing allows banks to adequately price the risk of immigrants. If there is severe adverse selection, data sharing leads to higher volumes of lending. The authors show that information sharing is more beneficial the higher the borrower mobility, as the lower are the costs of such exchanges and the greater the number of participants.

¹⁹ See the European Commission Notice – Guidelines on vertical restraint, OJ C 291, 13.10.2000.

The effects of information sharing are also analysed in Padilla & Pagano (1997), who discuss a model in which entrepreneurs' success depends on the level of invested effort. Banks can share information on the borrower's type, which reduces their ability to lock-in borrowers, thereby increasing the latter's incentives to exert effort or invest. The authors present different cases of information transmission in the market, one of which is the existence of a credit bureau. One of their main results is that information exchange triggers fiercer bank competition and reduces future interest rates and bank profits, thereby increasing efficiency by encouraging borrowers' investment.²⁰

If banks retain an initial advantage in soft information, information sharing can raise current profits. Furthermore, in Padilla & Pagano (2000), default information on borrowers can serve as a discipline device, which raises the incentive to perform.²¹ In the regime without information sharing as well as one with full (positive–negative) information sharing, effort levels are inefficiently low. Effort levels can be adjusted when banks share only negative information. In our empirical section, we therefore account for different information-sharing regimes to test whether they have a differential impact on market contestability.

One of the main reasons information sharing is beneficial is that in the absence of exclusivity in lending relationships it allows banks to keep track of borrowers that borrow from many different banks and are at risk of becoming over-indebted. This is at the core of Bennardo, Pagano & Piccolo (2009). Over-borrowing raises default risk, as contractual externalities arise. In the authors' hidden action model, information sharing can compensate for a lack of creditor rights, as it allows creditors to monitor their borrowers and the credit market can reach full efficiency.

5.1.2 *Information sharing and bank competition*

The exchange of data on borrowers can have interesting effects, when viewed as an upstream activity that has an impact on downstream banks' pricing strategies, and thus on competition and market contestability – an issue we explore by studying variables for market concentration and competition in our econometric estimations. Jappelli & Pagano (1993) already extended the analysis to the effects of competition. They showed that once market entry costs decline for foreign banks, making local markets contestable, the benefits from information sharing decline for the banks. Market entry costs shelter banks from competition and increase the benefits from information sharing that they are able to capture. In a paper closely related in focus to this report, Bouckaert, Degryse & Van Cayseele (1995) present a two-period overlapping generations model with banks, borrowers and different types of credit registers. The main interest is the evolving market structure in the equilibrium in the presence of either a positive or a negative register. Similar to Cournot competition, banks maximise profits by choosing the optimal number of outlets. In the case of a negative register, fewer banks enter the market and banks have more outlets (Bouckaert, Degryse & Van Cayseele 1995, p. 138). In the case of a positive register, more banks enter the market, but banks have fewer outlets – i.e. a higher number of smaller banks emerges.

The intertwining of market structure in the banking industry and information asymmetries is also discussed by Dell'Ariccia (2001) and Hauswald & Marquez (2006), although without considering information sharing. Using a multi-period model of spatial competition, Dell'Ariccia (2001) shows that information asymmetries are an important determinant of market

²⁰ In our empirical section, we present evidence that supports this assertion.

²¹ This is also well discussed in Vercammen (1995), who shows that welfare arising from reputation effects declines with a lengthening of a borrowers' credit history.

structure. In his set-up, adverse selection generates endogenously ‘fixed costs of entry’ and thus different degrees of adverse selection correspond to different degrees of market concentration.

There is also an incentive for a bank to strategically disclose information on their borrowers to competitors to affect the rival’s entry into the segment of high-quality borrowers. In a duopoly and with two kinds of borrowers, banks can soften competition in the first period by disclosing information on their clients, who can now switch providers, but will incur switching costs in doing so. In Bouckaert & Degryse (2006), lenders strategically release information on a portion of the pool of borrowers. The unreleased pool becomes characterised by adverse selection, which can reduce the scale of entry by the rival. A related argument is developed in Gehrig & Stenbacka (2007).

From this literature, we derive that information sharing can be used for different purposes, either strategic–competitive ones or those related to credit risk reduction. In the first case, banks try to influence the scale of entry and competition intensity, whereas in the second, the chief concern is to screen out bad risks. Whether such exchanges increase or decrease competition in the next rounds depends entirely on the model set-up, such that theory does not allow clear-cut conclusions to be drawn. This is an important point, as we intend to inform the theoretical discussion by adding some empirical evidence.

5.1.3 *Bank entry modes with different information regimes*

To date, there seem to be very few theoretical works relevant to the interaction of information sharing and the banks’ choice of entry mode. Two previously mentioned exceptions are Bouckaert, Degryse & Van Cayseele (1995) and Dell’Ariccia (2001), the latter using European markets as an anecdotal example. There are, however, closely related papers. In this section, we briefly discuss the most important papers in our context.

Sengupta (2007), for example, models bank competition among asymmetrically informed principals facing 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 entrant’s success in gaining borrowers of lower risk depends on its ability to offer cheaper loans. This ability, in turn, increases with the entrant’s cost advantage. The author points out that better information *ex ante* (and stronger legal protections *ex post*) facilitates the entry of low-cost rivals. He also explains why foreign banks tend to serve larger firms, while domestic banks lend to riskier and more opaque market segments. The reason is that larger firms are more transparent, because they are subject to public reporting rules.

Unfortunately, we could not obtain data on bank entry into specific market segments to account empirically for this assertion. Still, as is generally observable in Europe, wholesale lending occurs on a cross-border basis, whereas retail lending markets remain fragmented and cross-border lending to households is in its infancy (European Commission, 2009; European Central Bank, 2009; Kleimeier & Sander, 2002).

Related work on industrial organisation investigates the trade-off between greenfield and acquisition entry. Raff et al. (2009 and 2006) present models in which a firm’s decision between greenfield and acquisition depends on the differences in the marginal costs of foreign and domestic firms. In general, it is assumed that a greenfield entrant produces at lower marginal costs than domestic firms, because of superior production technology (Müller, 2007), and that when entering through an M&A the entrant loses this cost advantage because it is constrained by use of the inferior production technology of the acquired firm. At the same time, it is assumed that there are huge, fixed market-entry costs in entering through greenfield investments.

Claeys & Hainz (2007) examine the impact of different entry modes on interest rates. They state that while governments pledge to liberalise their markets, they often restrict entry modes, for example, by preventing foreign banks from taking major stakes in domestic banks. One of their main assumptions is that while incumbent banks have better information on their previous clients, foreign banks have better screening technologies. They distinguish two forms of entry: greenfield investment versus acquisition.

While these authors are interested in how entry modes affect information distribution among foreigners and local banks, we turn this question around and ask how the extent and kind of existing data exchanges affect bank entry modes.²²

With an emphasis on emerging economies, Van Tassel & Vishwasrao (2007) develop a model to study the trade-off between greenfield investments and acquisitions, offering an explanation for how equilibrium acquisition price and mode of entry are linked to *ex post* competition in the credit market. They suggest that a low-cost foreign bank and an informed domestic bank have incentives to trade information endowments, where foreign banks pursue acquisition strategies over *de novo* entry in order to capture valuable information held by domestic banks. This is also one of our key assumptions. With reference to the above, it can be argued that the informational advantage of entry through either acquisition or greenfield investment hinges on potential customers being non-transparent.

Acquisition ought to be the dominant mode of entry in countries with insufficient information-providing institutions and a relatively large number of non-transparent potential borrowers. To the knowledge of the authors, there are no theoretical works specifically addressing the choice of entry mode in terms of branching and M&As under different information-sharing regimes. At this stage, we leave this for further research and turn to the empirical evidence that provides the background to this paper. In the next section, we concentrate on evidence of the empirical interaction of information sharing and credit market performance, and then describe our novel dataset in comparison with pre-existing ones used in the studies surveyed below.

5.2 Empirical evidence

An increasing number of authors empirically study the subject of information sharing and credit market performance. Many of them have shown that sharing information about a borrower's type and history is beneficial for the performance of credit markets. These studies concentrate on the cross-country or firm level.

5.2.1 *The impact on credit market performance*

Although the empirical analysis of information sharing and credit market performance is expanding, there is a limited number of such works. Some empirical evidence on the positive effects of information sharing is presented in some of the papers quoted in the theoretical section (e.g. Bouckaert, Degryse & Van Cayseele, 1995; Jappelli & Pagano, 1993), where the empirical results in general confirm the theoretical conclusions.

But there are additional empirical analyses that are of direct interest in our context. For instance, Djankov et al. (2007) explore with cross-sectional regressions and a sample of 129 countries the

²² Claeys & Hainz (2007) observe that foreign banks only enter markets if they are better organised in generating information on borrowers to undercut the domestic bank's lending rate. We state that screening technologies are only imperfectly exportable, and therefore M&A modes would be preferred if no adequate information exchange exists. They further state that competition is stronger when a foreign bank enters through a greenfield investment than by acquiring an existing bank. We include this observation in a modified form, by analysing whether information-sharing mechanisms affect market concentration ratios and competition indicators.

potential substitutability of credit registers and the protection of creditor rights in legal proceedings. Their results suggest that both the presence of credit registries and better creditor rights are associated with a higher ratio of private credit to GDP. Both private and public credit registries are positively associated with private credit in poorer countries, indicating a role for government in facilitating information sharing.

Bofondi & Gobbi (2006) discuss the interaction of informational barriers and market entry for 95 local Italian markets, which underlines the significance of information asymmetries between incumbents and entrants. For instance, these barriers contribute significantly to the entrants' higher share of defaulting loans. The default rate is lower for banks that enter with local branches in these markets (compared with players that lend from a position outside the local market). As a proxy for the 'knowledge of local markets', the authors take a bank's initial share of the local loan market. Since most of the banks are connected to a credit reporting system (which levels exogenous information asymmetries), this ought to reduce entry barriers – a fact we account for in this report.

Related literature, which is not discussed here in greater detail, also associates credit reporting with access to finance (the interested reader is referred to Galindo & Miller, 2001, and to Love & Mylenko, 2003).

5.2.2 Foreign bank participation and the choice to go abroad

Only a few studies analyse empirically the choice of banks to go abroad either by opening a branch or a subsidiary.²³ In general, these emphasise the role of corporate taxes, lower regulatory restrictions and the inefficiencies of the local banks. We have integrated some of the most important determinants (which are used by most authors) as controls in our multivariate regressions. Some papers have highlighted banks' decision to go abroad as being affected by advantages in processing information, owing to greater use of technology and specialised skills among other factors. For example, Claessens & van Hoeren (2008) (using bilateral data on bank ownership for 1995–2006) show that there is an institutional competitive advantage: for banks that are used to operating in environments with relatively high institutional quality, a high level of quality in the target market will positively impact on market entry compared with banks that do not operate in high-quality institutional environments.

In other papers, informational costs play a role as determinants of M&As. These costs are often understood as differences in language and culture. Other drivers are regulations and taxation, bank-specific variables, saturated home markets, better profit opportunities abroad and other macroeconomic factors (Hryckiewicz & Kowalewski, 2008; Buch & Lipponer, 2007; Berger et al., 2004; Focarelli & Pozzolo, 2001).

Hryckiewicz & Kowalewski (2008) study the determinants of entry in four local markets in Central Europe (the Czech Republic, Poland, Hungary and Slovakia) for the period 1994–2004. The main drivers are the distance between the host country and the foreign bank headquarters, the growth rate differentials between the home and host markets, and the origin of commercial laws in the home country, among others. Buch & Lipponer (2004), on the other hand, analyse the international activities of German banks. They are especially interested in the decision of whether banks conduct FDI versus exports of financial services. They focus on the period 1997–2000. They find that scale variables (at bank and country levels) are important as well as the provision of trade-related finance. Potential limits are cultural and geographical distance.

²³ A subsidiary is a separately incorporated and capitalised 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.

The effects of foreign bank participation in a host country's banking system is not well documented empirically, but there is some evidence of the positive effects of foreign bank participation in developing countries (Giannetti & Ongena, 2005; Martinez Peria & Mody, 2004). In particular, there are indications that on average, M&As are surpassed in terms of efficiency and cost of credit by greenfield banks.²⁴ Degryse et al. (2008) analyse the effects of foreign bank ownership on interest rates for transparent and opaque borrowers. They show that bank ownership and mode of entry have a large influence on banks' portfolio composition in terms of borrowers. Yet, after controlling for these differences, there is no impact of foreign bank ownership or mode of entry on lending rates.

Altogether, some stylised facts stand out from the above discussion (see also Buch & DeLong, 2008). At the bank level, the probability of becoming an acquirer in an international merger is positively linked to the size band of profitability of an institution. At the country level, mergers of banks are more common among large and developed economies with a similar background, whereas regulatory barriers can deter entry. Another important aspect that has not been formally analysed to the knowledge of the authors is political protectionism, whereby some EU governments (e.g. Italy and Poland) have intervened to avert international takeovers of national banks (for a discussion, see Carletti & Vives, 2008). Despite the expanding literature, the empirical impact of credit reporting systems on the modes of bank entry into foreign markets has not been studied so far (to the knowledge of the authors), nor have informational costs been investigated as a potential determinant of the expansion strategy of a bank.²⁵

6. Exposition of the dataset

Empirical research on information sharing and banking competition has not kept pace with theoretical developments. That being stated, there is now a noticeable trend towards greater sophistication in terms of the datasets and econometric techniques used. In the past, it has been standard to work with country-level information. Examples are Focarelli & Pozzolo (2001), Jappelli & Pagano (1993, 2002) and Bouckaert, Degryse & Van Cayseele (1995). Many of these studies use information from the World Bank's Survey on Credit Registers, which has been conducted since 1999 and is now partially integrated in the Doing Business Database.

Owing to the limited number of years for which data were available, most of the papers used country-level cross-sectional regressions rather than time series. In cross-sectional regressions, the determination of causality is a challenge, e.g. the difficulty is to disentangle the effect of whether more information sharing leads to more lending or if it is the other way round.

One of our key contributions has been building a cross-sectional time series dataset on credit registers, which also allows us to draw some (cautious) conclusions about causality through application of a difference-in-differences analysis. This approach enables the removal of most biases that could be the result of permanent differences among country groups.

Firm-level evidence, on the other hand, is presented in a rising number of papers (examples are Brown, Jappelli & Pagano, 2009 or Luoto, McIntosh & Wydick, 2007). In Brown, Jappelli &

²⁴ See also Degryse et al. (2008), Vo Thi & Vencappa (2008), Havrylchuk & Jurzyk (2006) and Majnoni et al. (2003).

²⁵ In the international finance literature, information costs refer to geographical distance as well as differences 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 kinds of information exchanged.

Pagano (2009), the authors investigate the impact of data sharing on credit market performance in Eastern Europe and the former Soviet Union. They use cross-sectional estimates and panel estimates performed on 5,717 firms from 24 countries. Altogether, they find positive effects from information sharing: the cost of credit is lower for firms, especially for opaque firms. These effects are stronger in countries with weak legal institutions. Further examples from a firm-level data survey, which we do not explicitly discuss, have been gathered by Love & Mylenko (2003). Finally, Brown & Zehnder (2006) undertake an experimental study, in which borrowers can or cannot repeatedly transact with lenders. In the latter case, credit reporting has little impact on market performance, but on trading structure and distribution, where it leads to fewer bank relationships.

The new dataset we have compiled merges data from the World Bank, the Heritage Foundation, the ECB, the SDC Platinum database and ECRI. The dataset is unique as we have gathered information on the EU-27 member states over the period 1990–2007 and included (and this is the novelty) information on credit reporting systems. Table 1 presents the variables that have been included in the dataset (and then used in our econometric analysis), with descriptions and data sources. Our dataset also allows us to work with a higher number of observations, depending on the variable (230–480 observations). In the past, much of the research on credit reporting was conducted with cross-country data and a low number of observations, which severely limits econometric analysis.

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 M&As per year from 1990 to 2007. The data on branches is based upon ECRI compilations from national central banks and the ECB Statistical Data Warehouse. More precisely, to find out the number of entries through branches for each country and year (a flow measure), and to make it comparable with the number of entries through M&As (a flow measure), we differentiated the number of branches (i.e. a stock measure) over two consecutive periods.

In the case of a negative variation, we assume zero entry. We are aware that this way of proceeding might not give the exact numbers of entries through branches. Two reasons justify the choice, however. First, when using branch variation over consecutive years (i.e. net entry through branches) we know the direction of the potential bias, i.e. underestimating the total number of entries through branches per year due to branch exits. Second, if we had compared the total number of branches with the total number of foreign subsidiaries (another stock variable at our disposal containing information on M&As), we would have also mistakenly captured some entries through *de novo* investments.

The credit reporting systems were captured on two dimensions: their existence in the form of public and private credit registers as well as their ‘quality’ in terms of the kinds of information they collect. The variable we used for the regressions indicate the presence of a private credit bureau in the period 1990–2007. It equals 1 if a private bureau is operating and 0 otherwise, such that we capture the introduction of a credit bureau.

A private credit bureau is defined as a company that collects and distributes credit information on consumers or businesses (or both). We have more than 400 observations on this variable. Information on public credit registers were collected from the national central banks. In addition, we collected the number of large and known credit bureaus in the individual countries (we excluded small, niche credit bureaus).

Table 1. Variable, description and sources

| Variable | Description and source |
|--|--|
| Branches | <p>This variable is the number of branches of foreign credit institutions in each EU-27 member state for the period 1990–2007. A branch is an unincorporated entity that is established by a company legally incorporated in another country. It has no independent legal status and is wholly owned by its parent company. Branches of foreign credit institutions may offer some or all of the services of the parent institution. All branch offices set up in one country by the same institution constitute a single branch.</p> <p><i>Source:</i> Authors' compilation from national authorities and the ECB Statistical Data Warehouse.</p> |
| M&As | <p>This variable counts the number of M&As per year for the period 1990–2007. Domestic and cross-border M&As are separately taken into account.</p> <p><i>Source:</i> SDC Platinum database.</p> |
| Private credit bureaus (Second) | <p>This indicates the presence of a private credit bureau in the period 1990–2007. It equals 1 if a private bureau is operating and 0 otherwise. A private credit bureau is defined as a company that collects and distributes credit information on consumers or businesses (or both). The variable 'second' accounts for the second large credit bureau to be introduced in the market.</p> <p><i>Source:</i> ECRI.</p> |
| Public credit register | <p>This variable is the presence of a public credit register in the period 1990–2007. It equals 1 if a public register is operating and 0 otherwise. Public registers are mostly established within a country's central bank or supervisory authority, and in most cases, they store credit information on consumers and companies.</p> <p><i>Source:</i> ECRI.</p> |
| Negative information (Negative_Priv and Negative_Pub) | <p>According to the EGCH, negative data generally consists of statements about defaults or arrears and bankruptcies (i.e. facts of contractual non-compliant behaviour). It may also include lawsuits, liens and judgments obtained from courts or other sources. Negative_Pub (Negative_Priv) is 2 if a private credit bureau (a public register) reports negative data for both consumers and firms, 1 if the register reports negative data for either consumers or firms, and 0 if it does not provide negative information. The time series covers the period 1990–2007.</p> <p><i>Source:</i> ECRI.</p> |
| Positive information (Positive_Priv and Positive_Pub) | <p>According to the EGCH, positive information generally consists of assets and liabilities as well as guarantees. It sometimes includes outstanding types of credit, the amounts of loans and repayment patterns. Positive_Priv (Positive_Pub) is 2 if a private credit bureau (a public register) reports positive data on both consumers and firms, 1 if it reports positive data on either consumers or firms, and 0 if they do not provide positive information. The time series covers 1990–2007.</p> <p><i>Source:</i> ECRI.</p> |

Table 1. cont'd.

| | |
|--|--|
| Number credit bureaus (No_Private_Bureau) | This entails the number of the dominant (largest) private-credit bureaus in each country. The time series covers 1990–2007. <i>Source:</i> ECRI. |
| Concentration ratio 3 largest banks (CR3) | Concentration is the ratio of the three largest banks' assets to total banking sector assets. The time series covers 1990–2007. <i>Source:</i> World Bank (A New Database on Financial Development and Structure). |
| Gross domestic product per capita (p_gdp) | This variable is country per capita GDP measured at current prices. The time series covers 1990–2007. <i>Source:</i> IMF. |
| Return on assets (ROA) | ROA represents bank net income over total assets. For most countries, this information spans the period 1990–2007. <i>Source:</i> World Bank. |
| Return on equity (ROE) | ROE is bank net income over equity. For most of the countries in the sample, this information covers the period 1990–2007. <i>Source:</i> World Bank. |
| Net interest margin (NIM) | NIM is the difference between bank interest income and the amount of interest paid out to deposits relative to total assets. For most of the countries in the sample, this information covers 1990–2007. <i>Source:</i> World Bank. |
| Population | This variable refers to country population. The time series covers 1990–2007. <i>Source:</i> IMF. |
| Inflation | This variable represents average consumer prices (annual percentage change). The time series covers 1990–2007. <i>Source:</i> IMF. |
| Legal origin | Legal origin is 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. The time series covers 1990–2007. <i>Source:</i> Djankov et al. (2007) and the CIA World Factbook (2008). |
| Credit_Bank | This variable is the amount of domestic credit provided by the banking sector over GDP. The time series covers 1990–2007. <i>Source:</i> World Bank. |
| Overall freedom | Overall freedom 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 and labour freedom. The time series covers 1995–2007. <i>Source:</i> Heritage Foundation. |

The information quality (of positive or negative information) is of great importance when analysing banking competition and credit reporting. We applied the definitions used by the Expert Group on Credit Histories for these two kinds of information. Overall, this variable does not vary a lot, as there are not many countries that have changed their systems of reporting information. We collected information on both the reporting of positive information (on companies and individuals) and the reporting of negative information (on companies and individuals). To capture intervening variables that could be of consequence, we collected information on GDP, inflation and population (from the IMF) as well as legal origin, overall economic freedom and concentration of the largest banks from the standard sources (Table 2).

We have undertaken 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.

Table 2. Summary statistics of the dataset

| Variable | Mean | Std. Dev. | N |
|---------------------|--------|-----------|-----|
| branches_target | 1.202 | 2.087 | 391 |
| merger_target_cross | 2.593 | 3.539 | 486 |
| PRIVATE_BUREAU | 0.877 | 0.329 | 486 |
| PUBLIC_REGISTER | 0.383 | 0.487 | 486 |
| SECOND | 0.788 | 0.409 | 486 |
| positive_priv | 1.206 | 0.723 | 486 |
| negative_priv | 1.492 | 0.706 | 486 |
| positive_pub | 0.644 | 0.877 | 486 |
| negative_pub | 0.504 | 0.824 | 486 |
| no_PRIVATE_BUREAU | 3.167 | 2.062 | 486 |
| p_gdp | 19.893 | 10.688 | 474 |
| inflation | 0.144 | 0.646 | 469 |
| population | 18.196 | 22.172 | 474 |
| English | 0.148 | 0.356 | 486 |
| French | 0.37 | 0.483 | 486 |
| German | 0.37 | 0.483 | 486 |
| Scandinavian | 0.111 | 0.32 | 486 |

Source: For data description and sources, see Table 1.

7. Econometric analysis

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. We perform both univariate and multivariate analyses looking at several different indicators of concentration and competition *before* and *after* the introduction of a credit register. We also take into account the potential role of diverse kinds of information shared among credit bureaus (i.e. positive or negative on consumers or firms). Finally, we check the robustness of our results by performing various regressions, paying attention to the nature of our dataset (i.e. time-series cross-section dataset).

Difference-in-differences analysis is an econometric technique that measures the effect of a ‘treatment’ or change (e.g. an event such as the establishment of a credit bureau) at a given period in time. For analysing the effect, the countries are separated in a treatment group and a control group (where the event has not taken place). The effects can be measured by a before–after comparison of the means in the treatment group and by subtracting the mean of the control

group. Groups can also be established along some other characteristics, such as a high or low concentration of a banking industry in a country.

The strength of this technique is that it is not a simple *before–after comparison*. By subtracting the mean of the control group, all other changes that took place at the same time in both groups²⁶ (and that are unrelated to the establishment of a credit register) are subtracted. This enables us to draw better conclusions about the causes of effects compared with simple cross-country regressions.

7.1 Univariate analysis

7.1.1 Impact of credit reporting: 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 entries through branches and various indicators of market concentration and competition. To measure the share of entries into foreign markets through branches, we compute the share of branches in the following way:

$$\text{Entry_ratio} = \text{Tot Branch Entry} / (\text{Tot Branch Entry} + \text{Tot M\&As Entry}) \quad (1)$$

In equation (1), the total number of cross-border entries in the parentheses consists of the total number of cross-border mergers and cross-border entries through branches. To measure variations in the market structure before and 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. As indices of market structure do not always capture the degree of competition in banking markets (see Claessens & Laeven, 2004), we use as proxy indicators of competition bank net interest margin (NIM), return on assets (ROA) and return on equity (ROE), and bank overhead costs over total assets.

To perform a difference-in-differences analysis, two groups of countries have to be identified: a treatment and a control group. Similar to Djankov et al. (2007), our treatment group comprises countries that introduced either a private credit bureau or a public register in the period of the analysis, i.e. from 1990 to 2007. To guarantee sufficient variation in the data in this univariate analysis of private bureaus, we use as a reference date the year of the introduction of the second private bureau in each country. Indeed, for many countries the first private bureau was introduced before 1990 or in the years just after. Moreover, for private bureaus, we believe that the introduction of a second register may represent an important variation in the competitive structure of the credit reporting system. This exercise therefore captures 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 entries through branches, we further split the sample into low- and high-concentration country groups according to the value of the *CR3* ($CR3 > / < 60\%$).²⁷ As a matter of definition, we assume that markets with a *CR3* above 60% are concentrated. We then compare the difference before and 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. In line with the ECJ’s analysis,

²⁶ The technique assumes that both groups are homogenous.

²⁷ The results are substantially analogous using a threshold of 50%.

we would expect a positive difference-of-the-differences, that is, fewer entries through branches after the introduction of a credit register in more highly concentrated markets.²⁸

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 let $\overline{\Delta Entry_ratio(low_conc)}$ be the average of the change in the 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, i.e.

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

In equation (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 systematic differences in concentration between the two groups. To investigate the effects of the introduction of a credit register on the concentration index *CR3*, the control group consists of countries that did not introduce a public register in a five-year window around the year of the reform in the treated country. For instance, Bulgaria introduced a public register in 1998. The control group comprises all the countries that did not introduce a public register from 1993 to 2003.²⁹

For a country introducing a private bureau, we follow the same procedure. We choose 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. Owing to low cross-country variability, for the private credit bureau variable this would imply a control group of inferior quality. Furthermore, the five-year time window allows comparability with the results of Djankov et al. (2007). Still, we check the results for different control-group and time-window specifications, and find that the 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 three 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 $\Delta CR3(control)$ 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

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

In equation (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.

²⁸ As mentioned earlier, in its analysis of the potential anti-competitive effects of data sharing, the ECJ noted that information exchange should be pro-competitive if relevant markets are not highly concentrated.

²⁹ These are Cyprus, Estonia, Hungary, Malta and Poland (when using all the new EU member states). When all member states are used, the group consists of Austria, Belgium, Cyprus, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Malta, the Netherlands, Poland, Portugal, Spain, Sweden and the UK.

7.1.2 Results of the univariate analysis

The results from the univariate difference-in-differences analysis are consistent with the hypothesis that the introduction of a credit register has an impact on bank cross-border entry mode. Table 3 reports the average effects on branch share, separately for public and private registers, where countries have been grouped according to high and low levels of concentration. After the introduction of a public credit register, we can observe a variation in the share of entries through branches that is statistically significant: the share of entries 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 the 1% level). To see whether there are any differences related to accession to the EU, we additionally present results for the new EU member states alone.

A similar pattern can be observed for the introduction of a private credit bureau (see also Table 3). In this case, we can observe a positive effect on entry through branches (+20% significant at the 10% level) where the sample comprises all countries. There is an even greater positive effect when it comprises only new member states (+50% significant at the 5% level). In line with the ECJ's analysis, these results tentatively suggest that we can observe a higher rate of entry through branches after a credit register is introduced in countries with a low level of concentration.

Table 3. Effects on branching after the introduction of a credit register

| % Branches | Before | | After | | $\Delta\%$ Branches |
|--------------------|------------------------|------|----------|------|---------------------|
| | Public register | | | | After-Before |
| All countries | N | | N | | |
| 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 | N | | N | | |
| Low concentration | 16 | 0.14 | 20 | 0.29 | 0.15* |
| High concentration | 61 | 0.44 | 38 | 0.29 | -0.15* |
| Difference | -0.30*** | | 0.00 | | 0.30*** |
| | Private bureau | | | | After-Before |
| All countries | N | | N | | |
| 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 | N | | N | | |
| Low concentration | 15 | 0.10 | 40 | 0.29 | 0.19*** |
| High concentration | 2 | 0.75 | 111 | 0.44 | -0.31 |
| Difference | -0.65*** | | -0.15*** | | 0.50** |

Notes: This table reports the average effects (difference-of-the-differences) of the introduction of a credit register on the share of entries through branches ($\Delta\%$ branches). Countries have been grouped according to high (>60%) and low levels of concentration (<60%), so that the average difference in the high-concentration group (after–before) is subtracted from the average difference in the low-concentration group (after–before). For data descriptions, see Table 1. Asterisks denote significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Sources: For data sources, see Table 1.

These results do not arise because we observed more mergers in more highly concentrated markets or because of the way we compute our indicators. Indeed, by looking separately at entries through branches and mergers as shown in Table 4, we can also observe an absolute number of mergers that is higher in less concentrated markets compared with highly

concentrated markets. (The reverse is also true for branches – see for example the top left-hand cell for all the countries with the presence of a private bureau.)

Table 4. Branches and mergers after the introduction of a credit register

| Concentration | Private bureau | | Public register | |
|--------------------|----------------|---------|-----------------|---------|
| | Branches | Mergers | Branches | Mergers |
| All countries | | | | |
| Low concentration | 0.59* | 2.34** | 1.27*** | 1.11* |
| High concentration | 0.71** | 1.93*** | 0.26 | 1.40*** |
| Difference | -0.11 | 0.41 | 1.01*** | -0.29 |
| New members | | | | |
| Low concentration | -0.98 | 4.07 | 1.04** | -0.91 |
| High concentration | 0.23 | 1.47 | -0.05 | 1.19 |
| Difference | -1.21 | 2.60*** | 1.09** | 2.10* |

Notes: Table 4 reports the average effects (difference-of-the-differences) of the introduction of a credit register, separately for branches and mergers. Countries have been grouped according to high (>60%) and low levels of concentration (<60%). The average effects are obtained by subtracting the average difference in the high-concentration group from the average difference in the low-concentration group. For data descriptions, see Table 1. Asterisks denote significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Sources: For data sources, see Table 1.

The important role of a public register is confirmed in Table 5, where we analyse the variation in the concentration index *CR3*. To check robustness, we additionally allowed only new EU member states as a 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 the 1% level), when the control group consists of the EU-27. It is -10% (significant at the 1% level) when using only new member states in the control group. For a private credit bureau, the direction of the effect is analogous (although not significant).

Table 5. CR3 after the introduction of a public register and a private bureau

| CR3 | Before | | After | | ΔCR3 |
|----------------|-----------------|---------|-------|---------|--------------|
| | Public Register | | | | After-Before |
| | N | | N | | |
| Treated | 36 | 0.76 | 34 | 0.65 | -0.11*** |
| Control EU 27 | 341 | 0.69 | 282 | 0.70 | 0.01 |
| Difference | | 0.07*** | | -0.05 | -0.12*** |
| Control New EU | 150 | 0.71 | 100 | 0.70 | -0.01 |
| Difference | | 0.05** | | -0.05 | -0.10*** |
| | Private Bureau | | | | After-Before |
| | N | | N | | |
| Treated | 31 | 0.77 | 57 | 0.74 | -0.03 |
| Control EU 27 | 285 | 0.69 | 288 | 0.71 | 0.02* |
| Difference | | 0.08** | | 0.03*** | -0.05 |
| Control New EU | 140 | 0.68 | 104 | 0.69 | 0.01 |
| Difference | | 0.09** | | 0.05** | -0.04 |

Notes: This table reports the average effects (difference-of-the-differences) of the introduction of a credit register on the concentration index (ΔCR3). Countries have been grouped according to the date of the introduction of the credit register. In the treated group, there are countries that introduced a credit register in the period 1990–2007, whereas in the control group there are countries that did not introduce a credit register in a five-year window around the year *t*, in which the treated country introduced the credit register. Each treated country has its control group. The average effect is obtained by subtracting the average difference of the control group from the average difference in the treatment group. To deal with any differences among countries related to accession to the EU, a second control group was constructed that only uses new member states. For data descriptions, see Table 1. Asterisks denote significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Sources: For data sources, see Table 1.

The results for competition indicators such as ROA or ROE (see Tables 6 and 7) are largely consistent with the hypothesis of an intensification of competition after the introduction of a credit register. The measures for profitability are expected to decline (ROA and ROE) as well as the NIM.

Table 6. Other competition indicators before–after the introduction of a private bureau

| Indicator | Concentration | Δ Indicator | |
|-----------------------|---------------------|--------------------|-----------|
| | | EU 27 | New Eu |
| Net Int Margin | Low conc | 0.014** | -0.068** |
| | High conc | -0.018*** | -0.006 |
| | Diff of diff | 0.032*** | -0.06*** |
| Roe | Low conc | -0.027* | 0.02 |
| | High conc | -0.059*** | -0.05* |
| | Diff of diff | 0.031 | 0.07 |
| Roa | Low conc | 0.01** | 0.079 |
| | High conc | -0.008*** | -0.010*** |
| | Diff of diff | 0.019*** | 0.089*** |
| Overhead costs/Assets | Low conc | 0.013** | -0.067** |
| | High conc | 0.002 | 0.015*** |
| | Diff of diff | 0.011* | -0.082*** |
| Costs/Income | Low conc | 0.115*** | 0.029 |
| | High conc | 0.136 | 0.201*** |
| | Diff of diff | -0.021 | -0.173*** |

Notes: This table reports the average effects (difference-of-the-differences) of the introduction of a private bureau on the NIM, ROE, ROA, overhead costs over total assets and costs over income. Countries have been grouped according to high (>60%) and low levels of concentration (<60%). The average effect is obtained by subtracting the average difference in the high-concentration group from the average difference in the low-concentration group. For data descriptions, see Table 1. Asterisks denote significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Sources: For data sources, see Table 1.

Although the impact of a private credit bureau on the 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 NIMs (-1.8%), ROE (-5.9%) and ROA (-0.08%), although again, these are most notable in highly concentrated markets.

Competition indicators are also of interest in Table 7. In general, these descriptive results suggest that both types of credit registers may have an impact – not only on the modes of bank entry, but also on the market structure and level of competition.

For a more sophisticated analysis, 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.

Table 7. Other competition indicators before–after the introduction of a public register

| Indicator | Concentration | Δ Indicator | |
|-----------------------|---------------------|--------------------|-----------|
| | | EU 27 | New Eu |
| Net Int Margin | Low conc | 0.003 | -0.018*** |
| | High conc | -0.007*** | -0.010*** |
| | Diff of diff | 0.010*** | -0.008 |
| Roe | Low conc | -0.0199* | -0.006 |
| | High conc | -0.034** | -0.023 |
| | Diff of diff | 0.014 | 0.017 |
| Roa | Low conc | 0.001 | 0.005 |
| | High conc | -0.004*** | -0.006** |
| | Diff of diff | -0.021 | -0.001 |
| Overhead costs/Assets | Low conc | 0.0016 | -0.019*** |
| | High conc | 0.0017 | 0.005 |
| | Diff of diff | -0.0001 | -0.024*** |
| Costs/Income | Low conc | 0.105*** | -0.063 |
| | High conc | 0.102*** | 0.122 |
| | Diff of diff | 0.003 | -0.185*** |

Notes: This table reports the average effects (difference-of-the-differences) of the introduction of a public register on the NIM, ROE, ROA, overhead costs over total assets and costs over income. Countries have been grouped according to high (>60%) and low levels of concentration (<60%). The average effect is obtained by subtracting the average difference in the high-concentration group from the average difference in the low-concentration group. For data descriptions, see Table 1. Asterisks denote significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Sources: For data sources, see Table 1.

7.2 Multivariate analysis

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 also affect 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 kinds of information shared by a credit register.

We study the effects of different features of credit reporting systems on the total number of entries through branches, and separately on mergers, in each country and year, as well as on the share of branches among total entries. Next, we present the impact of credit reporting systems on bank competition (to measure bank competition, we use the *NIM* variable). To study the number of entries through branches and mergers, and to account for the two country groups (new member states and the EU-15), we rely on a random coefficient Poisson model.³⁰ This approach allows us to address the dependence within groups of countries, while taking into account that the dependent variable of the model is a non-negative integer. In addition, it allows us to assume a differential impact of the two types of credit registers in the two country groups. More precisely, the model is obtained by specifying the expected number of branches or mergers (μ_{ij}) in country i in group j (with j =EU-15, new EU) with a private/public register random slope (ξ_j), that is

³⁰ The Poisson model is a standard model in econometrics. It is used to model count data and assumes that the dependent variable has a Poisson distribution.

$$\begin{aligned} \ln(\mu_{ij}) &= \beta_1 \text{PRIVATE_BUREAU}_{ij} + \beta_2 \text{PUBLIC_REGISTER}_{ij} \\ &+ \beta_3 X_{ij} + \xi_{1j} \text{PRIVATE_BUREAU}_{ij} + \xi_{2j} \text{PUBLIC_REGISTER}_{ij} \\ &= (\beta_1 + \xi_{1j}) \text{PRIVATE_BUREAU}_{ij} + (\beta_2 + \xi_{2j}) \text{PUBLIC_REGISTER}_{ij} + \beta_3 X_{ij} \end{aligned} \quad (4)$$

where $\text{PRIVATE_BUREAU}_{ij}$ in (4) is equal to 1 in the years after the introduction of a private credit bureau (in country i of group j) and $\text{PUBLIC_REGISTER}_{ij}$ is equal to 1 in the years after the introduction of a public register and 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 the years after the introduction of the second private bureau (denoted as *SECOND*), the number of private credit bureaus (*no_private_bureau*), and four indicators summarising 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. This variable is introduced to be in line with the univariate difference-in-differences analysis where we use it to account for the problem that insufficient variability exists for this analysis, if using the date of the introduction of the first register. *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, to 1 if it reports positive information for either consumers or firms and to 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, to 1 if the register reports negative information for either consumers or firms and to 0 if the register does not provide negative information. Table 8 reports correlations among the variables. A correlation coefficient is a number that can vary between -1 and 1, which measures the degree to which two variables are linearly related. This coefficient is 1 if there is a perfect linear relationship with a positive slope between the two variables. Except for *Positive_Pub* (which contains almost the same variability as the *Public Register* dummy), these variables seem to provide diverse information on the structure of credit reporting systems.

Table 8. Correlation coefficients

| | 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 |

Sources: For data descriptions and sources, see Table 1.

Tables 9 and 10 report the results for a 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).³¹ Therefore, in the Poisson model, a coefficient greater than 1

³¹ This is the latest confirmed the random coefficient model.

suggests a positive effect (for example, 1.22 means +22%), whereas a coefficient less than 1 suggests a negative effect (for example, 0.60 means -40%).

The best way to interpret these estimations is to form intervals within which 95% of the slopes are expected to lie (Rabe-Hesketh & Skrondal, 2008). For instance, the coefficient on *PRIVATE_BUREAU* for sharing negative information on consumers and firms is equal to $0.29 \pm 1.96 \cdot 0.16 + 1.43$, where 0.16 is $sd(PRIVATE_BUREAU)$.³² That is, the effect of the introduction of a private bureau is expected to lie between 1.41 and 1.74, meaning 41% and 74% in terms of branches. The overall impact of a public register is also positive and significant (see Table 9).³³

For mergers, on the other hand, the effect of a public register sharing positive information is negative and significant at the 5% level, whereas a similar negative impact comes from the introduction of a private bureau sharing negative information. A coefficient greater than 1 for the variable on the number of major private bureaus also suggests that the greater the number of major private bureaus, the higher the number of cross-border bank mergers.

The results are confirmed by adding other country control variables, with the sole exception of the variable on number of major private bureaus in the random Poisson model for mergers. Other controls are the country's legal origin of commercial laws (German, French, English or Scandinavian) and a country's per-capita GDP, inflation and population (column b in Table 9).

A country's legal origin is an important determinant of both creditor rights and private credit (Djankov et al., 2007; La Porta et al., 1997; Levine, 1999), whereas better macroeconomic conditions make larger commitments less risky (i.e. entry through branches).

With the country's population, we control for different market size. Most of the controls are significant, with the expected direction of the effect associated with them. Finally, to account for a country's institutional environment, we add in column c of Table 9 the Index of Economic Freedom (by the Heritage Foundation and the *Wall Street Journal*), which is the average of 10 scored economic freedoms (such as fiscal freedom, financial and banking freedom and government size) and domestic credit provided by the banking sector as a percentage ratio of GDP. Despite obtaining a smaller sample (the Index is available only from 1995 onwards), the results are practically unchanged. One would perhaps have expected a positive effect of the freedom variable, which we do not find.

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 entries through branches – is a censored variable (that is partly continuous with a positive probability mass at zero). Table 11 presents the results for the Tobit model. The reported estimations are marginal effects computed at the mean level for continuous variables and for a discrete change for dummy variables. Table 11 also shows the marginal effects. Overall, these regressions seem to suggest a positive role of private credit bureaus in affecting the share of entries through branches (generally the effect of a credit bureau is positive and significant). These regressions, however, do not provide strong indications. In the next section, we deal with other data problems that may affect the results.

³² The term 'sd' refers to the standard deviation.

³³ These results are strongly confirmed when solely using observations for which the number of branches is greater than zero, in order to control for an excessive number of zeros compared with the Poisson distribution.

Table 9. Estimation results: Random coefficient Poisson (branches)

| | a | b | c |
|--------------------------------------|----------------------|----------------------|----------------------|
| PRIVATE_BUREAU | 0.2883*** (0.097) | 0.3311*** (0.137) | 0.1773*** (0.109) |
| PUBLIC_REGISTER | 0.6373 (0.255) | 0.7476 (0.368) | 0.8018 (0.468) |
| SECOND | 0.9289 (0.249) | 1.0196 (0.315) | 2.4538* (1.130) |
| positive_priv | 0.9546 (0.123) | 1.0995 (0.161) | 1.0818 (0.181) |
| negative_priv | 1.4355** (0.224) | 1.5966** (0.298) | 2.1294*** (0.496) |
| positive_pub | 1.2150 (0.196) | 1.1526 (0.193) | 1.188 (0.235) |
| negative_pub | 1.3812*** (0.139) | 1.2723 (0.211) | 1.0561 (0.193) |
| no_PRIVATE_BUREAU | 1.2014*** (0.043) | 1.086 (0.076) | 1.0688 (0.087) |
| p_gdp | | 1.0153** (0.007) | 1.0476*** (0.012) |
| inflation | | 1.0529 (0.090) | 1.0019 (0.097) |
| population | | 1.0068* (0.004) | 1.0042 (0.005) |
| English | | 0.3816*** (0.109) | 2.6946 (2.518) |
| French | | 0.5135** (0.157) | 2.5944 (2.157) |
| German | | 0.4769** (0.161) | 2.0028 (1.774) |
| Scandinavian | | 0.8112 (0.270) | 3.9955 (3.398) |
| CREDIT_BANK | | | 1.0021 (0.002) |
| OVERALL_FREEDOM | | | 0.9544*** (0.014) |
| sd(PRIVATE_BUREAU) | 0.1574** (0.116) | 0.0887 (0.141) | 0.3253 (0.243) |
| sd(PUBLIC_REGISTER) | 0.3011* (0.192) | 0.4182 (0.256) | 0.5269 (0.327) |
| cov(PUBLIC_REGISTER, PRIVATE_BUREAU) | 1.00 0.001 | 0.0002 (0.330) | 0.0001 (0.085) |
| ll | -671.1202 | -585.1088 | -456.9505 |
| N | 391 | 383 | 308 |

Notes: The dependent variable is the number of branches in each country and year. The random Poisson model is a mixed-effects model that takes into account that the dependent variable is a non-negative integer and there are two groups of countries (new member states and the EU-15). The coefficients can be interpreted as the log of the ratio of the expected counts (incidence-rate ratio). A coefficient greater than 1 suggests a positive effect (for example, 1.38 means +38%), whereas a coefficient less than 1 suggests a negative effect (for example, 0.63 means -37%). For data descriptions, see Table 1. The term *sd* is the standard deviation, *N* is the number of observations, and a, b and c denote the different models that were estimated. Asterisks denote significance levels: * p<0.10, ** p<0.05, *** p<0.01.

Sources: For data sources, see Table 1.

Table 10. Estimation results: Random coefficient Poisson (mergers)

| | a | b | c |
|--------------------------------------|----------------------|----------------------|----------------------|
| PRIVATE_BUREAU | 1.2217 (0.239) | 1.171 (0.339) | 0.9975 (0.349) |
| PUBLIC_REGISTER | 0.7869 (0.233) | 0.5386** (0.151) | 0.3517*** (0.098) |
| SECOND | 1.2779 (0.222) | 2.3276*** (0.511) | 2.2612*** (0.549) |
| positive_priv | 1.1421 (0.107) | 1.4451*** (0.142) | 1.2921** (0.143) |
| negative_priv | 0.6037*** (0.057) | 0.8757 (0.092) | 0.7627** (0.087) |
| positive_pub | 0.7947** (0.074) | 0.9009 (0.097) | 0.9971 (0.122) |
| negative_pub | 1.6667*** (0.095) | 1.2172 (0.149) | 1.3341*** (0.122) |
| no_PRIVATE_BUREAU | 1.3443*** (0.031) | 0.8993*** (0.036) | 1.0093 (0.041) |
| p_gdp | | 1.0132** (0.006) | 1.0158*** (0.006) |
| inflation | | 0.4361*** (0.115) | 0.8552 (0.119) |
| population | | 1.0277*** (0.002) | 1.0222*** (0.002) |
| English | | 0.4880*** (0.109) | 0.6281 (0.350) |
| French | | 0.7326 (0.180) | 0.9475 (0.472) |
| German | | 0.6405 (0.209) | 0.9351 (0.472) |
| Scandinavian | | 0.3473*** (0.091) | 0.4162* (0.218) |
| CREDIT_BANK | | | 0.9985 (0.001) |
| OVERALL_FREEDOM | | | 1.0004 (0.008) |
| sd(PRIVATE_BUREAU) | 0.0647*** (0.060) | 0.1394 (0.172) | 0 (0.041) |
| sd(PUBLIC_REGISTER) | 0.3226** (0.175) | 0.0983* (0.133) | 0 (0.065) |
| cov(PRIVATE_BUREAU, PUBLIC REGISTER) | 1.00 (0.001) | -1 (0.207) | -0.0136 (0.001) |
| ll | -1157.783 | -1017.749 | -746.5485 |
| N | 486 | 469 | 335 |

Notes: The dependent variable is the number of mergers in each country and year. The random Poisson model is a mixed-effects model that takes into account that the dependent variable is a non-negative integer and there are two groups of countries (new member states and the EU-15). The coefficients can be interpreted as the log of the ratio of the expected counts (incidence-rate ratio). A coefficient greater than 1 suggests a positive effect (for example, 1.22 means +22%), whereas a coefficient less than 1 suggests a negative effect (for example, 0.60 means -40%). For data descriptions, see Table 1. The term *sd* is the standard deviation, *N* is the number of observations, and a, b and c denote the different models that were estimated. Asterisks denote significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Sources: For data sources, see Table 1.

Table 11. Estimation results (dependent variable: % of branches)

| | a | b | c |
|-------------------|-----------|-----------|-----------|
| PRIVATE_BUREAU | -0.5585* | -0.6989* | -1.1516** |
| | (0.315) | (0.381) | (0.494) |
| PUBLIC_REGISTER | -0.4394 | -0.0502 | -0.0183 |
| | (0.442) | (0.356) | (0.408) |
| SECOND | 0.0193 | -0.0839 | 0.1362 |
| | (0.269) | (0.258) | (0.343) |
| positive_priv | -0.0288 | -0.1719 | -0.1658 |
| | (0.176) | (0.142) | (0.166) |
| negative_priv | 0.5260*** | 0.3717** | 0.5492*** |
| | (0.181) | (0.175) | (0.204) |
| positive_pub | 0.1439 | 0.1290 | 0.1095 |
| | (0.206) | (0.166) | (0.183) |
| negative_pub | 0.0957 | 0.0857 | 0.1139 |
| | (0.148) | (0.133) | (0.146) |
| no_PRIVATE_BUREAU | -0.0395 | 0.0351 | 0.0224 |
| | (0.058) | (0.066) | (0.074) |
| p_gdp | | -0.0007 | 0.0173* |
| | | (0.006) | (0.009) |
| inflation | | 0.0915 | 0.0568 |
| | | (0.079) | (0.082) |
| population | | -0.0055 | -0.0057 |
| | | (0.004) | (0.004) |
| English | | 0.6697** | 1.6235* |
| | | (0.280) | (0.830) |
| French | | 0.2732 | 1.0573 |
| | | (0.289) | (0.746) |
| German | | 0.3332 | 1.2258 |
| | | (0.268) | (0.779) |
| Scandinavian | | 0.7867** | 1.6610** |
| | | (0.332) | (0.773) |
| CREDIT_BANK | | | 0.0003 |
| | | | (0.002) |
| OVERALL_FREEDOM | | | -0.0211 |
| | | | (0.013) |
| sigma_u | 0.2549** | 0.0000** | 0.0000 |
| | (0.101) | (0.000) | (0.180) |
| sigma_e | 0.8459*** | 0.8223*** | 0.8163*** |
| | (0.067) | (0.064) | (0.071) |
| ll | -309.1181 | -293.9053 | -235.7769 |
| N | 307 | 304 | 250 |

Notes: The dependent variable is the share of entries through branches. The Tobit model takes into account that the dependent variable is a censored variable (i.e. partly continuous with a positive probability mass at zero). The reported estimations are marginal effects computed at the mean level for continuous variables, and for a discrete change for dummy variables. For data descriptions, see Table 1. N is the number of observations, and a, b and c denote the different models that were estimated. Asterisks denote significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Sources: For data sources, see Table 1.

We have also studied the effect of credit reporting systems on NIMs (Table 12). These results suggest that the introduction of a second credit bureau fosters competition in the banking sector, where net interest rates decline. The same is true for the establishment of public credit registers that share either negative or positive information.

Table 12. Estimation results (dependent variable: NIM)

| | a | b | c |
|-------------------|-----------------------|-----------------------|-----------------------|
| PRIVATE_BUREAU | -0.0112 (0.010) | -0.0135 (0.010) | 0.0031 (0.006) |
| PUBLIC_REGISTER | 0.0283*** (0.008) | 0.0350*** (0.008) | 0.0399*** (0.010) |
| SECOND | -0.0263*** (0.008) | -0.0204*** (0.007) | 0.0021 (0.010) |
| positive_priv | -0.0061 (0.004) | -0.0067 (0.004) | -0.0005 (0.003) |
| negative_priv | 0.0015 (0.005) | 0.0035 (0.005) | -0.0067** (0.003) |
| positive_pub | -0.0096** (0.004) | -0.0025 (0.004) | -0.0143*** (0.005) |
| negative_pub | -0.0262*** (0.006) | -0.0313*** (0.005) | -0.0226*** (0.006) |
| no_PRIVATE_BUREAU | -0.0002 (0.001) | 0.0001 (0.001) | -0.0005 (0.001) |
| p_gdp | | 0.0008*** (0.000) | 0.0006*** (0.000) |
| inflation | | 0.0092*** (0.003) | 0.0048*** (0.001) |
| population | | 0.0005** (0.000) | 0.0002 (0.000) |
| English | | 0.0003 (0.009) | 0.0507*** (0.014) |
| French | | 0.0334*** (0.011) | 0.0549*** (0.014) |
| German | | 0.0710*** (0.009) | 0.0726*** (0.016) |
| Scandinavian | | 0.0298*** (0.008) | 0.0544*** (0.015) |
| CREDIT_BANK | | | -0.0001** (0.000) |
| OVERALL_FREEDOM | | | -0.0005** (0.000) |
| ll | 1391.224 | 1422.031 | 1128.842 |
| N | 450 | 446 | 333 |

Notes: For data descriptions, see Table 1. N is the number of observations, and a, b and c denote the different models that were estimated. Asterisks denote significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Sources: For data sources, see Table 1.

7.3 Robustness checks for the multivariate analysis

Testing hypotheses regarding the effects of credit registers on bank entry modes with the dataset presented involves the problems typically related to the use of time-series cross-section datasets (TSCS). TSCS consist of a sequence of time series observed for different units – as in a panel dataset – 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 characterised by a large N and small T as estimators for panel data and can induce problems when applied to TSCS data (Beck & Katz, 1995).

There is no clear-cut rule. In general terms, a one-digit panel dataset for T is considered. Nevertheless, the notations are equal and the distinction between these two kinds of datasets appears relevant, since it allows us to neglect some issues that are associated with panel data analysis while creating new concerns that require attention.

In particular, in this section we deal with two methodological problems: the heterogeneity of panel data, and cojoint inclusion of time-invariant variables and fixed effects.

In addition, we have taken into account the concern related to the specification of the model while respecting that the share of branches is bounded by 0 and 1. Therefore, we perform our regression relying only on those observations that are greater than 0 or less than 1 in order to avoid a censoring problem.

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 the country-specific factors.

To overcome this problem, Plümer & Troeger (2007) propose a procedure for analysing the effect of time-invariant variables in a model including fixed effects. Their procedure has three stages:

- estimate a fixed-effect model,
- regress the unit effects on the time-invariant variables, and
- re-estimate the first stage 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 least biased estimator when time-variant and time-invariant variables are correlated with the unit effects. 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. The results are reported below in Table 13.

These results basically confirm our previous ones. More specifically, they allow stronger conclusions to be drawn about the role of a private credit bureau that also shares positive information, suggesting a positive effect on the share of cross-border bank entries through branches.

Table 13. XTFEVD estimator (dependent variable: the logit ratio)

| | a | b | c |
|-------------------|----------------------|-----------------------|-----------------------|
| PRIVATE_BUREAU | 0.4757*** (0.129) | 0.0172 (0.173) | 0.0052 (0.261) |
| PUBLIC_REGISTER | 0.0194 (0.137) | -0.0668 (0.140) | 0 (0.174) |
| SECOND | 0.0341 (0.110) | 0.0127 (0.112) | (0.000) (0.236) |
| positive_priv | 0.0929* (0.049) | 0.2704*** (0.086) | 0.5332*** (0.141) |
| negative_priv | -0.0156 (0.062) | 0.1743* (0.104) | 0.1614 (0.103) |
| positive_pub | 0.0188 (0.070) | -0.0376 (0.071) | -0.1576* (0.091) |
| negative_pub | -0.0797** (0.039) | -0.0882 (0.057) | -0.1366* (0.069) |
| no_PRIVATE_BUREAU | -0.0330** (0.016) | -0.1941*** (0.065) | -0.2817*** (0.078) |
| eta | 0.7926*** (0.294) | 1.0000*** (0.331) | 1.0000*** (0.270) |
| p_gdp | | -0.0004 (0.003) | -0.0001 (0.005) |
| inflation | | -0.0037 (0.021) | -0.0161 (0.023) |
| population | | 0.0140** (0.005) | 0.0185*** (0.006) |
| English | | 0.1585 (0.153) | 1.6366*** (0.422) |
| French | | 0.2602* (0.145) | 1.7841*** (0.423) |
| German | | 0.4573*** (0.124) | 1.9204*** (0.447) |
| Scandinavian | | 0.3190** (0.153) | 1.8697*** (0.430) |
| CREDIT_BANK | | | 0.0004 (0.001) |
| OVERALL_FREEDOM | | | -0.0228*** (0.007) |
| N | 121 | 120 | 95 |

Notes: This table reports the third-stage estimation. The XTFEVD estimator allows time-invariant and rarely changing variables to be estimated along with country-fixed effects. The coefficients represent marginal effects. For data descriptions, see Table 1. N is the number of observations, and a, b and c denote the different models that were estimated. Asterisks denote significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Sources: For data sources, see Table 1.

8. Conclusions

In this report, we study whether the presence of credit registers (public credit registers and private credit bureaus) has an impact on bank entry mode in Europe. Considering that financial market integration has been a major objective of policy-making in Europe, an answer to the question of how credit registers affect international entry patterns appears to be long overdue. Additionally, we also look at the effects of credit registers on banking market concentration and on competition indicators. Indeed, information asymmetries can constitute severe barriers for foreign banks to enter markets, which may deter entry or force them to enter through M&As instead of branching. M&As, however, are likely to have different effects in terms of market structure and competition compared with branching, as the former do not add additional market players to the number of existing players in the market.

To answer these questions, we have constructed a new dataset that exploits the diversity in credit reporting systems across the EU-27 member states, covering them over the period 1990–2007. The establishment of this dataset is one of our main contributions. It is a cross-sectional time-series dataset on credit registers that enables some (cautious) conclusions to be drawn about causality through the application of a difference-in-differences analysis. The new dataset we have compiled merges data from the World Bank, the Heritage Foundation, the ECB, the SDC Platinum database and ECRI. This dataset has enabled us to apply more advanced econometric techniques, such as univariate difference-in-differences analysis and a number of multivariate estimations.

In analysing this database, we have obtained several interesting results. The univariate analysis shows that public credit registers

- increase the proportion of entries through branches,
- have a significant negative effect on market concentration (CR3), and
- contribute to the intensification of competition (measured by various indicators).

These latter effects appear more pronounced for highly concentrated markets and 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 the share of the latter among overall cross-border entries. Some indications show that they may also contribute to the intensification of competition, which is again more pronounced for highly concentrated markets and new member states.

In the course of our research, we encountered a number of challenges in compiling information on private credit bureaus – which indicates that in the future policy-makers 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 data items are stored in the credit bureaus as well as what fee structures are applied. The availability of such information would also enable better comparisons of the credit reporting systems in the different countries.

In the multivariate analysis, we applied a selection of econometric estimation procedures to account for the time-series cross-country characteristics of the dataset and assorted kinds of information shared. We found that once we accounted for assorted 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 that shares negative information also reduces cross-border M&As and net interest rate margins (our proxy for competition) for all kinds of information shared.

The picture for private credit bureaus is more ambiguous. Our results show a positive contribution to cross-border branching and a negative effect for cross-border mergers in the presence of a private credit bureau sharing negative information. But we did not find significant effects on NIMs, where negative effects are only displayed for the introduction of a second credit bureau in the market. Contrary to the case of a public register, the kinds of information exchanged through credit bureaus seem to be more important, with such information typically being gathered through 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 analysis indicates that a public register plays a significant role, for all kinds of information shared, as does a private register that shares negative information. The results for a private bureau that shares positive information are more mixed and deserve further investigation.

Therefore, countries that would like to strengthen competition in the banking sector could consider setting up a public credit register. There are only 14 countries in Europe that currently have such registers. Also, from the viewpoint of financial stability and for bank supervisory purposes, these registers are considered useful (which are usually the reasons they are introduced by central banks).

The slightly more ambiguous effects of private bureaus also suggest that policy-makers may have to ensure that the information they allow to be shared is complete and up-to-date, and that these registers are not used in a discriminatory way to the detriment of foreign banks.

Another important policy recommendation in this respect is that policy-makers ought to obtain better information about the quality of data stored in the credit registers. We believe that data quality, which is crucial for borrower risk assessment and banking competition, should be one of the chief interests in the supervision of credit registers in the future.

Unequal patterns of market entry among banks across Europe can probably be diminished by reducing the exogenous information asymmetries, once credit information systems are harmonised to a greater extent in terms of the data they share. Efforts in this regard would probably provide some scope for action by the European Commission. But one of the main difficulties that policy-makers will encounter is the diversity of legal and business terms, such as bankruptcy or delinquencies.

A number of open questions remain about the empirical effects of credit registers on banking. For instance, in some theoretical works it is suggested that banks could strategically use credit registers to deter direct entry. Yet such use would only be possible for private credit bureaus, as exchange through a public credit register is mandatory and the deviant behaviour 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 on institutions, but are also the bureau's clients).

Future research could contribute to a better understanding of the horizontal and vertical relations that arise from credit reporting and whether these can be used strategically to reduce the quality of market access for competitors. In addition, the ability of credit bureaus to facilitate prudential regulation and the monitoring of systemic risk could be analysed in the face of the current crisis. Improved data collection by EU policy-makers on credit registers is essential, however, to enable a better-informed discussion about their (empirical) effects.

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List of Abbreviations

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| CR3 | Concentration ratio (of the three largest companies) |
| DG | Directorate-General (European Commission) |
| ECB | European Central Bank |
| ECJ | European Court of Justice |
| ECRI | European Credit Research Institute |
| EGCH | Expert Group on Credit Histories |
| EU | European Union |
| EU-15 | European Union (15 member states) |
| EU-27 | European Union (27 member states) |
| FDI | Foreign direct investment |
| GDP | Gross Domestic Product |
| M&A | Merger and acquisition |
| MFI | Monetary financial institutions |
| MOU | Memorandum of Understanding |
| NIM | Net interest margins |
| ROA | Return on assets |
| ROE | Return on equity |
| TSCS | Time-series cross-section data |

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Founded in 1999 by a consortium of European banking and financial institutions, the European Credit Research Institute is an independent, non-profit research institute based in Brussels. ECRI provides in-depth analysis and insight into the structure, evolution and regulation of retail financial services markets in Europe. It derives its expertise from an interdisciplinary team of in-house researchers and a network of academic partners based throughout Europe. ECRI keeps its members and the wider public up-to-date on a wide range of topics related to retail financial services, credit reporting and consumer protection at the European level. Its operations and staff are managed by the Centre for European Policy Studies (CEPS).

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