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DO CREDITOR RIGHTS AND INFORMATION SHARING AFFECT THE PERFORMANCE OF FOREIGN BANKS?

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Abstract

This paper examines the effect of host economy creditor rights and information sharing on the profit performance of foreign banks *vis-à-vis* domestic banks for a global sample of commercial banks over the 2005-2009 period. To this end, we employ the recent foreign bank ownership dataset of Claessens and Van Horen (2014) and measure performance as profit efficiency using the alternative profit function. Results from the Battese and Coelli (1995) stochastic frontier analysis model show that creditor rights exert a positive effect on efficiency that strengthens for foreign banks. On the other hand, information sharing exerts a negative effect on profit efficiency which strengthens for foreign banks. The results for information sharing show some variability across different levels of development of the host economy. Moreover, the transparency of the host economy moderates the effect of creditor rights and information sharing on foreign bank efficiency. We also examine the effect of "*institutional distance"* in creditor rights and information sharing between the home and host economy on foreign bank efficiency. The effect of creditor rights "*institutional distance"* on foreign bank efficiency is negative, while it turns positive for information sharing. These findings highlight the importance of strong creditor rights for foreign bank performance and are useful for both regulators in host economies and foreign bank managers.

Keywords: Foreign Banks, Liability of Foreignness, Profit Efficiency, Creditor Rights, Information Sharing.

JEL-classifications: F21, F23, G21, G28

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1. Introduction

The internationalization of the banking sector is a major feature of the world economy. Claessens and Van Horen (2014) report a growing presence of foreign banks in most economies from 1995 to 2009. As a result, academics and policy makers are keen to investigate the factors that affect the performance of foreign banks *vis-à-vis* domestic banks. The regulatory and institutional environment of the host economy is an important determinant foreign bank performance (Lensink et al., 2008; Claessens and Van Horen, 2012; Curi et al. 2015). Yet, no study has examined the effect of creditor rights and credit information sharing on the performance of foreign banks *vis-à-vis* domestic banks. In this paper, we employ a recent dataset on foreign bank ownership (Claessens and Van Horen; 2014) and shed light on this issue using a global sample of commercial banks over the 2005-2009 period[1]. This is the first study that performs such an analysis.

Creditor rights and information sharing are institutional arrangements that target the alleviation of the information asymmetry between creditors and borrowers. Creditor rights, by facilitating the use of collateral, enable banks to screen borrowers efficiently and thus reduce adverse selection (Bester, 1985, Berger et al., 2011a). Information sharing, by providing historical data on the past behaviour of borrowers, could also reduce adverse selection (Pagano and Jappelli, 1993; Dierkes et al., 2013) and decrease borrower moral hazard through a disciplinary channel (Klein, 1992). However, the effect of creditor rights and information sharing on bank performance is *a priori* ambiguous since they could induce relaxed credit standards (Manove et al.; 2001; Dell'Arriccia and Marquez, 2006) and, in the case of information sharing, lessen the ability of banks to extract rents from private borrower information (Brown and Zehnder, 2007). The empirical evidence, therefore, is inconclusive (Houston et al., 2010; Doblas-Madrid and Minetti, 2013; Kalyvas and Mamatzakis, 2014; Marthur and Marcelin, 2015).

One issue that has yet to be addressed in the literature though is the importance of foreign ownership in the relationship between creditor rights, information sharing, and bank performance. There are theoretical grounds that render this question a testable hypothesis. The seminal thesis of Hymer (1976) posits that foreign firms face an informational

[1] The time period of our study is restricted in this time-frame because the creditor rights and information sharing variables employed in this study are available only from 2005 onwards while the data on foreign ownership in the Claessens and van Horen (2014) dataset are available until 2009.

disadvantage in the host economies. This disadvantage of foreign firms is termed as *"liability of foreignness".* An important component of the *"liability of foreignness"* that foreign banks face, *vis-à-vis* domestic banks, is the high level of information asymmetry between them and domestic borrowers (Mian, 2003; Beck et al., 2015). For foreign banks, borrowers in the host economy are more informationally opaque than what they are for domestic banks (Berger et al., 2001; Clarke et al., 2006; Berger et al., 2008). Additionally, it is harder for foreign banks, in comparison with domestic banks, to assess "soft", relationship-based, information about lender quality [2] because of their hierarchical structure (Stein 2002, Berger et al. 2005). Thus, foreign banks depend more than domestic banks on "hard" financial information on borrowers (Dell'Ariccia and Marquez, 2004; Detragiache et al., 2008). Consequently, foreign banks rely heavily on the transactional-based lending technologies (e.g. collateral pledges and credit scoring models) that creditor rights and credit information sharing empower (Beck et al., 2015).

Therefore, the first question we address in this paper is the following: *"Does foreign ownership matter in the relationship between creditor rights (or information sharing) and bank performance?"*

The importance of creditor rights and credit information sharing in alleviating the information asymmetry between foreign banks and domestic borrowers could depend on the transparency of the host economy. The presence of financially transparent borrowers, for whom "hard" information are readily available, could reduce the informational barriers that foreign banks face in the host economy. The empirical evidence shows that foreign banks tend to focus on more transparent borrowers (Degryse et al. 2012; Pennathur and Vishwasrao, 2014). Thus, host economy transparency could weaken the informational disadvantage that foreign banks face *vis-à-vis* domestic banks and therefore the importance of creditor rights and information sharing for their performance. We identify three host economy transparency indicators that could be relevant for foreign banks: the presence of multinational enterprises (MNEs), the presence of listed companies, and the extent to which credit is directed towards the state and state-owned enterprises (SOEs). MNEs and listed

[2] Following Berger and Black (2011) we define as "hard" information on a potential borrower information that is of quantitative nature (financial ratios, audited accounts, values of collateral, credit scores). Information of qualitative nature is defined as "soft" and regards the personal knowledge that bank managers have about a specific firm, its ownership and management.

companies are "*de jure"* and *"de facto"* more transparent than domestic private firms (La Porta et al., 2000; Loderer and Waelchli, 2010; Branguinsky and Mityakov, 2015) while foreign banks could consider SOEs as transparent (Mian, 2003) because of government guarantees (Faccio, 2006; Borisova et al., 2015). Therefore, the second question we address is the following: *"Does host economy transparency influence the importance of foreign ownership in the relationship between creditor rights (or information sharing), and bank performance?"*

To address these two questions we create a global sample of commercial banks by merging bank-level data from Bankscope with the Claessens and Van Horen (2014) foreign ownership dataset. We supplement these data with the creditor rights and information sharing indices of the *"Doing Business"* project of the World Bank and host economy transparency variables. The final sample consists of 3,931 commercial banks in 119 countries over the 2005-2009 period. Around 20% of the banks are foreign. Then, we opt for profit efficiency as a measure of bank performance and employ the Battese and Coelli (1995) stochastic frontier analysis (SFA) model. This SFA model provides estimates of bank efficiency and its covariates in a single-stage and has been used in numerous studies that examine the determinants of bank efficiency (e.g. Fiordelisi and Mare, 2013; Duygun et al., 2014). Furthermore, we use the alternative profit efficiency model (Humphrey and Pulley, 1997), which allows for some degree of market power and is commonly used in bank efficiency studies (e.g. Bos and Kool, 2006; Koetter, 2006; Pasiouras et al., 2009; Duygun et al., 2014)

In relation to the first question, our results from the global sample reveal that foreign ownership does have a significant influence on the effect of both creditor rights and information sharing on bank performance. Specifically, creditor rights exert a positive effect on bank efficiency that strengthens for foreign banks. This finding highlights the importance of creditor rights in enabling the use of collateral as a borrower screening device in host economies (Sengupta, 2007; Berger et al., 2011a). These results hold in separate estimations for the developed countries (DCs) and the less developed countries (LDCs) subsamples.

We also find that information sharing exerts a negative effect on performance. This is consistent with the literature that posits that higher information sharing levels could lead to relaxed lending standards (Dell'Arricia and Marquez, 2006) and a reduction in the bank rents that stem from private information on borrowers (Brown and Zehnder, 2007; Ioannidou and

Ongena, 2010). For the two of the three information sharing variables we employ, the depth of information sharing and the private credit bureau coverage, we find that their negative effect on efficiency strengthens for foreign banks. This denotes that potential efficiency gains for foreign banks that stem from the access to more "hard" borrower information available through information sharing are trumped by efficiency losses stemming from their lower capacity, *vis-à-vis* domestic banks, to use "soft" information. On the other hand, the negative effect on efficiency of the third information sharing variable, the public credit registry coverage, subdues for foreign banks. This indicates that foreign banks find useful the "hard" information on large firms that public credit registries provide (World Bank, 2014). This is consistent with the observation that large corporations are important foreign bank customers (Giannetti and Ongena, 2012). In the case of the information sharing variables, we observe some results heterogeneity in separate estimations for the DCs and LDCs subsamples.

With regards to the second question, we find that host economy transparency moderates the importance of foreign ownership in the relationship between creditor rights, information sharing, and bank performance. These moderation effects stem from all the three measures of host economy transparency: the presence of MNEs, the presence of listed companies and credit to the government and SOEs. This implies that the availability of "hard" financial information directly from the borrowers renders the host economy creditor rights and information sharing less relevant for the performance of foreign banks. These results are consistent with the evidence that foreign banks tend to "cherry pick" borrowers that can directly provide "hard" information (Beck and Peria, 2010; Gormley, 2010; Beck and Brown, 2013).

Finally, in further analysis, we take into account that the literature suggests that institutional differences between the host and origin countries could affect the performance of foreign banks (Lensink et al., 2008; Claessens and Van Horen, 2012). Therefore, we also investigate if creditor rights and information sharing "*institutional distance"*, matters for foreign bank performance. We find that foreign banks that originate from high creditor rights countries incur efficiency losses when they operate in low creditor rights host economies while we find the opposite effect when it comes to information sharing.

This study makes three contributions to the literature. Firstly, it reveals that foreign bank ownership conditions the effect of creditor rights and information sharing on bank

performance. Secondly, it provides evidence that host economy transparency weakens the link between creditor rights and information sharing with the performance of foreign banks. Thus, we add to the literature that examines the factors that affect foreign bank performance (Lensink et al., 2008, Claessens and Van Horen, 2012; Curi et al, 2015) and to the literature that investigates the effects of creditor rights and information sharing on the banking sector (Houston et al., 2010; Dierkes et al., 2013; Karapetyan and Stacescu, 2014a). Thirdly, by providing evidence that "*institutional distance"* in terms of creditor rights and information sharing affects foreign bank performance we add also to the literature that relates to the effects of distance constraints on the banking sector (Mian, 2006; Bellucci et al., 2013; Goetz et al., 2016).

The rest of the paper is structured as follows: Section 2 presents some theoretical considerations and develops hypotheses, Section 3 presents the data and the methodology, Section 4 reports and discusses the results, whilst the final section offers some concluding comments together with policy and managerial implications.

2. Theoretical considerations and hypotheses development

2.1 Creditor rights

Creditor rights could decrease the information asymmetry between lenders and borrowers and thus increase bank performance by limiting adverse selection and moral hazard. In a strong creditor rights environment, banks are able to use collateral requirements to differentiate the risk level of the projects of seemingly comparable loan applicants. This reduction in adverse selection happens through signalling. Candidate borrowers with more creditworthy projects, and thus lower risk of loan default, post higher levels of collateral that candidate borrowers of less creditworthy projects would not be willing to post (Bester, 1985; Besanko and Thakor, 1987a, 1987b; Dell'Ariccia and Marquez, 2006; Berger et al., 2011a; Berger et al., 2011b). The usefulness of collateral as a signalling device in order to differentiate high-risk from low-risk borrowers is critically important for foreign banks in the theoretical model of Sengupta (2007). In this model foreign banks are assumed to have a disadvantage over domestic banks on information related to the quality of domestic borrowers. Foreign banks use the signalling nature of collateral requirements in order to reduce this disadvantage and thus compete successfully with domestic banks. The

theoretical model of Sengupta (2007) finds empirical support in the foreign bank literature (Esty, 2006; Haselmann et al., 2010).

Creditor rights could also reduce the moral hazard of borrowers and thus benefit bank performance (Marthur and Marcelin, 2015). Corporate borrowers are more reluctant in engaging in risk-taking activities (Acharya et al., 2011) and increasing their leverage (Vig, 2013, Cho et al, 2014) when creditor rights are strong. This, in turn, could have a positive effect on bank performance because of lower loan defaults. However, these potential beneficial effects assume a fixed set of borrowers. The literature suggests that stronger creditor rights increase bank lending (Djankov et al., 2007). If this increase in lending facilitates access to credit to a wider set of borrowers that are less creditworthy, bank performance could decrease in the case that higher loan default rates exceed the collateral recovery rates (Houston et al., 2010). Foreign ownership could exert an influence on this effect because foreign banks extend their lending substantially more than domestic banks do when creditor rights in the host economy strengthen (Qian and Strahan, 2007; Claessens and Van Horen, 2014).

Furthermore, strong creditor rights, by facilitating the use of collateral, may also lead to a decrease in bank performance by increasing the moral hazard of lenders. Manove et al. (2001) show that the use of collateral in the process of loan origination could lead to a significant decrease in the incentives of borrowers to screen and monitor borrowers and as a consequence induce banks to provide credit to a high number of worthless projects. Cowan et al. (2015) lend empirical support to the theoretical model of Manove et al. (2001) by finding that relying excessively on collateral reduces borrower quality. Similar findings are also evident in the study of Zazzaro (2005). As a result, strong creditor rights may increase loan defaults (Jiménez and Saurina, 2004) and thus lead to a reduction in bank performance (Houston et al., 2010; Kalyvas and Mamatzakis, 2014). Foreign ownership could influence this effect because foreign banks tend to rely more, in comparison with domestic banks, on transactional-based lending techniques such as demand for collateral and collateral pledges (Mian, 2006; Beck et al., 2015).

Based on the above discussion, there is not a clear indication if creditor rights would have a negative or positive effect on bank performance. Furthermore, we expect that

foreign ownership would exert an influence on the effect of creditor rights on bank performance. Thus, we formulate the following hypotheses:

H1.A (H1.B): The effect of creditor rights on bank performance is positive (negative)
H2: Foreign ownership significantly affects the effect of creditor rights on bank performance

2.2 Credit information sharing

The theoretical model of Pagano and Jappelli (1993) reveals that access to information related to the past behaviour of borrowers reduces adverse selection and leads to efficient loan screening. Some studies (Kallberg and Udell, 2003; Behr and Sonnekalb, 2012; Dierkes et al., 2013; Bos et al. 2015)[3] provide evidence in support of the theoretical predictions of Pagano and Japelli (1993) that information sharing is useful in assessing borrower quality. Thus, at higher levels of information sharing, bank performance could improve as banks could assess borrower creditworthiness more accurately and less costly. However, the beneficial effect of information sharing in assessing creditworthiness refers to individual borrowers. If information sharing increases the access of credit to lower quality borrowers then the aggregate default rate could also increase (Jappelli and Pagano, 2006) and bank performance could decline. This could be possible because information sharing increases the credit supply (Djankov et al., 2007; Brown et al., 2009; Grajzl and Laptieva, 2015) and could also lead to relaxed credit standards and less loan screening effort (Dell'Ariccia and Marquez, 2006). Bos and Nakamura (2014) find that banks tighten their lending standards at lower levels of information sharing and therefore provide empirical evidence in support of the theoretical model of Dell'Ariccia and Marquez (2006).

Through another channel, information sharing could improve bank performance by reducing the moral hazard of borrowers because of a disciplinary effect on loan repayments (Klein, 1992). This is because borrowers would try to avoid being blacklisted and as a result excluded from future bank financing. If creditors share information on defaults, borrowers take into account that their credit access could stop with all the other banks (Padilla and Pagano, 1997; 2000). Thus information sharing, through the disciplinary effect channel,

[3] Bos et al. (2015) further show that these effects are particularly evident for fist-time borrowers. That is when the information as asymmetry between lenders and borrowers is higher.

could have a negative impact on the access to credit for risky borrowers (Doblas-Madrid and Minetti, 2013). This could further lead to lower default rates (Jappelli and Pagano, 2002). The improvement of a bank's loan portfolio through lower risk and loan defaults could lead to improved performance (Houston et al., 2010; Kalyvas and Mamatzakis, 2014).

However, increased information sharing could also increase the moral hazard of borrowers and thus reduce bank performance. Padilla and Pagano (2000) show that increased depth of credit information, such as the sharing of both negative (defaults) and positive (timely repayments) information about the underlying borrower quality, lowers the incentive of borrowers to avoid default. A high-quality borrower knows that lenders' access to positive information is possible to offset incidents of bad credit events (Jappelli and Pagano, 2006). This reduced incentive in the effort of borrowers could arise from the good reputation that they have gained through the sharing of information about their positive history (Vercammen, 1995; Mailath and Samuelson, 2001; Moav and Neeman, 2010). Cheng and Degryse (2010) show that bank managers tend to place less importance on negative (default) information on borrowers in the presence of positive information. In addition to this, Elul and Gottardi (2015) show that lenders' limited access to the credit history of borrowers could improve the efforts of the latter even in the case of negative information (i.e. past defaults). The authors demonstrate that early erasure from the credit registries of negative (default) information strengthens the incentive of borrowers to perform well. This is because borrowers would attempt to defend their newly improved reputation in the credit market. Bos and Nakamura (2014) provide empirical evidence in support of the theoretical model of Elul and Gottardi (2015).

Lastly, information sharing may reduce bank performance because of a decrease in the monopolistic rents, through higher interest rates, that a bank can charge to its borrowers (Padilla and Pagano, 1997; Dell'Ariccia and Marquez, 2004). Private information on borrowers is an important source of bank profits (Hale and Santos, 2009; Schenone, 2010). Borrowers, in the presence of information sharing, have increased access to other banks so their bargaining power in relation to creditors increases (Brown and Zehnder, 2007; Ioannidou and Ongena, 2010). In support of this argument, empirical evidence shows than information sharing reduces bank net interest margins (Detraghiache et al., 2005; Dietrich et al., 2015).

Based on the above discussion and depending on which channel dominates, there is not a clear indication if information sharing would have a negative or positive effect on bank performance. It would be rational, though, to expect that foreign ownership would exert an influence on the effect of information sharing on bank performance. Sharing of "hard" information on borrowers through credit registries could be of importance for foreign banks. This is because foreign banks have limited knowledge of the local credit market and because their hierarchical organisational structure renders them less capable, in comparison with domestic banks, to acquire and then utilise "soft" information on the local borrowers (Stein, 2002; Berger et al., 2005). Therefore, information sharing could partly eliminate the informational disadvantage of foreign banks, *vis-à-vis* domestic banks, in the credit market of the host economies (Beck et al., 2015). Furthermore, information sharing would also enable the lending technologies that foreign banks tend to employ. Foreign banks tend to rely on credit scoring tools in assessing the creditworthiness of borrowers (Clarke et al., 2006; De Haas and Naaborg, 2006; Beck et al, 2015). In these credit scoring tools "hard" information available through information sharing forms an essential input (Berger and Udell, 2002; Berger and Udell, 2006; Canales and Nanda, 2012).

Based on the above discussion, we formulate the following hypotheses:

H3.A (H3.B): The effect of information sharing on bank performance is positive (negative)
H4: Foreign ownership significantly affects the effect of information sharing on bank performance

2.3 Transparency of the host economy

A more transparent economic environment in the host country reduces the information asymmetry between foreign banks and domestic borrowers. Empirical evidence shows that foreign banks tend to focus mostly on foreign, large and more transparent borrowers (Detragiache et al., 2008; Brown et al., 2011; Degryse et al. 2012; Pennathur and Vishwasrao, 2014) because such types of firms provide more "hard" information. A more transparent business environment, that is a higher level of availability of "hard" information directly from potential borrowers, could decrease the informational disadvantage of foreign banks. This, in turn, could affect the importance of host economy creditor rights and

information sharing with regards to the performance of foreign banks. We identify in the literature three measures of transparency relevant to foreign banks.

The first measure of transparency is the presence of multinational enterprises (MNEs). There is empirical evidence that banks follow the customers they have in the home economy abroad in order to continue their lending relationship with them (Golberg and Johnson, 1990; Miller and Parkhe, 1998; Buch, 2000; Wezel, 2004). This behaviour of banks to expand internationally in order to follow their corporate customers from their home economy is termed in the literature as the *"follow the customer"* hypothesis. The implication of the *"follow the customer"* hypothesis for this study is important. The reason is that when an economy in which a foreign bank operates has a high presence of non-bank multinational enterprises then it is possible to argue that the *"liability of foreignness"* that foreign banks face *vis-à-vis the* domestic banks declines. Indeed, Goldberg and Saunders (1981) find that the informational disadvantage of foreign banks *vis-à-vis* domestic competitors declines in the presence of a readymade pool of transparent clients when banks follow their multinational clients. It is important to note that MNEs could be viewed, by foreign banks, more transparent than purely domestic firms even in the case that they do not share a common home country. This is because MNEs tend to disclose a larger quantity and more accurate "hard" information than purely domestic firms (Raffournier 1995; Branguinsky and Mityakov, 2015)[4].

We identify the level of credit directed towards the government and state-owned enterprises (SOEs) as the second measure of the transparency of the host economy. When credit is directed towards the government and SOEs, there could be explicit government guarantees with regards to loan repayments that foreign banks view as "hard" information (Mian, 2003). Furthermore, when more lending is directed towards a SOE there is an implicit government guarantee that creditors will be fully repaid. This is because it is less likely that a government would allow such a firm to fail. Borisova and Megginson (2011) provide evidence in support of the existence of the "implicit government guarantee"

[4] Branguinsky and Mityakov (2015, pp. 142) note that it is costly and risky for MNEs to decrease their transparency in host economies for the following reasons: MNEs are conscious of their reputation, both in their home countries and worldwide. They can also be subject to litigation and punitive sanctions in their home countries and they commonly lack the necessary connections to escape the scrutiny of the host economy's authorities.

channel in the credit markets. The authors find that SOEs incur a lower cost of debt in comparison with private sector firms because of implicit government guarantees. Evidence of this channel is also provided in the studies of Faccio et al. (2006) and Borisova et al. (2015). If lending to the government and to SOEs is accompanied by explicit and/or implicit government guarantees, we could argue that the informational disadvantage of foreign banks declines in host economies where a lot of credit is direct towards the public sector.

Finally, we identify the number of listed firms as the third transparency measure of the business environment of the host economy. The law requires listed firms to produce extensive information about their activities through annual reports and other publications (La Porta et al., 2000). Furthermore, audited financial statements of listed firms have a lower risk of misstatement (Allee and Yohn, 2009, Ongena et al. 2013). Morover, Loderer and Waelchli (2010) provide evidence that listed companies disclose more detailed and more extensive information than private firms do even when they are not required to do so. This means that more "hard" and reliable financial information would be available to foreign banks directly from the listed firms themselves in order to use them in the loan origination process (Berger and Udell, 2006). Thus, a higher presence of listed firms could reduce the informational disadvantage of foreign banks vis-à-vis domestic banks.

Based on the above discussion we formulate the following hypothesis:

H5: Host economy transparency moderates the effect of creditor rights and information sharing on the performance of foreign banks.

3. Methods and data

3.1 Measuring profit (in)efficiency

We use bank data from Bankscope for the 2005-2009 period. Our final sample includes 3,931 commercial banks that operate in 119 countries globally[5]. Out of these 3,931 commercial banks around 20% of them (783 banks) are classified as foreign in the Claessens

[5] We focus on commercial banks for three reasons. The first, as Lozano-Vivas and Pasiouras (2010) point out, is that the comparability across countries is enhanced when a homogenous sample of banks in terms of services, and therefore inputs and outputs, is employed. The second is that profit efficiency estimations assume a profit maximization objective, which is a realistic assumption for commercial banks. Thirdly, the vast majority of foreign banks in the Claessens and van Horen (2014) dataset are commercial.

and van Horen (2014) bank ownership dataset. After removing errors and other inconsistencies 13,262 bank/year observations remain in an unbalanced panel.

We opt for profit (in)efficiency estimates as a measure of bank performance[6]. To this end, we employ stochastic frontier analysis (SFA). Furthermore, we opt for an alternative profit frontier as developed by Humphrey and Pulley (1997) for the bank profit (in)efficiency estimation. The alternative profit frontier model measures how close a bank is to generate maximum profits given its output levels instead of output prices, unlike in the standard profit frontier concept. Therefore, it allows for some degree of bank market power in terms of output prices while banks are still assumed to face a perfectly competitive market for inputs (Berger and Mester, 1997)[7]. A restriction of the alternative profit model is that the degree to which banks can exert an influence on the price of outputs will depend on the given input prices, the given quantities of outputs and the technological constraints (Koetter, 2006). The alternative profit model has been widely used in the banking literature (Maudos et al., 2002; Bos and Kool, 2006; Koetter, 2006; Pasiouras et al., 2009; Duygun et al., 2014)

Since this paper focuses on the impact of country-level environmental variables such as the cross-country variations in creditor rights and information sharing on bank profit (in)efficiency, we opt for the Battese and Coelli (1995) SFA model in order to estimate bank profit (in)efficiency[8]. This estimation of the frontier accommodates panel data and allows to

[6] Efficiency estimations have some distinct advantages over accounting-based measures of performance such as financial ratios (Berger and Humphrey, 1997; Bauer et al., 1998). This is because bank efficiency estimates are able to account for all the inputs, input prices and outputs of bank operations (Thanassoulis et al., 1996; Berger and Humphrey, 1997). Furthermore, we opt for profit efficiency because, unlike cost efficiency, it captures the ability of banks to convert inputs efficiently into outputs (Humphrey and Pulley, 1997). Therefore, profit efficiency emphasizes the ability to maximise profits. This fits with our sample that comprises of commercial banks for whom profit maximization is a realistic assumption. For example cooperative banks might not have as strict profit maximising targets as commercial banks (Bos and Kool, 2006).

[7] Berger and Mester (1997) outline a number of cases under which the alternative profit function may be more appropriate than the standard one. Two of them are especially relevant to this study. The first is the case that banks are not sole price takers, so that they have some market power in the prices they charge. The second is the case in which the quality of the financial products and services offered differs substantially across banks. This study is a cross-country one so we expect different degrees of market power and different quality of bank products in different countries. For the above reasons Maudos et al. (2002) and Kasman and Yildirim (2006) point out that it is more appropriate to estimate an alternative rather than a standard profit function in international comparisons across a diverse group of countries.

[8] An advantage of SFA is that it distinguishes statistical noise from (in)efficiency (Berger and Humphrey, 1997). However, it is based on strong assumptions with regards to the distribution of each error component (Kumbhakar and Lovell, 2000). Non-parametric approaches for efficiency estimation, such as DEA, do not impose such distributional assumptions but their disadvantage is that deviations from the frontier are attributed exclusively to (in)efficiency. Kumbhakar and Lovell (2000) point to two other parametric methods of efficiency estimation. One of them is the thick frontier approach as developed by Berger and Humphrey (1991, 1992). This

control for variables that could affect (in)efficiency in a single stage estimation and takes the form:

$$\ln PBT_{it} = f(P_{it}, Y_{it}, N_{it}) - u_{it} + v_{it} \quad (1)$$

where $\ln PBT_{it}$ is the natural log of profits before taxes of bank *i* at year *t*, P_{it} is a vector of input prices, Y_{it} is a vector of output quantities and N_{it} is a fixed netput . The v_{it} term represents random errors that are assumed to be independently and identically distributed and have $N(0,\sigma_v^2)$, while u_{it} represents non-negative (in)efficiency effects that are assumed to be independently but not identically distributed. For each bank in the sample, (in)efficiency, u_{it}, is estimated as truncation at zero of a normal distribution $N(z_{it}\,\delta, \sigma_u^2)$ with a mean defined by the following specification:

$$u_{it} = z_{it}\,\delta + E_{it} \quad (2)$$

Where z_{it} is a vector of explanatory variables that can affect (in)efficiency and δ is a vector of unknown parameters[9]. E_{it} is defined by the truncation of the normal distribution with zero mean and variance, σ^2, such that the point of truncation is $-z_{it}\,\delta$, i.e., $E_{it} \geq -z_{it}\,\delta$. Equations (1) and (2) are both estimated in a single step with maximum likelihood.

Herein, we opt for a flexible translog specification of the alternative profit function:

$$lnPBT_{i,t} = \alpha_0 + \sum_i \alpha_i lnP_{i,t} + \sum_i \beta_i lnY_{i,t} + {}^1\!/_2 \sum_i \sum_j \alpha_{ij} lnP_{i,t} lnP_{j,t} + {}^1\!/_2 \sum_i \sum_j \beta_{ij} lnY_{i,t} lnY_{j,t} +$$

$$+ \sum_i \sum_j \lambda_{ij} lnP_{i,t} lnY_{j,t} + \sum_i \zeta_i lnEq_{i,t} + {}^1\!/_2 \sum_i \sum_j \zeta_{ij} lnEq_{i,t} + {}^1\!/_2 \sum_i \sum_j \theta_{ij} lnP_{i,t} lnEq_{i,t} +$$

$$\sum_i \sum_j \kappa_{ij} lnY_{i,t} lnEq_{i,t} + \mu_1 T + {}^1\!/_2\, \mu_2 T^2 + \sum_i \psi_i t lnP_{i,t} + \sum_i \xi_i t lnY_{i,t} + \sum_i \rho_i t lnEq_{i,t} + \sum_i \pi_i NPI_{i,t} - u_{i,t} + v_{i,t} \quad (3)$$

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approach does not impose restrictive assumptions on the error component. However, a major shortcoming of this approach is that does not generate an (in)efficiency estimate for each decision making unit but one core (in)efficiency estimate. The other method is the distribution-free approach by Berger (1993). It is less restrictive than SFA but its shortcoming is that it estimates time-invariant (in)efficiencies. Another important restriction of SFA is that it requires the (in)efficiency term to be independent of the regressors in the SFA model. That means that in equation (3), u_{it} is assumed to be independent from the $v_{i,t}$ term and the rest of the regressors. This restriction denotes that a two-stage set up, in which (in)efficiency estimates from the SFA model are regressed in a second-step to further variables, would provide inconsistent estimates. Wang and Schmidt (2002) provide evidence explaining why both stages of the two-stage procedure are seriously biased. Therefore, employing the single-stage Battese and Coelli (1995) SFA model to estimate the (in)efficiency correlates simultaneously with the frontier parameters is justified in the context of this study.

[9] By modelling the (in)efficiency term u_{it} as a linear function of explanatory variables, the Battese and Coelli (1995) model introduces heterogeneity in the distribution of (in)efficiency. Therefore, it facilitates a comparative cross-country study of bank performance as we could attribute differences in the performance of the banking sector to the characteristics of the operating environment, such as creditor rights and information sharing that are the focus of this study.

For the definition of bank outputs and prices of bank inputs, we follow Sealey and Lindley (1977) and opt for the intermediation approach. This approach assumes that the main function of banks is to use labour and capital in order to collect funds with the scope of transforming them into loans and other income generating assets. More specifically, three inputs and two outputs are specified. Inputs include labour, as measured by personnel expenses, financial capital, and physical capital while loans, net of provisions (Y_1) and other earning assets, government securities, bonds, equity investments, CDs and T-bills (Y_2), are the outputs. In terms of the input prices, the price of labour (P_1) is calculated as the ratio of personnel expenses to total assets, the price of financial capital (P_2) is the ratio of the interest expenses to deposits and short-term funding, while the price of physical capital (P_3) is the ratio of other operating expense to fixed assets[10]. We also impose linear homogeneity as in Hasan et al. (2009) by normalising the input prices by the price of physical capital (P_3). Furthermore, we include the logarithm of equity (*Eq*) as a quasi-fixed netput.[11] Additionally, in the specification of the frontier, we include a time trend (*T*) in order to capture the effects of technological progress. Finally, we follow Bos and Koetter (2011) and include a negative profit indicator (*NPI*) to deal with some observations in our sample that report losses[12].

[10] Using bank-specific input prices is the standard practice in the literature. An anonymous referee has pointed out that these prices are endogenous to the bank behaviour while an assumption of the alternative profit function is that banks face exogenously determined input prices. Therefore, following the part of the literature that tackles this issue (Bos and Kool, 2006; Koetter 2006) we also derive exogenous market-specific input prices. To this end we compute *P1*, *P2* and *P3* approximated by the average price paid for an input factor in a specific market (country). Following Koetter (2006), these market, country-specific, averages are calculated for each bank excluding the bank itself. Assuming input markets at the country level is plausible for fixed assets (real estate) and labour but we are careful with regards to the financial capital market. We examine the deposits to total funding ratio of the banks in our sample and we observe that this is 80% for foreign banks and 82% for domestic banks so it would rational to assume that the market for borrowed funds (financial capital) for both domestic and foreign banks is largely country-specific. Using these alternative, exogenously determined, input prices yields similar results in terms of efficiency estimates, rank correlation of efficiency estimates and the efficiency covariates. These results are consistent with the observation of Bos and Kool (2006) and Koeter (2006) that profit efficiency is not as sensitive as cost efficiency when one employs these exogenously computed input prices. These results are available upon request.

[11] Ignoring financial capital may lead to a biased estimation of efficiency as banks with higher equity capital, which denotes that the shareholders have more capital at stake, may behave in a more risk averse manner than banks with lower level of equity but still optimally given the risk preferences of their shareholders (Berger and Mester, 1997).

[12] A number of banks in our sample have losses (i.e. negative profits) in some years. In order to deal with negative values of profits we follow the approach suggested by Bos and Koetter (2011). In particular, negative values of profits are replaced by the value of 1 in the left had side of the frontier equation (3), while simultaneously we use a new variable, namely the negative profit indicator (NPI), at the right hand side of equation (3). The NPI in case of losses takes the absolute value of negative profits while in case of positive profits takes the value of 1. This method of dealing with negative profits improves the precision of profit efficiency estimates (Bos and Koetter, 2011) and avoids the manipulations in the error term structure that the increase of profits of all banks by adding the sample minimum plus one implies (Hasan et al. 2009). This

3.2 Profit (in)efficiency covariates

In order to investigate the factors that affect profit (in)efficiency, we model $u_{it,}$ in equation (2) as follows:

$$u_{i,t} = \delta_0 + \delta_1 OWN_{i,t} + \delta_2 CRRIGHTS_{k,t} + \delta_3 DEPTH_{k,t} + \delta_4 PBREG_{k,t} + \delta_5 PRREG_{k,t} + \delta_6 lnGDPcap_{k,t} + \delta_7 GDPgr_{k,t} + \delta_8 INFL_{k,t} + \delta_9 C3_{k,t} + \delta_{10} PSC_{k,t} + \delta_{11} FINFREE_{k,t} + \delta_{12} CRISIS_{08,09} + \delta_{13} FDI_{k,t} + \delta_{14} CGOV_{k,t} + \delta_{15} LIST_{k,t} + \delta_{16} NONDEP_{i,t} + \delta_{17} NONIR_{i,t} + \delta_{18} LLP/L_{i,t} + \delta_{19} lnTA_{i,t} + E_{i,t} \quad (4)$$

The first variable (OWN) is a dummy variable that takes the value of 1 if a bank is foreign-owned and 0 if it is of domestic ownership. To construct this variable we utilised the foreign bank ownership dataset of Claessens and van Horen (2014) [13] and we matched it with the data on a global sample of commercial banks derived from Bankscope. In this dataset, a bank is defined as foreign, in accordance with the banking literature, when 50% or more of the specific bank's equity is owned by foreigners. To account for creditor rights and information sharing at the country level we employ the *"Getting Credit"* category of regulations from the "*Doing Business"* project of the World Bank. More specifically, we employ the creditor rights index (CRRIGHTS) which measures the extent to which bankruptcy and collateral legislation defends the rights of lenders. This index ranges from 0-10 with higher values denoting a higher level of creditor rights protection. To account for information sharing in each economy we use three different variables that capture different aspects of its credit information infrastructure. To proxy for the richness of information related to the scope, coverage and accessibility of the information existing in each country's state-owned credit registry or private credit bureau we use the depth of credit information index (DEPTH). The values of this index range from 0 to 6 for each economy and higher

approach of dealing with negative profits in efficiency estimation has been employed in the recent banking literature (Gaganis and Pasiouras, 2013; Mamatzakis and Bermpei, 2015).

[13] There are two distinct advantages of this dataset in comparison with the foreign ownership information provided by Bankscope and other published datasets related to the foreign ownership of banks (see for example Micco et al., 2007). The first is that it provides the specific point in time when a foreign bank entered a host economy or the ownership of domestic banks changed to foreign. This gives a within-bank time variation of foreign ownership during the time period of the study. Thus, we avoid the potential bias of the common assumption in the literature that a bank is foreign in all the period of the study. The second advantage is that it specifies the home country of the parent of each foreign bank. This enables us to provide, in a further analysis section of this paper, evidence with regards to the effects of creditor rights and information sharing *"institutional distance"* between the home and the host economy on the performance of foreign banks. Recent research in the foreign bank literature also employs the Claessens and van Horen (2014) dataset because of its distinct advantages. See for example Delis et al. (2016) and Kouretas and Tsoumas (2015).

values represent higher informational depth[14]. Finally, the variables PBREG and PRREG report, at a country level, the percentage of households and firms out of the total population for whom their borrowing record from the past five years is available from a state-owned credit registry and a private credit bureau respectively[15]. In Table 1 we provide some descriptive statistics for the creditor rights and information sharing variables[16].

Table 1

The rest of the variables in Equation (4) represent the transparency variables and country and bank-specific control variables. With regards to the transparency measures, the first is the inward FDI stock in the host economy (FDI). This variable is sourced from UNCTAD and represents all the non-residents direct investments in the host economy as a percentage of this country's GDP[17]. The second is the ratio of domestic credit to government and state-owned enterprises (SOEs) to GDP (CGOV). We use it as a proxy of the extent to which credit from banks located in a given economy is directed towards the public sector. The third is the number of listed companies per 10,000 people in each economy (LIST). We

[14] A country gets one point in the depth of information sharing index for each the following features: i) Both positive and negative information are distributed, ii) data are available for both firms and individuals, iii) more than two years of historical data are distributed, iv) data on large as well as small loans are distributed, v) data from financial institutions as well as retailers and utility companies are distributed and vi) by law, borrowers have the right to access their data in the largest registry or bureau (World Bank, 2012).

[15] The distinction between a public credit registry and a private credit bureau is important as they can differ significantly in the availability of credit history and the associated information they might contain. OECD (2010) reports that private credit bureaus have some distinct advantages over public credit registries. Public credit registries collect information for large loans that could affect bank systemic stability, they are subject to stricter privacy laws in comparison with private credit bureaus and they usually do not provide additional services such as credit scoring. Credit scoring is widely used in the banking industry to estimate the probability of default of potential borrowers (Roszbach, 2004). On the other hand, an advantage of public credit registries is that they have the regulatory authority to impose to financial institutions to submit information to them.

[16] Interestingly, we note that for the global sample the creditor rights and information sharing indicators have improved over the years of the study. This holds for both developed (DCs) and less developed countries (LDCs). This improvement appears to be stronger in terms of the information sharing variables and for less developed economies (LDCs), the time series shows that less developed economies (LDCs) are in a catch-up process as they improve considerably their scores in creditor rights and the information sharing. The latter is consistent with the observation of Brown et al., (2009) that information sharing is becoming pervasive in emerging economies.

[17] We opt for a stock measure of inward FDI instead of an inflow measure as the latter ignores capital raised in the host economy (as for example loans from banks located in the host economy) and so it is more appropriate in the context of this study. We do recognise some important limitations of the inward FDI stock measure of multinational activity in the host economy in the context of this study. A more appropriate measure would be the non-bank inward FDI stock but such data are not available on a global scale. An even more appropriate measure would be bilateral inward non-bank FDI stocks. In this way we would have a 100% valid measure of the *"follow the customer"* hypothesis but again such data are not available. Nevertheless, it could be argued that multinational enterprises, even if they are not from the same home economy as a foreign bank, could be viewed by the latter as more transparent from the average domestic firm (Raffournier 1995; Branguinsky and Mityakov, 2015).

source the CGOV and the LIST variables from the 2013 version of the *Global Financial Development Database* of the World Bank.

For the country control variables, we use domestic credit to the private sector as a share of GDP (PSC) as financial development proxy, while to account for the general level of economic development we employ the natural logarithm of the real GDP per capita (lnGDPcap) in purchasing power parity (PPP) terms. Furthermore, we take account of GDP growth (GDPgr) and inflation (INFL). To account for the level of concentration in the banking industry, we use the assets of the three largest banks as a share of the assets of all commercial banks (the C3 ratio). To control for government imposed frictions and regulations in the banking industry we use the *"financial freedom"* (FINFRE) component of the *Heritage Foundation* economic freedom index (see for example Chortareas et al., 2012). This index ranges from 0-100 with higher values denoting less government interference in the form of regulations in the banking industry. In order to control for the global financial and economic crisis, we include a crisis dummy (CRISIS) which takes the value of 1 for the last two years of our study (2008 and 2009) and zero otherwise[18].

In terms of bank-specific controls,[19] we first utilise variables that capture bank business models Demirguc-Kunt and Huizinga (2010). Therefore, to control for the funding and the activity strategy of each bank, we employ the non-deposit funding over the total funding ratio (NONDEP) and the share of non-interest income over the total operating income (NONIR) of each bank respectively. Additionally, we control for the ratio of loan loss provisions over total loans (LLP/L) and for the natural logarithm of the total assets (lnTA) as a proxy for bank size (Gaganis and Pasiouras, 2013). We source these bank-specific variables

[18] We attempted to perform estimations that include both the crisis dummy and time effects. In this case, the crisis dummy dropped from the estimations. The estimations that include just the time effects and not the crisis dummy produce similar results.

[19] We thank an anonymous referee for pointing out that variables that control for the bank business model are important in the context of this study even if our sample consists of banks of the same type (commercial). For example, if banks that are located in some specific countries (or even originating from some specific countries in the case of foreign banks) have systematic differences in their business models with banks in other countries (or with domestic banks in the same host economy) then the effect of our main variables of interest (creditor rights and information sharing) on performance might just be capturing geographical differences in business models. For this reason we follow Demirguc-Kunt and Huizinga (2010) and introduce variables that capture the activity and funding strategy of each bank. Furthermore, the referee has pointed out that there could also be systematic differences, stemming from different business models, between foreign and domestic banks, with regards to the sectoral composition of loans. This would reflect differences in the risk appetite that stem from different business models. Again in this case the effect of creditor rights and information sharing on performance could be contaminated. We do not have such disaggregated loan data for a global sample of banks. Therefore, we include as control variable the loan loss provisions over total loans ratio (LLP/L) ratio assuming that it would reflect to an extent the risk appetite differences that stem from different sectoral loan composition.

from Bankscope. Furthermore, in equation (4) we control for the level of economic development of each country as in Gaganis and Pasiouras (2013). To do so we create dummies for high income and middle-income economies following the 2009 version of the World Bank country classification according to GDP per capita.[20] Additionally, in all the models of equation (4) we control for the legal origin of each country[21]. To capture any other form of country heterogeneity, as for example national culture, we also introduce in equation (4) country dummies.

4. Empirical results and discussion

4.1 Profit efficiency estimates

The profit efficiency scores from the baseline model of the global best-practice frontier are in Table 2.[22]

Table 2

The full sample overall mean stands at 0.773 and conforms with the scores that other studies that employ global samples report (Pasiouras et al., 2009; Gaganis and Pasiouras 2013). We also observe that the overall mean profit efficiency score declined from 0.799 in 2005 to 0.710 in 2009 reflecting the severe consequences of the global financial crisis on the banking sector. Another important observation that Table 2 reveals is that although banks located in developed countries (DCs) are more profit efficient than banks located in less developed economies (LDCs) in accordance with Gaganis and Pasiouras (2013), in the last year of the study (2009) banks in LDCs are more efficient than banks in DCs. This implies that the impact of the crisis was significantly more severe for banks in DCs than for banks located in LDCs.

[20] We drop one level of development dummy; the one for the low income economies.

[21] This is important in the context of our study because the level of creditor rights and information sharing in each economy might be directly linked to legal origins. For example, Djankov et al. (2007) show that public credit registries are more prevalent in countries with French legal origin, especially when they are less developed. To control for legal origins we create country dummies for countries with English, French, German and Socialist legal origins. To avoid perfect collinearity we drop the dummy variable for Scandinavian legal origins.

[22] We also investigate in which economies foreign banks have outperformed domestic banks. A list of such economies is available on Table A1 of the Appendix. Only in a few economies of the global sample foreign banks outperform domestic banks. Furthermore, the majority of the countries where foreign banks are more profit efficient than domestic banks are LDCs. This is in accordance with previous research which finds that it is more often the case that foreign banks would outperform domestic banks in LDCs (e.g. Grigorian and Manole 2006; Berger et al. 2009).

4.2 Profit efficiency covariates

4.2.1 Global best-practice frontier

Table 3 shows the covariates of bank profit efficiency obtained from the Battese and Coelli (1995) model and assuming a global best-practice frontier.

Table 3

The first model of Table 3 shows the baseline results while in the rest of the models (2 to 6) we interact the foreign ownership variable (OWN) with the creditor rights and the information sharing variables. The results of the baseline model 1 in Table 3 show that the foreign ownership (OWN) variable is significant at the 1% level and has a negative effect on profit efficiency. This result provides evidence in support of the *"liability of foreignness"* that foreign banks face when they operate in a given host economy. Turning to the creditor and information sharing variables we find that creditor rights (CRRIGHTS), in support of hypothesis *H1.A*, exert a significant at the 1% level positive effect on profit efficiency. One channel through which creditor rights could have a positive effect on bank performance could stem from the signaling nature of collateral requirements with regards to the evaluation of borrower creditworthiness (Sengupta, 2007; Karapetyan and Stacescu, 2014a). Furthermore, strong creditor rights could reduce the moral hazard of borrowers (Acharya et al., 2011, Vig, 2013, Cho et al, 2014). This, in turn, could have a positive impact on bank revenues through improved loan performance and thus overall bank efficiency.

On the other hand, the information sharing variables exert a negative effect on bank profit efficiency (see model 1 of Table 3). This results provides evidence in support of hypothesis *H3.B*. The depth of creditor information (DEPTH) and the coverage of public credit registries (PBREG) have a negative and significant at the 1% level impact on profit efficiency. The coverage of private credit bureaus (PRREG) also exerts a negative impact on efficiency but is not significant. Through one channel, increased information sharing reduces bank bargaining power and the monopolistic rents built on relationship intensity that a bank can charge to its customers as it becomes easier for borrowers to switch banks (Padilla and Pagano, 1997; Dell'Ariccia and Marquez, 2004) and this could have a negative impact on bank profitability. Through another channel, increased information sharing can lead to a deterioration of bank portfolio quality because of decreased loan screening effort (Dell'Ariccia and Marquez, 2006). Furthermore, the negative impact of the depth of

information sharing (DEPTH) on bank efficiency could be a result of the negative effect that increased information depth, as for example the provision of both positive and negative (defaults) records, could have on the ability of historical information on borrowers to act as disciplinary device for borrowers (Padilla and Pagano, 2000; Cheng and Degryse, 2010). It could also imply the increase in the effort of borrowers, in order to defend their newly improved reputation, when negative information (i.e. past defaults) are erased early from credit registries or bureaus (Bos and Nakamura 2014; Elul and Gottardi, 2015)[23].

The models that include the interaction terms between the foreign ownership dummy (OWN) and the creditor rights and information sharing variables reveal some interesting findings. In models 2 and 6 of Table 3 the interaction between foreign ownership (OWN) and the creditor rights of the host country (CRRIGHTS) has a positive and significant at the 5% level impact on efficiency while the individual effect of CRRIGHTS on efficiency is positive and significant at the 1% level. In support of hypothesis *H2*, the positive effect of creditor rights on efficiency strengthens for foreign banks. This implies the increased usefulness of collateral for foreign banks as a signaling device to estimate borrower creditworthiness in a foreign environment where they have an informational disadvantage vis-à-vis a domestic bank (Sengupta, 2007). In model 3 and model 6 of Table 3 we find that the negative effect of the depth of credit information (DEPTH) on bank efficiency strengthens for foreign banks. The interaction term between the foreign ownership dummy (OWN) and the DEPTH variable is negative and significant at the 1% level lending support to hypothesis *H4*. At a given level of depth of credit information, domestic banks have the advantage over foreign banks to be more familiar with the local borrower firms. Higher access of domestic banks to "soft" information on local firms can complement the "hard" information provided in the credit registries or bureaus. Higher depth of credit information (DEPTH) then does little to motivate foreign banks to acquire "soft" information on local borrowers, although at higher levels of information sharing the marginal benefit of "soft" information becomes higher (Karapetyan and Stacescu, 2014b). This could stem from the hierarchical structure of foreign banks that renders less capable than domestic banks to rely on "soft" information on lenders (Stein 2002, Berger et al. 2005). On the other hand, in models 4 and 6 of Table 3,

[23] To economise space, we do not analyse in detail the results for the bank-specific and the rest of the country control variables but we note that they are in accordance with several banking studies (Dietsch and Lozano-Vivas, 2000; Demirgüç-Kunt and Maksimovic, 2002; Grigorian and Manole, 2006; Kasman and Yildirm, 2006; Demirguc-Kunt and Huizinga, 2010; Chortareas et al., 2012; Barth et al., 2013; Bertay et al., 2013).

we find that the negative effect of the public credit registry coverage (PBREG) on efficiency subdues for foreign banks. Since public credit registries report information mostly on large firms with high credit exposure (OECD, 2010; World Bank, 2014) and large firms are a segment of the market favored by foreign banks (Pennathur and Vishwasrao, 2014) information on these firms might be of particular usefulness for foreign banks.

4.2.2 Separate Frontier for Developed Countries (DCs) and for Less Developed Countries (LDCs)

The results in section 4.2.1 are based on a global best-practice frontier. It would be interesting to examine for potential heterogeneity of the results based on separate frontiers for banks located in DCs and LDCs (Lensink et al., 2008)[24]. The results for the profit efficiency covariates using separate best practice frontiers for DCs and LDCs are available in Tables 4 and 5 respectively.

Table 4 and Table 5

We note that in both cases the foreign ownership dummy (OWN) is significant at the 1% level and exerts a negative impact on efficiency. However, in terms of magnitude the coefficient of the OWN variable is quite higher in the case of DCs (compare model 1 of Table 4 with model 1 of Table 5). This implies that although the *"liability of foreignness"* holds in both cases, it is less strong for foreign banks located in LDCs. For creditor rights (CRRIGHTS) we find, in accordance with hypothesis *H1.A*, that they exert a positive and significant effect on bank efficiency in both DCs and LDCs. In the case of LDCs, the magnitude of the CRIGHTS variable is quite larger (compare model 1 of Table 4 with model 1 of Table 5). This suggests that the beneficial effects of strong creditor rights on the usefulness of collateral as signaling device for estimating borrower creditworthiness (Berger et al., 2011a; Berger et al., 2011b) are prevalent in LDCs.

Regarding the information sharing variables, we find that credit information depth (DEPTH), in accordance with hypothesis *H3.B*, exerts a negative and significant effect on bank efficiency in both DCs and LDCs (see model 1 of Table 4 and model 1 of Table 5). This result is consistent with our findings for the global sample. However, in the case of the

[24] Lensink et al. (2008) who examined the impact of institutional quality on the efficiency of foreign banks have also separated, in a second step, their sample between DCs and LDCs for sensitivity analysis. The authors argued that this distinction helps to account for different banking technologies in these two subsamples.

private credit bureaus coverage (PRREG) we observe heterogeneity between DCs and LDCs. The PRREG variable has a negative and significant effect on the profit efficiency for banks located in DCs (supporting the hypothesis *H3.B*) while its coefficient is positive in the LDCs case (supporting the hypothesis *H3.A*). In the case of LDCs, where borrowers are characterized by high opacity (Degryse et al. 2012), the informational advantage that private credit bureaus bring to banks in the loan origination process (Pagano and Japelli, 1993; Dierkes et al., 2013; Bos et al. 2015) could be higher than the efficiency losses due lower screening efforts at higher levels of information sharing (Dell'Ariccia and Marquez, 2006; Bos and Nakamura, 2014). On the other hand, such informational advantages in DCs where firms are less opaque could be lower and the efficiency losses due to lower screening effort might dominate them. Finally, the coverage of public credit registries (PBREG), in accordance with hypothesis *H3.B*, exerts a negative and significant impact on bank efficiency in the case of LDCs. The latter results cast doubt on the quality of public credit registries in LDCs consistent with the observations of Giannetti et al. (2016).

Turning to the interaction terms between the foreign ownership dummy (OWN) and the creditor rights and information sharing variables in the DCs and LDCs subsamples we observe that most of them are significant lending support to the hypotheses *H.2* and *H.4*. In both DCs and LDCs, the interaction term between creditor rights (CRIGHTS) and the foreign ownership dummy (OWN) is positive and significant (see models 2 and 6 of Tables 4 and 5). In the case of LDCs though, the coefficient and statistical significance of this interaction are larger. This implies that for foreign banks the usefulness of collateral as a borrower screening device (Sengupta, 2007) increases in more opaque host economies.

However, in the case of information sharing we observes some heterogeneity. With regards to the depth of credit information (DEPTH), we find that its negative effect on efficiency subdues for foreign banks in LDCs (see models 3 and 6 of Table 5). On the other hand, in the case of DCs, the negative effect of the DEPTH variable on efficiency strengthens for foreign banks (see models 3 and 6 of Table 4). In LDCs foreign banks have the disadvantage *vis-à-vis* domestic banks to be highly unfamiliar with the local firms (Gianneti and Ongena, 2009). Yet, foreign banks in LDCs might possess strong internalized competitive advantages, such as superior loan screening technologies, *vis-à-vis* domestic banks (Bruno and Hauswald, 2014). It could be the case that the negative effect of credit information depth (DEPTH) on bank efficiency subdues for foreign banks in LDCs because the higher

depth of information sharing would enable the use of their advanced lending technologies. This is because the lending technologies of foreign banks, as for example credit scoring models, rely heavily on shared credit information as inputs (Berger and Udell, 2006; Beck et al, 2015). Foreign banks in DCs on the other hand, might have more limited competitive advantages *vis-à-vis* domestic banks as they probably use similar lending technologies (Claessens and Van Horen, 2012). In DCs then, efficiency losses stemming from the lower ability of foreign banks to access "soft" information could outweigh the limited efficiency gains, *vis-à-vis* domestic banks, stemming from lending technologies that rely on credit information sharing. In such case, the negative effect of the depth of credit information on bank efficiency would increase for foreign banks. In a similar way, we could explain why the negative effect of the coverage of private credit bureaus (PRREG) on bank efficiency in DCs increases for foreign banks (see models 5 and 6 of Table 4). Another finding is that the negative effect of the public credit registry coverage (PBREG) on bank profit efficiency in LDCs decreases for foreign banks (see models 4 and 6 of Table 6). This result is in line with our findings for the global sample (see model 4 of Table 3) and could denote the importance for foreign banks of "hard" information on large firms (Giannetti and Ongena, 2009) that are usually available in public credit registries (World Bank, 2014).

4.2.3 Does Host Economy Transparency moderates the important of creditor rights and information sharing for foreign banks?

In this section, we test the fifth hypothesis (*H.5*) and explore if higher transparency of the host economy could moderate the effect of creditor rights and information sharing on foreign bank profit efficiency. We proxy the host economy transparency with variables that reflect the presence of multinational firms (FDI), the level of credit directed towards the government (CGOV) and the number of listed companies (LIST).[25]

[25] An anonymous referee has pointed out that the presences of listed firm variable (LIST) and the credit to the government (CGOV) variable might not capture just transparency. For example the LIST variable might capture the level of development of the firms in the host economy and the CGOV variable the lower or higher level of country-level economic efficiency in countries with more government enterprises. To robust-check these results, we used alternative variables for LIST and CGOV. We regressed the LIST variable over an index of the quality of individual firms operations and strategies, at the country-level, sourced from the *Global Competitiveness Reports* of the World Economic Forum (WEF). The residuals derived from this regression proxy for cross-country variation in listed firms that is unexplained by factors correlated with country-specific firm development. We use these residuals as an alternative to the LIST variable. We also regress the CGOV variable over a variable that reflects, at the country-level, freedom from the presence of SOEs that we source from the *Fraser Index of Economic Freedom.* The residuals derived from this model proxy for cross-country variation in

We use triple interaction terms between the foreign ownership variable (OWN), the creditor rights (CRRIGHTS) and information sharing variables (DEPTH, PBREG, PRREG) and the three transparency variables (FDI, CGOV and LIST). The effects of these triple interaction terms are available in Table 6[26] and provide evidence in support of hypothesis *H.5*.

Table 6

We observe that the positive effect on efficiency of the interaction term between creditor rights (CRRIGHTS) and foreign ownership (OWN) subdues at higher levels of FDI stock, when more credit is directed to the government and SOEs, and in the presence of more listed companies in the host economy (see model 1 of Table 6). Similar moderation effects, we also observe for the triple interaction terms that include the foreign ownership dummy (OWN), the credit information sharing variables (DEPTH, PBREG, PVREG) and the three transparency variables (see models 2,3 and 4 of Table 6). Most of these results remain robust when we include all the interaction terms in one model (see model 5 of Table 6).

When the economic environment of the host economies becomes more transparent, as measured by the FDI, CGOV and LIST dimensions, the importance of creditor rights and information sharing for the performance of foreign banks declines. Higher presence of (MNEs) in the host economies means that foreign banks could either gear their services to customers they already know from their home economy, in accordance with the *"follow the customer"* hypothesis, or gear their services towards MNEs in general (no matter of the country of origin of a given MNE) as MNEs are more financially transparent than the average domestic firm (Branguinsky and Mityakov, 2015). In this way, at a given level of creditor rights and information sharing in the host economy, foreign banks could utilise "hard" information provided directly by the MNEs borrowers and thus engage in a more efficient

terms of credit directed to the government that is unexplained by factors related to the weight of SOEs in an economy. We use these residuals as an alternative to the CGOV variable. Using these alternative transparency variables leads to qualitatively similar results. These alternative estimations are available upon request. We thank the anonymous referee for motivating us to perform this robustness check.

[26] We have also performed the same exercise for separate best-practice frontiers for DCs and LDCs. In these models the results for the profit efficiency covariates regarding the triple interaction terms between foreign ownership (OWN), the creditor rights (CRRIGHTS) and information sharing variables (DEPTH, PBREG, PRREG), and the FDI, CGOV and LIST variables for both the DCs and LDCs subsamples are qualitatively similar to the ones for the global sample. Therefore we report in this paper the results for the global sample. These results for the DCs and LDCs subsamples are available upon request.

loan origination. For a similar reason, the importance of creditor rights and information sharing for the performance of foreign banks could decline in the presence of a high number of listed companies and when more credit is directed towards the government and SOEs. In the case of listed companies, foreign banks could gear their services towards firms that can directly provide them with reliable "hard" information (La Porta et al., 2000; Loderer and Waelchli, 2010) while credit to the government is usually protected by explicit (Mian, 2003) or implicit government guarantees (Faccio et al., 2006; Borisova et al., 2015)[27].

In terms of the main effect of the transparency variables on efficiency, we find that the presence of MNEs (FDI) and credit to the government and SOEs (CGOV) exert a positive effect on efficiency (see all models in Table 6). We find though, that the third transparency variable, the presence of listed firms (LIST), has a negative effect on efficiency (see all models in Table 6). This could denote that any bank efficiency gains stemming from the "hard" information availability that listed firms provide are not enough to compensate for the informational rent decrease that stems from the lower bargaining power position that banks have over listed firms because the latter have access to alternative non-bank sources of finance (Pagano et al.1998; Saunders and Steffen, 2011).

4.2.4 Further Analysis: The effect of Institutional Distance in Creditor Rights and Information Sharing on Foreign Bank Performance

So far we have examined the effect of the host economy level of creditor rights and information sharing on foreign bank profit efficiency *vis-à-vis* domestic banks. However, the banking literature also finds that institutional differences between the host and origin countries could matter for the lending behavior (Ongena et al., 2013; Beck et al., 2015) and the performance (Lensink et al., 2008; Claessens and Van Horen, 2012) of foreign banks in the host economy. In this section, we examine if such *"institutional distance"*, in terms of creditor rights and information sharing, would have an effect on foreign bank performance. To this end, we follow Lensink et al. (2008) and limit our sample solely to foreign banks. Furthermore, we construct four variables based on the differences between the home and host economy in terms of a) creditor rights (DISCRIGHTS), b) depth of information sharing

[27] The argument that relates to the gearing of the services of foreign banks towards more transparent borrowers follows the Dell'Ariccia and Marquez (2004) model of segmentation of the loan market of the host economy. In this model foreign banks serve more transparent customers and domestic banks serve more opaque borrowers.

(DISDEPTH), c) public credit registry coverage (DISPBREG) and d) private credit bureau coverage (DISPRREG). The *"institutional distances"* derived from the above process could take both negative and positive values. A positive value implies that a foreign bank that comes from a home country with high creditor rights (or information sharing) operates in a host economy with low creditor rights (or information sharing) while a negative value implies the opposite.

The results for the foreign bank profit efficiency covariates that include the *"institutional distances*" for the global, DCs and LDCs best-practice frontiers for foreign banks are available in Table 7[28].

Table 7

The coefficient of the impact of the distance in creditor rights (DISCRIGHTS) on profit efficiency is negative and significant at the 1% level for the global sample of foreign banks (model 1 of Table 7) and for the LDCs sample (model 3 of Table 7). When a bank that originates from a home country environment with high creditor rights operates in a host economy with low creditor rights, especially if the latter is an LDC, its profit efficiency decreases. Banks originating from a high creditor rights home country could have developed lending technologies that rely on the use of collateral as a screening device to evaluate borrower creditworthiness (Mian, 2006; Sengupta, 2007; Beck et al., 2015). When such foreign banks are in a host economy with a lower level of creditor rights, then they might not be able to exploit fully their collateral-based lending technologies in the loan screening and this could lead to efficiency losses. This would be especially evident in the opaque loan markets of LDCs (Cull and Peria, 2010).

On the other hand, the impact of the distance in the credit information depth (DISDEPTH) on foreign bank profit efficiency is positive and significant for the global sample model as well as for the DCs and LDCs subsamples (see all models of Table 7). Foreign bank originating from home economies with a high level of depth of credit information operate more efficiently in a host economy with lower levels depth of credit information. Such foreign banks could be more prudent in their loan screening efforts in host economies with low credit information depth and thus, experience efficiency gains. Furthermore, a higher

[28] In these estimations we expand equation (4) by including the *"institutional distance"* variables we have constructed but also dummies for same legal origin, dummies for same level of development and country-pair dummies. This is to ensure that the *"institutional distance"* variables in terms of creditor rights and information sharing capture just that and no other differences between the home and the host economy of foreign banks.

"institutional distance" in terms of depth of credit information could motivate foreign banks to focus on the less opaque borrowers of the host economy's loan market (Dell'Ariccia and Marquez, 2004). This is consistent with the evidence in the literature that higher *"institutional distance"* would induce foreign banks to focus on less opaque borrowers so that they can apply their lending technologies that rely on "hard" information inputs (Mian 2006, Beck et al., 2015). In a similar manner, we could explain the positive and significant effect of the distance in the public credit registry coverage (DISPBREG) on profit efficiency for the global sample and the DCs subsample (see models 1 and 2 of Table 7). Finally, we do not find statistically significant evidence that *"institutional distance"* in terms of private credit bureaus (DISPRREG) affects foreign bank efficiency (see all models of Table 7).

In terms of the results regarding the effects of host economy creditor rights and information sharing on foreign bank efficiency we find that creditor rights (CRIGHTS) exert a positive and significant effect on efficiency (see all models of Table 7). The comparatively large positive coefficient for the LDCs subsample though provides evidence that creditor rights are more useful for foreign banks as a borrower screening device in more opaque economies (Sengupta, 2007; Hasellman et al., 2010; Hanedar et al., 2014). We also find that depth of credit information (DEPTH) exerts a negative effect on foreign bank efficiency in all specifications (see all models of Table 7). This result is consistent with the estimates for the sample that includes both foreign and domestic banks (see model 1 in Tables 3, 4 and 5). As it has been discussed before, a higher level credit information depth could decrease bank performance because of decreased loan screening effort (Dell'Ariccia and Marquez, 2006) and because it would undermine the ability of historical information to act as a disciplinary device for borrowers (Padilla and Pagano, 2000; Cheng and Degryse, 2010). The public registry coverage variable (PBREG) exerts a significant and positive effect on foreign bank performance especially in LDCs (see models 1 and 3 of Table 7). This result confirms the importance that foreign banks place on the availability of "hard" information on large firms in LDCs. This is because public credit registries usually contain information on large companies (OECD, 2010, World Bank, 2014) that are generally less opaque than smaller firms in the host economy and form an important customer base for foreign banks (Giannetti and Ongena, 2012). Moreover, the coefficient of the effect of private credit bureau coverage (PRREG) on the profit efficiency of foreign banks is significant at the 1% level and negative in in the DCs subsample while significant at the 10% level and positive in

the LDCs subsample (See models 2 and 3 of Table 7). Greater private credit bureau coverage, and thus more "hard" information availability in the highly opaque LDCs loan markets, might lead to efficiency gains for foreign banks larger than the efficiency losses due to lower screening effort in lending that could result from higher levels of information sharing (Dell'Ariccia and Marquez, 2006), while the opposite could be the case for foreign banks located in DCs. Furthermore, DCs are characterized by more competitive bank markets (Clerides et al., 2015). Therefore, a decrease in the loan screening effort of banks due to a higher level of information sharing in accordance with the model of Dell'Arricia and Marquez (2006) is more likely to be the case in DCs where the competitive pressures are stronger. Finally, we note that all the host economy transparency variables that we employ in this study (FDI, CGOV and LIST) are positively related to efficiency, especially in LDCs, in the estimations that are restricted exclusively to foreign banks (see all models of Table 7). The latter result lends support to the view that the financial transparency of borrowers in the host economy is of importance for foreign banks (Brown et al., 2011; Pennathur and Vishwasrao, 2014).

4.2.5 Robustness Estimations: Panel vector autoregression (VAR) estimation with Foreign Bank Profitability Ratios

As a final robustness check, we follow Love and Zicchino (2006) and opt for the flexible framework of a panel VAR specification that includes a foreign bank profitability measure and the level of creditor rights and information sharing of the host economy. In a panel VAR framework, all variables are assumed to be endogenous and in this way we can take into account reverse causality issues. Furthermore, the panel VAR methodology allows us to observe the isolated impact of creditor rights and information sharing on bank performance and as well as its intertemporal effects. In order to enhance the validity of this robustness check exercise, we measure profit performance with simple profitability ratios. In particular, we opt for the Return on Average Equity (ROAE) and the Return on Average Assets (ROAA) ratios. We report the panel VAR results of the ROAE models as employing the ROAA profitability measure produces essentially the same results[29].

[29] As a first step in the panel VAR estimation we follow Lütkepohl (2006) and assume the optimal order of lags for the right-hand side variables of the system of equations. We compute for the first, second and third lag the Arellano-Bond GMM estimator. We confirm with the results of the Akaike Information Criterion (AIC) and with the results of the Arellano-Bond AR tests that the optimal lag is of order one. We add more lags to control

The impulse response functions (IRF) derived from the unrestricted panel-VAR are reported in figure 1. The plots show the response of each variable (ROAE, CRRIGHTS, DEPTH, PBREG and PRREG) to its own innovation and to the innovations of the other variables. The first row shows the response of ROAE on a one standard deviation shock in the CRRIGHTS, DEPTH, PBREG and PRREG variables. The results provide support to the evidence from the SFA models related to the effect of these variables on the profit performance of foreign banks.

Figure 1

We observe that the effect of creditor rights (CRRIGHTS) on ROAE is positive over the whole period while it peaks in the first period year and converges towards equilibrium thereafter. Furthermore, the response of ROAE to a shock in the depth of credit information (DEPTH) is negative in the period under study. Negative is also the response of ROAE on a shock in the private credit bureau coverage variable (PRREG) in line with the SFA results. Finally, the response of ROAE to a shock in the public credit registries coverage variable (PBREG) is positive but the wide standard errors of this response warn us about the validity of this outcome.

Table 8

Table 8 presents further evidence of the importance of creditor rights and information sharing for foreign bank profitability as reported by the variance decompositions (VDC) estimations. Specifically, around 19% of the forecast error variance of bank ROAE after 10 years is explained by creditor rights (CRRIGGHTS) disturbances. The depth of credit information is also an important determinant of foreign bank profitability as 8.72% of the forecast error variance of ROAE explained by shocks in the DEPTH variable. Finally, disturbances in the private credit bureau coverage (PRREG) appear to matter more than public credit registry coverage (PBREG) in forecasting foreign bank profitability.

for autocorrelation and the Sargan tests imply, as the null hypothesis cannot be rejected, that the first lag is suitable for the panel VAR estimation. Since the creditor rights and information sharing variables are characterised by low time frequency using the first lag in the panel VAR framework conserves information and degrees of freedom.

5. Conclusion

This study examines if foreign ownership influences the effect of creditors rights and information sharing on bank performance. To this end, we employ the recent bank ownership dataset of Claassens and Van Horen (2014) and match it with commercial bank data for 119 countries for the 2005-2009 period. We find a positive effect of creditor rights on performance, as measured by profit efficiency, which strengthens for foreign banks. This effect holds when we break our sample in DCs and LDCs but is more apparent in the latter group of countries. When it comes to information sharing, the results for the global sample show that it exerts a negative effect on performance which strengthens for foreign banks. These results are more evident for the depth of credit information and private credit bureau coverage aspects of information sharing and when we focus on DCs. In LDCs however, the negative effect of information sharing on performance subdues for foreign banks especially in the case of the public credit registry coverage aspect of information sharing. Furthermore, we employ three measures of host economy transparency; the presence of MNEs, the presence of listed companies and credit to the government, and find that they moderate the importance of foreign ownership in the relationship that creditor rights and information sharing have with bank performance. Finally, we find that *"institutional distance",* in terms of creditor rights and information sharing, between the home and host economy, matters for foreign bank performance.

This empirical evidence has some important policy and managerial implications. In terms of policy, governments in both DCs and LDCs should focus on strengthening the protection of creditor rights in order to increase the performance of foreign banks located in their jurisdiction. Governments in LDCs, should also focus on improving the public registry coverage aspect of the information sharing infrastructure of their country in order for foreign banks to incur efficiency gains. In terms of managerial implications, foreign bank managers should place strong importance on the host economy's strength of creditor rights. Furthermore, when a bank aims to expand internationally in LDCs the coverage of public credit registries should be in their list of location selection criteria along with the strength of creditor rights. Importance should also be given by foreign banks on the transparency of the host economy business environment. The transparency of the host economy is able to decrease the information asymmetry between foreign banks and domestic borrowers

rendering less important creditor rights and credit information sharing. Finally, banks that originate from a high creditor rights economy should be wary of expanding in countries with low creditor rights as they might incur efficiency losses.

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Tables and Figures

Table 1: Variation in the Level of Creditor Rights and Information Sharing by Development Level

	Measure	CRRIGHTS			DEPTH			PBREG			PRREG		
All Economies	mean	5.59			3.504			3.545			30.519		
Developed Economies (DCs)	mean	7.361			5.049			4.435			58.643		
Less Developed Economies (LDCs)	mean	4.291			2.371			2.893			9.893		
Year	**Measure**	**LDCs**	**DCs**	**All Economies**	**LDCs**	**DCs**	**All Economies**	**LDCs**	**DCs**	**All Economies**	**LDCs**	**DCs**	**All Economies**
2005	mean	4.079	7.133	5.524	1.233	5.12	3.073	1.212	3.571	2.328	6.212	55.828	29.69
2006	mean	4.063	7.35	5.467	1.512	5.188	3.081	1.833	3.398	2.501	7.658	58.163	29.22
2007	mean	4.145	7.695	5.512	1.636	5.194	3.006	2.329	3.98	2.965	7.107	65.116	29.445
2008	mean	4.529	7.369	5.732	3.688	4.846	4.179	3.866	5.28	4.466	12.22	56.71	31.077
2009	mean	4.66	7.275	5.736	3.846	4.87	4.267	5.186	6.192	5.6	16.398	57.669	33.381

Note: CRRIGHTS stands for creditor rights and has a 0 to 10 scale, DEPTH stands for depth of credit information and has a 0-6 scale, PBREG stands for public credit registry and PRREG stands for private credit bureau. The PBREG and PRREG variables are measured as percentages of each country total individual and firm population. DCs stands for developed countries and includes the high –income economies based on the World Bank classification of 2009. LDCs stands for less developed countries and includes the middle-income and low-income countries according to the World Bank classification of 2009.

Table 2. Profit efficiency estimates by year and development level

	Profit Efficiency Global Best-Practice Frontier					
	All Countries		DCs		LDCS	
year	mean	s.d.	mean	s.d	mean	s.d
2005	0.799	0.167	0.827	0.186	0.761	0.116
2006	0.804	0.184	0.830	0.188	0.764	0.134
2007	0.798	0.175	0.799	0.208	0.760	0.112
2008	0.747	0.206	0.738	0.224	0.727	0.148
2009	0.710	0.228	0.707	0.241	0.715	0.172
Total	**0.773**	**0.192**	**0.782**	**0.215**	**0.745**	**0.135**

Note: The Table presents the averaged bank profit efficiency estimates averaged by year and level of development. They are obtained using the Battese and Coelli (1995) model, using the alternative profit function and assuming a best-practice global frontier. DCs stands for developed countries and includes the high –income economies based on the World Bank classification of 2009. LDCs stands for less developed countries and includes the middle-income and low-income countries according to the World Bank classification of 2009.

Table 3. Foreign Ownership, Creditor Rights and Information Sharing as Determinants of Bank Profit Efficiency – Global Sample (2005-2009)

Variables	1		2		3		4		5		6	
constant	3.428	***	3.215	***	3.082	***	3.412	***	3.329	***	3.531	***
OWN	-1.034	***	-1.085	***	-0.815	***	-1.073	***	-0.858	***	-0.876	***
CRIGHTS	0.083	***	0.073	***	0.118	***	0.074	***	0.089	***	0.050	***
DEPTH	-0.278	***	-0.255	***	-0.121	**	-0.174	***	-0.236	***	-0.132	**
PBREG	-0.004	***	-0.005	***	-0.049	***	-0.006	***	-0.005	***	-0.004	**
PRREG	-0.001		-0.001		-0.001		-0.004		-0.004	*	-0.003	
FDI	0.004	***	0.005	***	0.004	***	0.004	***	0.005	***	0.006	***
CGOV	0.034	***	0.034	***	0.034	***	0.031	***	0.036	***	0.038	***
LIST	-0.038	***	-0.034	***	-0.033	***	-0.048	***	-0.041	**	-0.028	***
lnGDPcap	0.762	***	0.718	***	0.743	***	0.680	***	0.723	***	0.677	***
GDPgr	0.019	***	0.014	***	0.016	***	0.021	***	0.019	***	0.011	***
INFL	0.040	***	0.038	***	0.040	***	0.037	***	0.036	***	0.040	***
C3	-0.161	***	-0.123	***	-0.126	***	-0.158	***	-0.118	***	-0.104	***
PSC	-0.015	***	-0.015	***	-0.015	***	-0.014	***	-0.014	***	-0.015	***
FINFREE	0.012	***	0.012	***	0.012	***	0.011	***	0.012	***	0.011	***
CRISIS	-0.932	***	-0.952	***	-0.951	***	-0.911	***	-0.930	***	-0.941	***
LLP/L	-0.468	***	-0.434	***	-0.442	***	-0.480	***	-0.468	***	-0.427	***
NONDEP	0.093	***	0.098	***	0.091	***	0.119	***	0.093	***	0.086	***
NONIR	0.012	*	0.001		0.001		0.011	*	0.007		0.005	
lnTA	0.320	***	0.342	***	0.386	***	0.316	****	0.298	***	0.273	***
OWN*CRIGHTS			0.017	**							0.020	**
OWN*DEPTH					-0.167	***					-0.042	***
OWN*PBREG							0.016	***			0.008	*
OWN*PVREG									-0.001		0.000	
Development Dummies	yes		yes		yes		yes		yes		yes	
Legal Origin Dummies	yes		yes		yes		yes		yes		yes	
Country Effects	yes		yes		yes		yes		yes		yes	
Banks	3931		3931		3931		3931		3931		3931	
Observations	13262		13262		13262		13262		13262		13262	
Log-lik	-1947.25		-1934.28		-1936.68		-19312.35		-1952.88		-1929.62	
LR test one sided error	7617.65		7643.58		7638.79		7604.13		7632.74		7623.45	

Note: The parameter estimates in this table were obtained simultaneously with the parameters of the stochastic frontier using the Battese and Coelli (1995) model. Originally, the coefficients that are estimated from the model give the effect of the covariates on the inefficiency term. In the present table, we have reversed the signs. Thus, positive (negative) parameter estimates for these variables are to be interpreted as a positive (negative) relationship between these variables and the efficiency term. OWN stands for foreign ownership, CRRIGHTS stands for creditor rights, DEPTH stands for depth of credit information, PBREG stands for public credit registry coverage and PRREG stands for private credit bureau coverage. FDI stands for the stock of inward FDI as percentage of GDP, CGOV stands for the ratio of domestic credit to the government and state-owned enterprises over GDP, LIST stands for the number of listed companies per 10,000 people. lnGDPcap is the natural log of GDP per capita in purchasing power parity (PPP) constant 2005 international $. GDPgr stands for GDP growth, INFL stands for the inflation rate, C3 stands for the concentration ratio in the banking industry, PSC stands for the ratio of domestic credit to the private sector over GDP. FINFREE stands for the financial freedom variable. CRISIS stands for the crisis dummy. LLP/L is the loan loss provisions over total assets, NONDEP is the ratio of non-deposit funding overall total funding, NONIR is the ratio of non-interest income over total operating income and lnTA is the natural logarithm of total assets. ***, ** and * indicate 1%, 5% and 10% significance levels respectively.

Table 4. Foreign Ownership, Creditor Rights and Information Sharing as Determinants of Bank Profit Efficiency – DCs Subsample (2005-2009).

Variables	1		2		3		4		5		6	
constant	-8.531	***	-6.745	***	-9.232	***	-9.784	***	-7.247	***	-7.858	***
OWN	-2.194	***	-2.218	***	-1.939	***	-2.176	***	-2.037	***	-1.672	***
CRIGHTS	0.023	***	0.026	***	0.029	***	0.027	***	0.032	***	0.028	***
DEPTH	-0.079	***	-0.112	***	-0.022	**	-0.071	***	-0.125	***	-0.033	***
PBREG	-0.002		-0.003	*	-0.003	*	-0.003	*	-0.002		-0.002	
PRREG	-0.016	***	-0.016	***	-0.016	***	-0.015	***	-0.009	**	-0.007	**
FDI	0.001		0.001		0.001		0.001		0.001		0.002	***
CGOV	0.033	***	0.032	***	0.037	***	0.038	***	0.045	***	0.045	***
LIST	-0.044	***	-0.031	***	-0.044	***	-0.050	***	-0.047	***	-0.046	***
lnGDPcap	1.021	***	0.722	***	1.008	***	1.172	***	0.784	***	0.841	***
GDPgr	0.007		0.038	**	0.008		0.022		0.065	***	0.033	**
INFL	0.072	***	0.045	**	0.089	***	0.090	***	0.003	**	0.030	*
C3	-0.237	***	-0.198	***	-0.218	***	-0.208	***	-0.217	***	-0.246	***
PSC	-0.049	***	-0.047	***	-0.040	***	-0.059	***	-0.044	***	-0.014	***
FINFREE	0.036	***	0.037	***	0.036	***	0.034	***	0.035	***	0.040	***
CRISIS	-1.800	***	-1.576	***	-1.819	***	-1.781	***	-1.675	***	-1.747	***
LLP/L	-0.261	***	-0.242	***	-0.234	***	-0.275	***	-0.231	***	-0.186	***
NONDEP	0.079	***	0.078	***	0.083	***	0.081	***	0.084	***	0.083	***
NONIR	0.015	***	0.017	***	0.014	***	0.020	***	0.015	***	0.014	***
lnTA	0.211	*	0.194	*	0.186	*	0.192	*	0.195	*	0.087	
OWN*CRIGHTS			0.009	*							0.014	**
OWN*DEPTH					-0.233	***					-0.169	***
OWN*PBREG							0.001				0.000	
OWN*PVREG									-0.015	***	-0.014	***
Legal Origin Dummies	yes		yes		yes		yes		yes		yes	
Country Effects	yes		yes		yes		yes		yes		yes	
Banks	1609		1609		1609		1609		1609		1609	
Observations	5611		5611		5611		5611		5611		5611	
Log-lik	-2012.76		-1998.15		-1997.53		-2010.37		-1989.27		-1985.5	
LR test one sided error	2369.75		2398.97		2400.21		2374.53		2416.73		2398.76	

Note: The parameter estimates in this table were obtained simultaneously with the parameters of the stochastic frontier using the Battese and Coelli (1995) model. Originally, the coefficients that are estimated from the model give the effect of the covariates on the inefficiency term. In the present table, we have reversed the signs. Thus, positive (negative) parameter estimates for these variables are to be interpreted as a positive (negative) relationship between these variables and the efficiency term. OWN stands for foreign ownership, CRRIGHTS stands for creditor rights, DEPTH stands for depth of credit information, PBREG stands for public credit registry coverage and PRREG stands for private credit bureau coverage. FDI stands for the stock of inward FDI as percentage of GDP, CGOV stands for the ratio of domestic credit to the government and state-owned enterprises over GDP, LIST stands for the number of listed companies per 10,000 people. lnGDPcap is the natural log of GDP per capita in purchasing power parity (PPP) constant 2005 international $. GDPgr stands for GDP growth, INFL stands for the inflation rate, C3 stands for the concentration ratio in the banking industry, PSC stands for the ratio of domestic credit to the private sector over GDP. FINFREE stands for the financial freedom variable. CRISIS stands for the crisis dummy. LLP/L is the loan loss provisions over total assets, NONDEP is the ratio of non-deposit funding overall total funding, NONIR is the ratio of non-interest income over total operating income and lnTA is the natural logarithm of total assets. ***, ** and * indicate 1%, 5% and 10% significance levels respectively.

Table 5. Foreign Ownership, Creditor Rights and Information Sharing as Determinants of Bank Profit Efficiency – LDCs Subsample (2005-2009)

Variables	1		2		3		4		5		6	
constant	2.604	***	2.944	***	2.829	***	2.885	***	2.750	***	3.367	***
OWN	-0.592	***	-0.533	***	-0.482	***	-0.575	***	-0.542	***	-0.422	***
CRIGHTS	0.165	***	0.133	***	0.172	***	0.170	***	0.171	***	0.080	***
DEPTH	-0.161	***	-0.159	***	-0.141	***	-0.154	***	-0.159	***	-0.191	***
PBREG	-0.013	***	-0.018	***	-0.015	***	-0.018	***	-0.011	***	-0.010	***
PRREG	0.019	***	0.019	***	0.020	***	0.019	***	0.018	***	0.017	***
FDI	0.005	***	0.004	***	0.005	***	0.004	***	0.004	***	0.004	***
CGOV	0.016	***	0.016	***	0.015	***	0.016	***	0.016	***	0.016	***
LIST	-0.020	***	-0.015	***	-0.022	***	-0.153	***	-0.017	***	-0.019	***
lnGDPcap	0.407	***	0.668	***	0.628	***	0.680	***	0.541	***	0.584	***
GDPgr	0.053	***	0.029	***	0.033	***	0.030	***	0.028	***	0.030	***
INFL	0.034	***	0.038	***	0.040	***	0.036	***	0.027	***	0.037	***
C3	-0.092	***	-0.085	***	-0.096	***	-0.091	***	-0.084	***	-0.093	***
PSC	-0.003		-0.004	*	-0.005	*	-0.004	*	-0.003		-0.003	
FINFREE	0.029	***	0.023	***	0.024	***	0.021	***	0.022	***	0.020	***
CRISIS	-0.164	***	-0.343	***	-0.307	***	-0.291	***	-0.359	***	-0.468	***
LLP/L	-0.950	***	-0.874	***	-0.835	***	-0.847	***	-0.901	***	-0.621	***
NONDEP	0.178	***	0.170	***	0.156	***	0.159	***	0.135	***	0.162	***
NONIR	0.006	*	0.006	*	0.006	*	0.004		0.047		0.001	
lnTA	0.237	***	0.217	***	0.245	***	0.192	***	0.229	***	0.176	***
OWN*CRIGHTS			0.028	***							0.039	***
OWN*DEPTH					0.001	***					0.007	***
OWN*PBREG							0.020	***			0.011	***
OWN*PVREG									0.010	***	0.001	
Legal Origin Dummies	yes		yes		yes		yes		yes		yes	
Country Effects	yes		yes		yes		yes		yes		yes	
Banks	2322		2322		2322		2322		2322		2322	
Observations	7651		7651		7651		7651		7651		7651	
loglik	932.06		967.22		983.38		980.96		949.42		962.69	
LR test one sided error	5146.03		5216.33		5248.66		5243.83		5180.75		5231.53	

Note: The parameter estimates in this table were obtained simultaneously with the parameters of the stochastic frontier using the Battese and Coelli (1995) model. Originally, the coefficients that are estimated from the model give the effect of the covariates on the inefficiency term. In the present table, we have reversed the signs. Thus, positive (negative) parameter estimates for these variables are to be interpreted as a positive (negative) relationship between these variables and the efficiency term. OWN stands for foreign ownership, CRRIGHTS stands for creditor rights, DEPTH stands for depth of credit information, PBREG stands for public credit registry coverage and PRREG stands for private credit bureau coverage. FDI stands for the stock of inward FDI as percentage of GDP, CGOV stands for the ratio of domestic credit to the government and state-owned enterprises over GDP, LIST stands for the number of listed companies per 10,000 people. lnGDPcap is the natural log of GDP per capita in purchasing power parity (PPP) constant 2005 international $. GDPgr stands for GDP growth, INFL stands for the inflation rate, C3 stands for the concentration ratio in the banking industry, PSC stands for the ratio of domestic credit to the private sector over GDP. FINFREE stands for the financial freedom variable. CRISIS stands for the crisis dummy. LLP/L is the loan loss provisions over total assets, NONDEP is the ratio of non-deposit funding overall total funding, NONIR is the ratio of non-interest income over total operating income and lnTA is the natural logarithm of total assets. ***, ** and * indicate 1%, 5% and 10% significance levels respectively.

Table 6. Host Country Transparency, Foreign Bank Ownership, Creditor Rights and Information Sharing– Global Sample (2005-2009).

Variables	1		2		3		4		5	
constant	3.027	***	3.076	***	3.356	***	3.301	***	2.297	***
OWN	-0.919	***	-0.845	***	-1.229	***	-0.884	***	-0.926	***
CRIGHTS	0.024	**	0.026	***	0.057	***	0.048	***	0.050	***
DEPTH	-0.153	***	-0.026	*	-0.154	***	-0.146	***	-0.051	**
PBREG	-0.008	***	-0.010	***	-0.003		-0.010	***	-0.004	
PRREG	-0.003	***	-0.003	***	-0.001	**	-0.004	**	-0.001	*
FDI	0.002	***	0.001	***	0.005	***	0.001	***	0.001	***
CGOV	0.042	***	0.048	***	0.035	***	0.046	***	0.046	***
LIST	-0.011	***	-0.005		-0.038	***	-0.035	***	-0.011	***
lnGDPcap	0.666	***	0.654	***	0.753	***	0.757	***	0.882	***
GDPgr	0.018	***	0.014	***	0.019	***	0.021	***	0.018	***
INFL	0.031	***	0.034	***	0.031	***	0.034	***	0.029	***
C3	-0.171	***	-0.104	***	-0.140	***	-0.132	***	-0.192	***
PSC	-0.013	***	-0.013	***	-0.015	***	-0.014	***	-0.013	***
FINFREE	0.011	***	0.010	***	0.012	***	0.011	***	0.010	***
CRISIS	-0.855	***	-0.944	***	-0.975	***	-0.886	***	-0.932	***
LLP/L	-0.421	***	-0.449	***	-0.476	***	-0.467	***	-0.390	***
NONDEP	0.084	***	0.087	***	0.085	***	0.096	***	0.095	***
NONIR	0.012	*	0.022	**	0.013	*	0.003		0.005	
lnTA	0.315	***	0.296	***	0.312	***	0.305	***	0.299	***
OWN*CRIGHTS	0.012	***							0.027	***
OWN*CRIGHTS*LIST	-0.010	***							-0.007	***
OWN*CRIGHTS*FDI	-0.001	*							-0.002	*
OWN*CRIGHTS*CGOV	-0.003	***							-0.001	*
OWN*DEPTH			-0.166	***					-0.187	***
OWN*DEPTH*LIST			0.037	***					0.032	***
OWN*DEPTH*FDI			0.002	***					0.001	
OWN*DEPTH*CGOV			0.008	***					0.007	***
OWN*PBREG					0.013	***			0.100	***
OWN*PBREG*LIST					-0.009	***			-0.006	***
OWN*PBREG*FDI					-0.004	***			-0.004	***
OWN*PBREG*CGOV					0.000				0.000	
OWN*PRREG							-0.006	***	-0.015	***
OWN*PRREG*LIST							0.005	***	0.003	***
OWN*PRREG*FDI							0.001	*	0.002	*
OWN*PREG*CGOV							0.001		0.000	
Developments Dummies	yes		yes		yes		yes		yes	
Legal Origin Dummies	yes		yes		yes		yes		yes	
Country Effects	yes		yes		yes		yes		yes	
Banks	3931		3931		3931		3931		3931	
Observations	13262		13262		13262		13262		13262	
loglik	-1914.4		-1925.5		-1931.8		-1911.13		-1875.1	
LR test one sided error	7652.56		7642.09		7632.76		7645.34		7639.92	

Note: The parameter estimates in this table were obtained simultaneously with the parameters of the stochastic frontier using the Battese and Coelli (1995) model. Originally, the coefficients that are estimated from the model give the effect of the covariates on the inefficiency term. In the present table, we have reversed the signs. Thus, positive (negative) parameter estimates for these variables are to be interpreted as a positive (negative) relationship between these variables and the efficiency term. OWN stands for foreign ownership, CRRIGHTS stands for creditor rights, DEPTH stands for depth of credit information, PBREG stands for public credit registry coverage and PRREG stands for private credit bureau coverage. FDI stands for the stock of inward FDI as percentage of GDP, CGOV stands for the ratio of domestic credit to the government and state-owned enterprises over GDP, LIST stands for the number of listed companies per 10,000 people. lnGDPcap is the natural log of GDP per capita in purchasing power parity (PPP) constant 2005 international $. GDPgr stands for GDP growth, INFL stands for the inflation rate, C3 stands for the concentration ratio in the banking industry, PSC stands for the ratio of domestic credit to the private sector over GDP. FINFREE stands for the financial freedom variable. CRISIS stands for the crisis dummy. LLP/L is the loan loss provisions over total assets, NONDEP is the ratio of non-deposit funding overall total funding, NONIR is the ratio of non-interest income over total operating income and lnTA is the natural logarithm of total assets. ***, ** and * indicate 1%, 5% and 10% significance levels respectively.

Table 7. Foreign Banks Sample: The Impact of Creditor Rights and Information Sharing and Institutional Distance on Bank Profit Efficiency (2005-2009).

Variables	1: Global		2: DCs		3: LDCs	
constant	5.971	***	9.872	***	6.230	***
DISCRIGHTS	-0.058	***	0.002		-0.086	***
DISDEPTH	0.064	***	0.122	***	0.014	***
DISPBREG	0.001	**	0.004	***	-0.001	
DISPRREG	0.000		0.000		-0.001	
CRIGHTS	0.017	***	0.009	**	0.019	***
DEPTH	-0.139	***	-0.194	***	-0.044	***
PBREG	0.005	***	-0.002		0.009	***
PRREG	-0.004	***	-0.019	***	0.001	*
FDI	0.013	***	0.001		0.018	***
CGOV	0.028	***	0.016	**	0.034	***
LIST	0.043	**	0.002		0.081	***
lnGDPcap	0.430	***	0.177	***	0.547	***
GDPgr	0.024	***	0.090	***	0.012	**
INFL	0.096	***	0.021	***	0.044	***
C3	-0.152	***	-0.237	***	-0.125	***
PSC	-0.014	***	-0.001		-0.013	***
FINFREE	0.035	***	0.015	***	0.032	***
CRISIS	-0.979	***	-0.899	***	-0.325	***
LLP/L	-0.509	***	-0.927	***	-0.277	**
NONDEP	0.096	***	0.026	*	0.233	***
NONIR	0.014	**	0.019	***	0.006	
lnTA	0.144	***	0.116	***	0.178	***
Legal Origin Dummies Host	yes		yes		yes	
Development Level Dummies Host	yes		no		no	
Same Legal Origin Dummies home and host	yes		yes		yes	
Same Development Level Dummies for home and host	yes		yes		yes	
Country-pair effects	yes		yes		yes	
Country effects host	yes		yes		yes	
Banks	783		292		491	
Observations	2448		973		1475	
loglik	-677.71		-453.15		-167.34	
LR test one sided error	839.34		252.07		557.53	

Note: The parameter estimates in this table were obtained simultaneously with the parameters of the stochastic frontier using the Battese and Coelli (1995) model. Originally, the coefficients that are estimated from the model give the effect of the covariates on the inefficiency term. In the present table, we have reversed the signs. Thus, positive (negative) parameter estimates for these variables are to be interpreted as a positive (negative) relationship between these variables and the efficiency term. DISCRIGHTS stands for home-host country creditor rights distance, DISDEPTH stands for home-host depth of credit information distance, DISPBREG stands for home-host public credit registry distance, and DISPRREG stands for home-host private credit bureau distance. CRRIGHTS stands for creditor rights, DEPTH stands for depth of credit information,

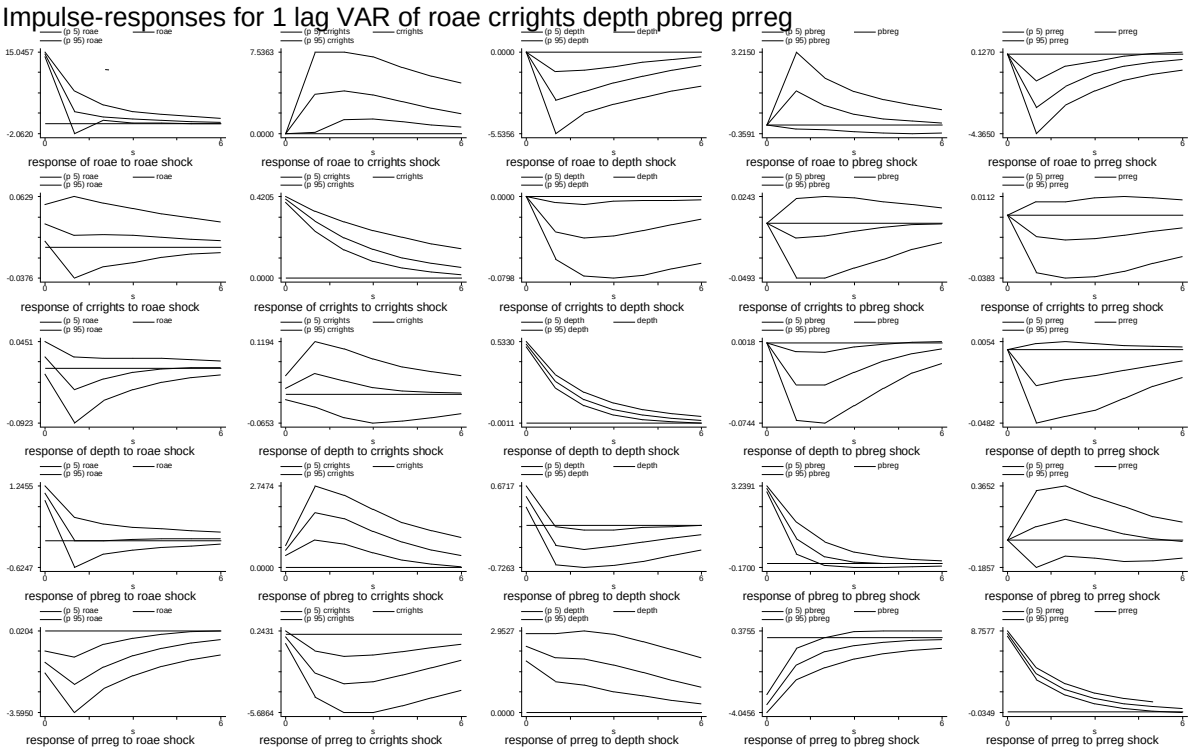
PBREG stands for public credit registry coverage and PRREG stands for private credit bureau coverage. FDI stands for the stock of inward FDI as percentage of GDP, CGOV stands for the ratio of domestic credit to the government and state-owned enterprises over GDP, LIST stands for the number of listed companies per 10,000 people. lnGDPcap is the natural log of GDP per capita in purchasing power parity (PPP) constant 2005 international $. GDPgr stands for GDP growth, INFL stands for the inflation rate, C3 stands for the concentration ratio in the banking industry, PSC stands for the ratio of domestic credit to the private sector over GDP. FINFREE stands for the financial freedom variable. CRISIS stands for the crisis dummy. LLP/L is the loan loss provisions over total assets, NONDEP is the ratio of non-deposit funding overall total funding, NONIR is the ratio of non-interest income over total operating income and lnTA is the natural logarithm of total assets. ***, ** and * indicate 1%, 5% and 10% significance levels respectively.

Table 8: Variance Decompositions (VDCs) FOR Return on Average Equity (ROAE) , creditor rights (CRRIGHTS) and information sharing (DEPTH, PBREG, PRREG) for Foreign Banks.

	s	**ROAE**	**CRRIGHTS**	**DEPTH**	**PBREG**	**PRREG**
ROAE	10	0.67057	0.19037	0.08720	0.01037	0.04149
CRRIGHTS	10	0.00573	0.96972	0.02075	0.00100	0.00280
DEPTH	10	0.00544	0.00922	0.97007	0.01100	0.00427
PBREG	10	0.05191	0.41923	0.03758	0.48957	0.00172
PRREG	10	0.06030	0.27320	0.10573	0.07852	0.48225

Note: ROAE stands for the return on average assets, CRRIGHTS stands for creditor rights, DEPTH stands for depth of credit information, PBREG stands for public credit registry and PRREG stands for private credit bureau. The PBREG and PRREG variables are measured as percentages of each country total individual and firm population. S denotes years ahead.

Figure 1: Impulse Response Function (IRF) for Return on Average Equity (ROAE), creditor rights (CRRIGHTS) and information sharing (DEPTH, PBREG, PRREG) for Foreign Banks.



Note: ROAE stands for the return on average assets, CRRIGHTS stands for creditor rights, DEPTH stands for depth of credit information, PBREG stands for public credit registry and PRREG stands for private credit bureau. The PBREG and PRREG variables are measured as percentages of each country total individual and firm population.

Appendix

Table A1. List of Countries where Foreign Banks are More Profit Efficient than Domestic Banks

Algeria	LDC
Angola	LDC
Bangladesh	LDC
Botswana	LDC
Burkina Faso	LDC
Burundi	LDC
Georgia	LDC
Ghana	LDC
Hong Kong, China	DC
Ireland	DC
Jordan	LDC
Kazakhstan	LDC
Kenya	LDC
Kyrgyz Republic	LDC
Mali	LDC
Namibia	LDC
Nepal	LDC
Netherlands	DC
New Zealand	DC
Norway	DC
Philippines	LDC
Portugal	DC
Senegal	LDC
Singapore	DC
Slovak Republic	DC
Tunisia	LDC
Venezuela	LDC

DC stands for developed countries and includes the high–income economies based on the World Bank classification of 2009. LDC stands for less developed countries and includes the middle-income and low-income countries according to the World Bank classification of 2009

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