

Do banks benefit from internationalization? Revisiting the market power-risk nexus*

Claudia Buch (University of Tübingen, IAW and CESifo)

Cathérine Tahmee Koch (University of Zürich)

Michael Koetter (University of Groningen)

August 2011

Abstract

Recent developments on international financial markets have called the benefits of bank globalization into question. Large, internationally active banks have substantial market power, and internationalization has not made banks less risky. In this paper, we jointly estimate the relationship between internationalization, market power, and risk in banking. We measure market power through the Lerner index and bank risk through the actual probability of distress. We consider the effects of bank expansions across foreign countries (the extensive margin) and in terms of the volume of foreign activities (intensive margin). Our analysis has four main findings. First, banks with higher foreign assets enjoy higher market power at home. Second, holding assets in many foreign countries increases bank risk, suggesting that the costs of monitoring a large portfolio outweigh the benefits in terms of diversification. Third, higher market power is associated with lower risk. Fourth, the effects of internationalization are heterogeneous across banks.

JEL codes: F3, G21

Keywords: market power-risk nexus, international banking, micro-data

* Corresponding author: Claudia M. Buch, University Tuebingen, Department of Economics and Social Sciences, Mohlstrasse 36, 72074 Tuebingen, Germany, Phone: +49 7071 2972962, claudia.buch@uni-tuebingen.de

This paper has partly been written during visits of the authors to the research centre of the *Deutsche Bundesbank*. The hospitality of the *Bundesbank* as well as access to its bank-level financial accounts and External Position Report databases are gratefully acknowledged. Financial support from the National Science Foundation in the Netherlands (NWO) (M. Koetter), the Foundation “*Stiftung Geld und Währung*” (C. Koch) and the EFIGE project financed by the European Commission (SSH-2007-1.2.1) is gratefully acknowledged. We are grateful to Klaus Düllmann, Marcel Fratzscher, Heinz Herrmann, Thomas Kick, Cordula Munzert, Esteban Prieto, Winfried Rudek, and participants of seminars at the European Central Bank and the *Deutsche Bundesbank* for most helpful discussions and suggestions on an earlier draft. All errors and inconsistencies are solely in our own responsibility.

1 Motivation

Recent developments on international financial markets have called the benefits of bank globalization into question. Large, internationally active banks have substantial market power, and international activities of banks have not necessarily made banks less risky.¹ Given these perceptions, surprisingly little is known about the actual link between bank internationalization, bank risk, and market power. Analyzing this link is the purpose of this paper. We use a novel and very detailed bank-level dataset provided by the *Deutsche Bundesbank* including balance sheets and income statements of all German banks, of their foreign branches and their subsidiaries.

The data allow painting a nuanced picture of banks' internationalization strategies. Because information on banks' foreign assets is not subject to reporting thresholds,² we can distinguish the number of countries in which banks are active (the extensive margin) from the volume of foreign assets relative to total assets (the intensive margin), and we distinguish different modes of entry into foreign markets (cross-border asset holdings, foreign branches, foreign subsidiaries). From the Bundesbank's bank-level databases, we also obtain information on banks' actually experienced probability of distress (Kick and Koetter 2007), and we estimate the Lerner index as a bank-specific measure of market power (Koetter and Poghosyan 2009). Methodologically, we use a system estimator, which takes the simultaneous determination of risk and market power at the bank level into account.

¹ De Jonghe (2010) shows that universal, diversified banks are less stable than specialized peers. In a recent contribution, Townsend and Ueda (2010) study the welfare implications from a macroeconomic perspective.

² Foreign assets do not include off-balance sheet items with the exception of so-called irrevocable credit commitments.

In studying internationalization and banks' risk-market power trade-off simultaneously, we link two strands of previous literature which, so far, stand mainly in isolation.

First, literature on the internationalization of banks typically focuses on the determinants of the cross-border expansions of banks (Berger et al. 2003, Buch and Lipponer 2007, de Haas and van Lelyveldt 2010, Focarelli and Pozzolo 2005). This literature finds that regulatory and cultural barriers limit the international expansion of banks, and that more profitable and larger banks find it easier to overcome these barriers. Our analysis accounts for bank heterogeneity but asks the reverse question: Given that banks are active abroad, how does this impact upon their risk-return trade off? We address the potential endogeneity of foreign activities by adapting the methodology proposed by Frankel and Romer (1999) to a panel context. They suggest using the geographic component of international trade as an instrument for actual trade.

Second, while there is a large set of studies looking at the determinants of risks in banking (De Nicolò 2001, González 2005, Nier and Baumann 2003), but only a few papers address the impact of the internationalization of banks. Amihud et al. (2002), for instance, examine risk effects of cross-border bank mergers. Analyzing changes in market risk and stock price reactions, they find that, on average, cross-border bank mergers do not change the risk of acquiring banks. Méon and Weill (2005) study the impact of cross-border mergers in Europe on banks' exposure to macroeconomic risks. They find potential gains in risk diversification from cross-border mergers. Our study takes a broader perspective since we analyze all modes of entry into foreign markets, not just entry through mergers and acquisitions. In terms of the effects of internationalization on risk, we find that being active in a large number of countries increases rather than decreases bank risk. This result is driven by the cooperative banks in our sample, and it suggests that the costs of monitoring a large portfolio outweigh diversification benefits.

There is also an abundant literature on the risk-market power nexus for banks. In a comprehensive survey, Beck (2008) concludes that cross-country studies point mostly to a positive relationship between competition and stability in the banking system. We are not aware of previous literature analyzing the impact of bank internationalization on the link between risk and market power of banks.³ We find a negative relationship between banks' market power and risk. In this sense, our results are in line with the theoretical model developed by Allen and Gale (2004) and Martinez-Miera and Repullo (2008) who argue that less intense competition increases banks' margins and buffers against loan losses.

Understanding the risk-market power trade-off for internationally active banks is of key importance for policymakers. Under the impression of the recent global financial crisis, the benefits of international banking in terms of a more efficient international allocation of risks seem fairly illusive. The crisis has unveiled that international integration not only brings about diversification benefits but also exposes banks to (systemic) risks. Designing appropriate policy responses requires better insights into the link between bank risk and internationalization of banks. Our results inform this debate by revealing that internationalization has a relatively weak impact on bank distress.

In addition, the crisis has spawned a discussion about the systemic implications of risks at large banks and on the need to impose stricter regulations on large, systemically important banks. This debate has largely ignored the possible link between market power and bank internationalization. As for non-financial firms, internationalization may generate an endogenous increase in bank productivity and market power. This paper adds to this discussion by showing the impact of bank globalization on market power in banking. We in fact find that banks with a higher volume

³ For German banks, Behr et al. (2007) analyze the impact of diversification on banks' risk-return-characteristics, but they do not take the international dimension into account.

of foreign assets, in particular those held by foreign branches, enjoy greater market power at home. This is not a mere size effect. Instead, after controlling for other bank-specific characteristics, market power and size are negatively correlated.

In the following second part, we derive theoretical hypotheses on the impact of internationalization on the risk-market power nexus for banks. In part three, we present the data and descriptive statistics. In part four, we describe the empirical model; part five has the regression results. Part six summarizes the evidence.

2 Theoretical Hypotheses

H1: The expected impact of internationalization on the degree of market power at home is positive.

Empirically, we will measure banks' domestic market power by the Lerner index, which is defined as the mark-up between the banks' average revenues and its marginal costs (see Section 3.4). We expect a positive long-run impact of internationalization on banks' market power at home. Banks will maintain foreign operations only if they ultimately perceive a positive impact on their market position. In the short-run, and in particular during the early expansion period, however, the cost effects of internationalization might dominate, and measured market power might decline.

H2: A greater degree of diversification of foreign assets lowers bank risk. The impact of a higher volume of foreign assets per se is ambiguous.

If banks behave as portfolio managers, they optimize their expected utility as a positive function of expected profits and a negative function of expected portfolio risk (Rochet 2008). In an international context, foreign entry should have the potential to reduce banks' risk of insolvency (see,

e.g., Berger 2000). This conventional wisdom is based on the notion that it is better for a bank not to put all its “eggs in one basket” (Winton 1999), hence geographic diversification might be a risk-reducing strategy. According to this interpretation, the impact of internationalization on bank risk depends on the correlation between domestic and foreign returns and on the volatility of foreign markets. Risk might decrease if assets are sufficiently diversified, but risk might increase if diversification is limited and/or if foreign markets are risky. To capture diversification effects, we will use information on the number of countries in which banks are active (the extensive margin). The expected impact on risk is negative. The share of foreign activities in total assets per se (the intensive margin) has no clear-cut impact on bank risk.

Two effects potentially offset the diversification benefits. First, banks have incentives to shift risk when the regulatory safety net and its associated implicit and explicit guarantees are underpriced (John et al. 1991, John et al. 2000). Second, the issue as to “who is watching the eggs in the basket” arises (Winton 1999). After going international, a bank is confronted with potentially new and risk-increasing monitoring problems related to the loan customer base or the operating cost structure of a large international portfolio. If monitoring and information costs are high, bank risk might increase.

H3: The link between market power and bank risk is ambiguous.

Because banks choose their business model according to the implied trade off between risk and return, we will also analyze how market power and risk influence each other. Allen and Gale (2004) suggest a negative relation between bank risk and market power because more concentrated banking systems reduce incentives of bankers to lend recklessly. Moreover, more concentrated systems can be supervised more effectively by regulators. In contrast, Boyd and de Nicolo (2005) argue that market power increases risk taking, because banks can roll-over higher risk associated

with lower quality loans by charging higher interest rates from customers. If borrowers endogenously choose the risk of their project, an increase in lending rates increases risk due to an adverse selection effect. Martinez-Miera and Repullo (2008) show that this *risk shifting effect* is due to the assumption that loan default rates are perfectly correlated. They introduce imperfect correlation of loan default rates and show that there is an additional *margin effect*: More competition lowers loan rates as well as revenues from non-defaulting loans and thus reduces buffers against loan losses. Banks become riskier. The net effect is ambiguous.

3 Data and Descriptive Statistics

We use several bank-level datasets of German banks, which have kindly been provided by the *Deutsche Bundesbank* to test the above hypotheses. The data are confidential and can be used on the premises of the *Bundesbank* only. The main novelty of this paper is that we draw on a detailed database on banks' international assets. The so-called "External Position Report" provides comprehensive information on the international on balance sheet assets of German banks, their foreign branches, and their foreign subsidiaries year-by-year, and country-by-country. We use this database for the years 2003-2006 since reporting thresholds on international positions have been abolished in 2002. Hence, we do not face problems due to truncation or censoring. We focus on the pre-crisis period because, in response to the crisis, governments have intervened into the banking system by guaranteeing banks' liabilities, injecting liquidity, or by directly recapitalizing banks. We want to focus on bank behavior for a period which is not affected by such interventions.

We complement the "External Position Report" with information from the balance sheets and income statements of all banks operating in Germany. Each bank which holds a German banking

license is required to submit these data to the supervisory authority. Details on the data specification and definitions are given in the Appendix.

3.1 *Measuring Bank Internationalization*

The “External Position Report” contains information on cross-border assets held by the bank’s domestic headquarters, on foreign assets held by a bank’s foreign branches, and foreign subsidiaries. Establishing branches and subsidiaries is a much more cost-intensive channel of entering foreign markets, and only relatively few banks use this mode of entry. On average, only 28 out of a total of all 2,235 banks that were active in Germany during the sample period are purely domestic, 27 maintain only foreign branches, and 37 run subsidiaries and/or branches. The largest group consists of banks that hold international assets in at least one foreign country (2,143).⁴ We compute two broad measures of internationalization at the bank level.

Our first measure of bank internationalization is the volume of foreign activities relative to total assets, i.e. the intensive margin. We link branches and subsidiaries located in host country h to their domestic parent bank i . We aggregate all assets held in destination country j across the different modes of foreign activity and use a composite foreign asset. We do not distinguish between different types of assets to keep the analysis tractable. Apart from the aggregate measure of cross-border assets, we also consider the share of cross-border assets held by the domestic headquarters, foreign branches, and foreign subsidiaries separately.

Our second measure of bank internationalization describes the extensive margin. We compute the number of countries in which a bank holds cross-border assets as well as the number of countries in which this bank runs foreign branches and/or subsidiaries. If a bank holds several branch-

⁴ See Buch, Koch, and Koetter (2011a) for details.

es or subsidiaries in a particular country, we aggregate this information to obtain one observation per bank, country, and mode of market entry (branches or subsidiaries). In case of cross-border assets, our measure of the extensive margin is the number of countries in which a particular bank holds assets.

3.2 Measuring Bank Risk

Bank risk can be measured in several ways. Previous literature has used a bank's z -score, non-performing loans, or the volatility of bank-level variables such as reserves, profits, or non-performing loans (Beck 2008, Behr et al. 2007, Corvoisier and Gropp 2002, De Guevara and Maudos 2007b). These measures do not provide information on actual failures of banks. Our measure of bank risk is a direct measure of the probability to experience a distress event. Distress events are defined by regulatory interventions, and information on these events is obtained from the distress database of the *Deutsche Bundesbank*. This database comprises distress events that range from weak incidences to forced exit by means of restructuring mergers ordered by the Federal Supervision Authorities (*Bundesanstalt für Finanzdienstleistungsaufsicht – BaFin*). See Kick and Koetter (2007) and the Data Appendix for a description and analysis.

The majority of banks (about 95%) have not reported any distress event during the observation period. In total, there have been 26 weaker distress events such as mandatory announcements by individual banks to the supervisory authority or official warnings by the *BaFin* and 240 more severe events such as direct interventions into the ongoing business of a bank by the *BaFin* or events that reflect the disappearance of a bank from active business operations such as closure of a bank or restructuring mergers. In our baseline specifications, we use a dummy variable that indicates the occurrence of any such event as the dependent variable; to check which events drive our results, we also distinguish between severe and weak events as defined above.

The distress indicator has the advantage that it captures actual bank risk. Yet, larger banks have not experienced such an event under the period of observation. To obtain a measure of risk for all banks, we follow Hale and Santos (2008) and compute a z -score given by $z = \frac{-(E/A + \rho)}{\sigma}$ where E/A is a bank's capital-asset-ratio, ρ is the mean of a bank's profits, and σ denotes the standard deviation of profitability. We calculate the z -score using a rolling 5-year window. Hence, the z -score measure increases if the standard deviation of profits increases, and it falls in the degree of capitalization and mean returns. The z -score measures the number of standard deviation of profits (below the mean) by which profits would have to fall until equity capital has been eroded (Hale and Santos 2008).

3.3 Measuring Market Power

We use the Lerner index to measure the domestic market power of banks. Lerner indices give the mark-up between average revenues and marginal cost, scaled by average revenues. They provide two clear advantages over other measures of market power. First, the Lerner index nests different models of competition and, second, it yields a measure at the level of the individual bank (Degryse et al. 2009). A higher Lerner index indicates a lower degree of competition (a higher degree of market power).

We obtain both arguments used to compute the Lerner index from stochastic cost and profit frontier analysis and thus have a competition measure net off operational slack (Koetter et al. 2011). Marginal costs are the total derivative of estimated operating cost frontiers with respect to four outputs (interbank loans, customer loans, securities, and off-balance sheet items). We obtain average revenues from profits predicted by a stochastic profit frontier, scaled by total assets so as to avoid confounding profit inefficiencies and realized (monopoly power) revenues. To account

for the three-tier banking structure in Germany banks and the fact that banks operate under different technology regimes, we estimate both frontiers as latent classes as in Koetter and Poghosyan (2009).⁵ Average revenues and marginal costs comprise revenues and costs of domestic operations (including cross-border asset holdings) and of operating foreign branches but not of operating foreign subsidiaries.

Summary statistics for the bank-level variables are provided in Table 2. Lerner indices are on average 23 points, which is in line with results reported by De Guevara and Maudos (2007a) for a sample of European banks and Koetter and Poghosyan (2009) for German banks. Because both, Lerner indices and distress events, are (partly) derived from annual accounting data, all covariates are specified with a lag of one year to avoid simultaneity by construction.

4 Empirical Model and Regression Results

4.1 *Simultaneous Equation Model*

When choosing their business model, banks implicitly choose also their degree of market power as well as the risk structure of their activities. This is a simultaneous choice. We thus need a model which allows estimating the link between bank risk (probability of distress) and market power (Lerner index) jointly, and which allows analyzing the impact of internationalization on the risk-market power nexus. Simultaneous equation models based on two continuous variables

⁵ See Koetter and Poghosyan (2009) for a more detailed discussion and for robustness tests. The German banking system is characterized by a three-tier structure of savings, cooperative, and (private) commercial banks. These banks differ with regard to their ownership structures, their ability to expand regionally, and their core business model.

have previously been applied in the banking literature (Kwan and Eisenbeis 1997).⁶ However, one of the variables that we are interested in (the probability of distress) is binary. We thus employ an instrumental-variables estimation using the procedure suggested by Rivers and Vuong (1988) and described in Wooldridge (2002) for systems with one of the endogenous variables being binary.⁷

The market-power equation uses the Lerner index $y_{1,it} = y_{1,it}^*$ as a fully observed, continuous variable as the dependent variable. Because the probability of distress is not observable, we proxy it by the binary indicator of an observable distress event, such that $y_{2,it} = I(y_{2,it}^* > 0)$.

Before estimating the structural model described by equations 2a and 2b, we estimate the following reduced-form equations to generate instruments for market power and risk:

$$y_{1,it} = \Pi'_1 \mathbf{X}_{it-1} + v_{1,it} \quad (1a)$$

$$y_{2,it} = \Pi'_2 \mathbf{X}_{it-1} + v_{2,it} \quad (1b),$$

where i is a bank-index and t denotes time. The market-power equation (1a) is estimated using OLS and yields the $(K \times 1)$ -vector of parameter coefficients $\hat{\Pi}'_1$. The risk equation (1b) is estimated using a probit model to obtain the $(K \times 1)$ -vector of parameter coefficients $\hat{\Pi}'_2$. Both equations draw on the same vector of independent variables \mathbf{X}_{it-1} . From equation (1a), we compute

⁶ Previous literature has typically not formulated this problem in a system context. De Guevara and Maudos (2007b), for instance, use a single regression setting and regress the Lerner index on the probability of distress. Alternatively, Jiménez et al (2007) reverse the causality and regress risk proxies on competition measures.

⁷ Maddala (1983) suggests estimating reduced-form equations for each endogenous variable. According to this method, the binary (continuous) dependent variable is estimated using a probit (OLS) model. In case of the continuous dependent variable, predicted values from the probit reduced-form estimation are then used as right-hand side regressors. See Degryse and Ongena (2000) for an application to the question how banks' return on investment and the number of creditor relationships are linked.

the residuals as the difference between the true market-power variable (the Lerner index) and fitted values $\hat{v}_{1,it} = y_{1,it} - \hat{y}_{1,it} = y_{1,it} - \hat{\Pi}'_1 \mathbf{X}_{it-1}$.

Next, we estimate our structural equations of interest:

$$y_{1,it} = \gamma_1 \hat{y}_{2,it}^* + \beta'_1 \mathbf{X}_{1,it-1} + \varepsilon_{1,it} \quad (2a)$$

$$y_{2,it}^* = \gamma_2 y_{1,it} + \beta'_2 \mathbf{X}_{2,it-1} + \theta \hat{v}_{1,it} + \varepsilon_{2,it} \quad (2b),$$

where $\mathbf{X}_{1,it-1}$ and $\mathbf{X}_{2,it-1}$ are the exogenous explanatory variables affecting risk and market power, including measures of internationalization. Fixed effects (time-fixed effects, regional and banking-group dummies) are included to control for the state of the macroeconomy.⁸ Equation (2a) is estimated using OLS, and equation (2b) is estimated using a probit model. We bootstrap the standard errors because equations (2a) and (2b) include generated regressors.

The simultaneity between banks' choices of market power and risk is captured in the following way. In the market-power equation (2a), we insert fitted values from the probit estimation of the risk equation (1a). In the risk equation, we insert the residuals from the continuous reduced-form equation ($\hat{v}_{1,it}$) along with the true continuous variable, i.e. the Lerner index $y_{1,it}$.⁹ Rivers and Vuong (1988) recommend this procedure because the probit estimation relies on non-linear estimation techniques. We implicitly test for exogeneity of the Lerner index in the risk equation

⁸ The main qualitative results remain unchanged if we control for regional macroeconomic developments such as the regional insolvency rate or GDP growth.

⁹ Alvarez and Glasgow (2000) support this combination of two-stage probit least squares and two-stage conditional maximum-likelihood techniques to benefit from the explicit test of exogeneity in the binary equation.

(Winkelmann and Boes 2009). A z -test of the $H_0 : \theta = 0$ indicates whether the true Lerner index $y_{1,it}$ is exogenous to the probability of distress.¹⁰

4.2 Regression Results

Table 3a provides results of OLS regressions using the Lerner index as the dependent variable; Table 3b provides results of probit models, using the probability of experiencing a distress event as the dependent variable. The following tables split up the sample by banking group (Tables 4a and 4b). Finally, we run several robustness tests to account for the potential endogeneity of the internationalization variable (Tables 5a and 5b).

We allow for feedback effects between market power and risk. The Lerner residuals are usually significant in the risk equation, and we can reject the null of exogeneity between Lerner and our binary risk indicator. The cross-terms are negative and significant. Hence, our results are in line with theoretical models by Allen and Gale (2004) or the margin effect stressed in Martinez-Miera and Repullo (2008).

The overall fit of our model is quite good with an adjusted R^2 of about 0.42 for the market power equation and a pseudo- R^2 of 0.25 for the risk equation.

4.2.1 Determinants of Market Power (Lerner Index)

Table 3a provides regression results for market power as the dependent variable. A higher volume of foreign activities has a positive impact on market power which is in line with Hypothesis H1. This effect is driven by cross border assets held through domestic headquarters and through

¹⁰ Implementing fitted values from the market-power equation (1a) into the structural equation (2a) instead of the combination of residuals and the true Lerner index would mean that we try to estimate a probit model with an unknown scaling factor which would not allow valid inference.

foreign branches, which are mainly geared towards retail banking. A higher volume of foreign activities of subsidiaries lowers market power at home. This finding is consistent with the hypothesis that subsidiaries are a particularly costly way of entering foreign markets.

Being active in a larger number of countries has a negative impact on market power at home: foreign expansions are costly and squeeze profit margins. In unreported regressions, we have checked whether threshold effects matter, i.e. whether increasing international activities beyond a certain number of countries (10 for cross-border assets, 5 for countries with foreign affiliates) drives this result. The negative impact of the extensive margin is in fact driven by banks which are present in more than 10 countries. Generally though, coefficient estimates show that the impact of internationalization on market power is relatively small compared to the impact of the control variables.

For the control variables, we mostly obtain significant and expected results. The *share of fee income* measures whether banks can retain their market power by substituting traditional interest income with fee income (De Young and Rowland 2001). We find a positive impact of fee income on market power.

Larger banks might be able to charge high mark-ups due to their dominant role in output markets, but they may also enjoy market power due to economies of scale in funding markets. We include a discrete variable to indicate the size quintile of banks' total assets (from 1 to 5).¹¹ Results show a negative link between size and market power, reflecting the fact that smaller savings and cooperative banks enjoy market power in regional and niche markets.

We measure the degree of specialization of banks' activities using *Hirschman-Herfindahl indices* computed across different asset categories. A higher degree of specialization can have at

¹¹ Results are qualitative identical if we use log size instead.

least three distinct effects on the performance of banks. First, specialization in certain banking activities may yield benefits in terms of higher margins if banks succeed in developing superior skills compared to other intermediaries. Second, economies of scope can increase the competitiveness of banks. Third, in response to increasing deregulation, some banks have ventured into novel business activities, such as off-balance sheet activities to substitute for eroding interest margins. Lacking specific expertise, such strategies could lower returns and increase volatility and thus risk. According to the first two effects, the impact of specialization would be positive; the last effect could have a negative impact. Our results support the positive impact of greater specialization – focusing on certain activities, increases market power. Regional concentration (the number of branches in each region and the number of new acquisitions) enhances market power as well.

As a final control variable, we include a dummy for publicly incorporated banks, and we find a significantly negative impact on market power.

Traditionally, German banks differ in their degree of internationalization. Large commercial banks have a long-standing tradition in foreign markets whereas savings and cooperative banks have mostly been domestically oriented. Splitting the sample by type of bank allows accounting for these differences (Table 4a). For cooperative banks, being active abroad has no significant impact on market power. For savings banks, a greater volume of foreign assets lowers market power while holding assets in a large number of markets increases risk. For commercial banks, we find the positive impact of the intensive margin that is also present in the full sample.

4.2.2 Determinants of Risk (Probability of Distress)

Table 3b shows the determinants of the distress probability for German banks. The key result concerning the impact of internationalization is that holding assets in a larger number of countries

increases rather than decreases bank risk. This result contradicts the prior that diversification lowers risk, and it is in support of the hypothesis there is an additional counterbalancing effect, namely the monitoring costs associated with the management of a large and complex portfolio (Winton 1999). This explains why risk may well increase if banks expand into a larger number of countries. This interpretation is supported by the fact that the risk-increasing effect of expansions along the extensive margin is driven by the cooperative banks and thus the banking group which, arguably, is the least experienced internationally (Table 4b). For the remaining banking groups, the extensive margin has an insignificant impact.

The volume of activities (intensive margin) has an insignificant impact on bank risk. This result is not unexpected as we have argued that the degree of diversification rather than the scale of foreign activities should matter for bank risk (Hypothesis H2).

In addition to the internationalization variables, we include a standard vector of control variables which conditions the likelihood of distress on CAMEL covariates capturing various aspects of bank-specific risks (capitalization, assset quality, managerial skill, earnings, and liquidity) (Acharya and Yorulmazer 2007). From a theoretical point of view, we expect more profitable, better capitalized, and banks with a less risky asset portfolio to be less likely to experience a distress event. The signs for the control variables are in line with these expectations and with previous literature (Kick and Koetter 2007). Banks with a lower level of hidden reserves and with a lower return on equity are more likely to experience a distress event (Berger 1995). In line with e.g. Wheelock and Wilson (1995), higher cost efficiency lowers bank risk. Higher profit efficiency, in turn, has only a weakly significant positive impact on risk. This result corroborates the well-known negative correlation between cost and profit efficiency measures (Bauer et al. 1998). It confirms that both concepts measure different types of optimal behavior of bank managers: the realization of optimal profits seems to involve inevitably higher risk-taking while economizing

on costs does not. The core capital ratio, the share of non-performing loans, and the cost-to income ratio have no significant impact.

4.3 Endogeneity of Foreign Assets

The empirical model that we have used so far accounts for the simultaneous determination of market power and risk, but it does not address the potential endogeneity of the internationalization variables. Banks engaged in risky domestic activities could venture abroad to offset high risk at home. Moreover, one would also expect banks to be more active internationally if this rewards them with greater market power at home.

We address the endogeneity of foreign assets in three ways: (i) by adopting a proxy for the exogenous component of banks' foreign assets; (ii) by using lagged foreign status; and (iii) by focusing on banks which have changed foreign status.

Turning to the first measure, we adopt a methodology that has been suggested in the empirical literature studying the link between trade openness and growth at the country-level. Frankel and Romer (1999) propose to measure the causal impact of trade on growth by employing geographic variables as an (exogenous) instrument for foreign trade. Their method is based on a two-step estimation model. In a first step, a bilateral openness equation is specified. Predicted bilateral openness measures from this equation are then aggregated to obtain a measure of aggregate openness which is related to a set of exogenous variables only. In a second step, predicted openness is used as an instrument in a regression explaining the impact of openness on GDP per capita.

This method does not fully suit our panel context because geographic variables used to extract the exogenous component of trade are time-invariant. A time-varying exogenous explanatory variable is thus required for the first-stage regression. In our setup drawing on bank-level data, es-

essentially all foreign macroeconomic variables can be considered exogenous from the individual bank's perspective. Hence, our modified Frankel-Romer regression looks as follows:

$$FA_{ijt} = a_0 + a_{i,1}Dist_j + a_{i,2}GDP_{jt}^* + \varepsilon_{ijt} \quad (3)$$

where FA_{ijt} is the share of foreign assets across modes relative to total assets of bank i held in country j in year t , $Dist_j$ is the geographic distance between Germany and country j , GDP_{jt}^* is foreign GDP, which is exogenous to the individual bank i , and ε_{ijt} is an error term which captures the bank-specific determinants of foreign assets shares such as risk and market power. We estimate equation (3) bank-by-bank using OLS to obtain bank-specific regression coefficients.

The predicted values from this equation are used to obtain a bank-specific instrument of bilateral openness which draws on geographic components and exogenous country-variables. Rewriting (3) in matrix form $FA_{ijt} = \mathbf{a}_i' \Theta_{jt} + \varepsilon_{ijt}$ where \mathbf{a}_i is the vector of coefficients and Θ_{jt} is the vector of right-hand-side variables, bank i 's overall predicted foreign assets are given by:

$$\hat{FA}_{ijt} = \sum_j \hat{\mathbf{a}}_i' \Theta_{jt}.$$

For the predicted foreign asset share to be a good instrument for the actual foreign asset share, it should be sufficiently highly correlated. This is indeed the case. The correlation between the predicted and the actual foreign asset share at the bank-level (i.e. aggregated across all countries) is 0.58. To eliminate the country dimension in the data, we aggregate these foreign asset shares across all countries.

Results are reported in Column (2) of Table 5a and Table 5b. They are qualitatively unchanged from those using the actual volume of foreign assets: expansions along the intensive

margin increase market power, these expansions have no impact on risk, market power and risk are negatively correlated, and the remaining control variables retain their signs and significance.

The second way to account for the endogeneity of openness is to make use of the fact that current market power and risk are unlikely to have affected internationalization decisions taken in the past. Hence, we use foreign status lagged by two periods as a right-hand side variable. Results in Column (3) of Table 5 are very similar to those using the actual or the predicted share of foreign assets.

Third, because lagged foreign status may be persistent, we use information on *changes* in foreign status, i.e. we use first differences of the extensive margin as a right-hand side variable. Again, we lag this variable by two periods, and we distinguish entry and exits. The new indicator equals “One” if a given bank has left any foreign market two years ago and “Zero” otherwise. We also use the number of countries from which the bank has withdrawn. Results in Columns (4) and (5) of Table 5a and 5b show that past exits have a negative impact on market power and no impact on risk.

4.4 Robustness

To further check the robustness of our results, we have divided the sample into weak and severe distress events, we have used the z -score described in Section 3.2 as an alternative risk measure, and we have dropped explanatory variables one by one. Results are not reported but are available upon request.

Type of distress event: Splitting the sample into weak and severe distress events provides qualitatively identical results compared to those reported above: the mutual negative impact of market power on return survives the robustness check. As to internationalization, expansions along the

extensive margin lower market power while expansions along the intensive margins increase market power. Effects on risk are insignificant.

Z-score: Using the z -score as an alternative risk measure basically confirms the negative correlation between risk and market power, but the impact of predicted Lerner indices on the z -score are sometimes insignificant. The impact of internationalization on market power is mostly replicated. As before, internationalization has no significant impact on risk. Results for the remaining explanatory variables do not change.

Multicollinearity: We also exclude individual explanatory variables one by one to check whether some of our results might be driven by multicollinearity. This is not the case.

Sample split by size: Splitting the sample by size reveals differences between small and large banks. For all but the mid-sized banks, a higher volume of cross-border assets has a positive effect. The impact of expansions along the extensive margin on market power at home varies across banks of different size. For the smallest 40% of the banks, internationalization has an insignificant (negative) effect. For the mid-sized and large banks, internationalization has a positive effect. The negative and significant impact for the full sample is driven by the “upper-middle” sized banks in the fourth size quintile. One interpretation of this non-linear effect is that these banks are too large to gain a competitive edge from foreign expansions as the mid-sized banks do, but that they are too small to reap the true scale economies as the very large banks do.

5 Conclusions

This paper analyzes whether and through which channels the internationalization of banks affects their risk-market power trade-off. We use a very detailed dataset on German banks, which provides information on actual distress events (our measure of banks’ risk), the Lerner index (our

bank-level measure of market power), and on banks' international activities. We distinguish between different modes of entry into foreign markets such as cross-border assets, foreign branches, and foreign subsidiaries. Hence, we depart from previous literature by analyzing the risk-market power nexus for banks from an international angle. Methodologically, our results differ because we simultaneously model risk and market power.

Our analysis has four main findings:

First, holding foreign assets either directly through cross-border assets or through foreign branches enhances market power at home. This is not merely a size effect. Rather, large banks in Germany not necessarily enjoy also greater market power. After controlling for other bank-specific characteristics, market power and size are negatively correlated.

Second, banks with a foreign presence in a large number of foreign countries are more likely to reveal above-average probabilities of distress. Diversification benefits thus seem to be over-compensated by the costs of maintaining a large international banking network.

Third, there is a negative correlation between market power and the probability to experience a distress event. This negative relationship between risk and return is in line with the theoretical model by Allen and Gale (2004) or the margin effect stressed by Martinez-Miera and Repullo (2008). According to this explanation, more profitable banks can build up buffers against loan losses.

Fourth, the effects of internationalization are heterogeneous across banks of different size and type. Commercial and savings banks tend to improve their risk-return trade-off; (small) cooperative banks tend to worsen their risk-return trade-off.

Overall, our results suggest that the benefits of internationalization in terms of a better risk-return trade off are rather small. Even for the banks that can increase their market power through

internationalization, the marginal effects of going abroad are small compared to the domestic determinants of market power. At the same time, and perhaps contrary to the conventional wisdom, internationalization has only a limited impact on bank distress. Instead, the most important determinants of bank risk are their market power and profitability as well as their hidden reserves.

References

- Acharya, V.V. and T. Yorulmazer (2007). Too many to fail – An analysis of time-inconsistency in bank closure policies. *Journal of Financial Intermediation* 16: 1-31.
- Allen, F., and D. Gale (2004). Competition and Financial Stability. *Journal of Money, Credit and Banking* 36(3): 453-480.
- Alvarez, M. and G. Glasgow (2000). Two-Stage Estimation of Nonrecursive Choice Models. *Political Analysis* 8: 147-165.
- Amel, D., C. Barnes, F. Panetta, and C. Salleo (2004). Consolidation and Efficiency in the Financial Sector: A Review of the International Evidence. *Journal of Banking and Finance* 28(10): 2493–2519.
- Amihud, Y., DeLong, G., and Saunders, A. (2002). The effects of cross-border bank mergers on bank risk and value. *Journal of International Money and Finance* 21(6): 857-877.
- Bauer, P. W., A. N. Berger, G. D. Ferrier, and D. B. Humphrey (1998). Consistency Conditions for Regulatory Analysis of Financial Institutions: A Comparison of Frontier Efficiency Methods, *Journal of Economics and Business* 50(2): 85-114.
- Beck, T. (2008). Bank Competition and Financial Stability: Friends or Foes? World Bank Policy Research Working Paper 4656. Washington DC.
- Behr, A., A. Kamp, C. Memmel, and A. Pfingsten (2007). Diversification and the banks' risk-return-characteristics – evidence from loan portfolios of German banks. Deutsche Bundesbank. Discussion Paper Series 2: Banking and Financial Studies. 05/2007 Frankfurt a.M.
- Berger, A.N. (1995). The relationship between capital and earnings in banking. *Journal of Money Credit and Banking* 27(2): 432–456.
- Berger, A.N. (2000). The big picture of bank diversification. Proceedings of the Federal Reserve of Chicago: 162-174.
- Berger, A.N., Dai, Q., Ongena, S., and D.C. Smith (2003). To what extent will the banking industry be globalized? A study of bank nationality and reach in 20 European nations. *Journal of Banking and Finance* 27: 383–415.
- Boyd, J., and G. De Nicolo (2005). The Theory of Bank Risk Taking and Competition Revisited. *Journal of Finance* 60(3): 1329-1343.
- Buch, C.M., and A. Lipponer (2007). FDI versus exports: Evidence from German banks. *Journal of Banking and Finance* 31: 805-826.
- Buch, C.M., C. Koch, and M. Koetter (2011a). Size, productivity, and international banking. *Journal of International Economics* (forthcoming)

- Buch, C.M., C. Koch, and M. Koetter (2011b). Crises, rescues, and policy transmission through international banks. Deutsche Bundesbank. Discussion Paper Series 1: Economic Studies. 17/2011. Frankfurt a.M.
- Corvoisier, S., and Gropp, R. (2002). Bank concentration and retail interest rates. *Journal of Banking and Finance* 26: 2155-2189.
- De Guevara, J. and J. Maudos (2007a). The cost of market power in banking: social welfare loss vs. cost efficiency. *Journal of Banking and Finance* 31: 2103–2125.
- De Guevara, Juan and J. Maudos (2007b). Explanatory factors of market power in the banking system. *The Manchester School* 75(3): 275-296.
- De Haas, R. and I. van Lelyveld (2010). Internal capital markets and lending by multinational bank subsidiaries. *Journal of Financial Intermediation* 19: 1-25.
- De Jonghe, O. (2010). Back to the basics: A micro-analysis of banking system stability. *Journal of Financial Intermediation* (forthcoming).
- De Nicolò, G. (2001). Size, charter value and risk in banking: An international perspective, in: *The Financial Safety Net: Costs, Benefits and Implications for Regulation*. Proceedings of the 37th Annual Conference on Bank Structure and Competition, Federal Reserve of Chicago: 197-215.
- De Young, R. and K. Rowland (2001). Product mix and earnings volatility of commercial banks: Evidence from a degree of total leverage model. *Journal of Financial Intermediation* (10): 54-84.
- Degryse, H., M. Kim, and S. Ongena (2009). *Microeconomics of Banking*. Oxford University Press.
- Degryse Hans and Steven Ongena (2001). Bank relationships and firm profitability. *Financial Management* 30: 9-34.
- Ferrier, G.D., S. Grosskopf, K.J. Hayes, and S. Yaisawarng (1993)- Economies of diversification in the banking industry: A frontier approach. *Journal of Monetary Economics* 31(2): 229-249.
- Fiorentino, E., C.T. Koch, and W. Rudek (2010). Database on German Banks' External Positions. Deutsche Bundesbank. Frankfurt a.M.
- Focarelli, D., and A. Pozzolo (2005). Where do banks expand abroad? An empirical analysis. *Journal of Business* 78: 2435–2465.
- Frankel, J. and D. Romer (1999). Does trade cause growth? *American Economic Review* 89: 379-399.
- González, F. (2005). Bank Regulation and Risk-Taking Incentives: An International comparison of bank risk. *Journal of Banking and Finance* 29: 1153-1184.

- Hale, G., and J.A.C. Santos (2008). The decision to first enter the public bond market: The role of firm reputation, funding choices, and bank relationships. *Journal of Banking and Finance* 32(9): 1928-1940.
- Jiménez, G., J.A. Lopez, and J. Saurina (2007). How Does Competition Impact Bank Risk-Taking? Federal Reserve Bank of San Francisco Working Paper 23.
- John, K., John T., and L. Senbet (1991). Risk shifting incentives of depository institutions: a new perspective on Federal Deposit Insurance reform. *Journal of Banking and Finance* 15 (45): 895-915.
- John, K., Saunders, A., and L. Senbet (2000). A theory of bank compensation and management regulation. *Review of Financial Studies* 3(1): 95-126.
- Kick, T., and M. Koetter (2007). Slippery Slopes of Stress: Ordered Failure Events in German Banking. *Journal of Financial Stability* 3(2): 132-148.
- Koetter, M., and T. Poghosyan (2009). The identification of technology regimes in banking: Implications for the market power-financial fragility nexus. *Journal of Banking and Finance* 33: 1413-1422.
- Koetter, M., J. Kolari, and L. Spierdijk (2011). Efficient Competition? Testing the "Quiet Life" of US Banks with Adjusted Lerner Indices. *The Review of Economics and Statistics* (forthcoming)
- Kwan, S., and R. A. Eisenbeis (1997). Bank Risk, Capitalization, and Operating Efficiency. *Journal of Financial Services Research* 12.
- Maddala, G. (1983). *Limited-Dependent and Qualitative Variables in Econometrics*. Cambridge. Cambridge University Press.
- Martinez-Miera, D., and R. Repullo (2008). Does Competition Reduce the Risk of Bank Failure? CEMFI Working Paper 0801. Madrid.
- Méon, P.G., and L. Weill (2005). Can mergers in Europe help banks hedge against macroeconomic risk? *Applied Financial Economics* 15(5): 315-326.
- Nier, E., and U. Baumann (2003). Market Discipline, Disclosure and Moral Hazard in Banking, in: *Corporate Governance: Implications for Financial Services Firms*, proceedings of the 39th Annual Conference on Bank Structure and Competition, Federal Reserve Bank of Chicago: 261-277.
- Rivers, D. and Q.H. Vuong (1988). Limited information estimators and exogeneity tests for simultaneous probit models. *Journal of Econometrics* 39: 347-366.
- Rochet, J.-C. (2008). Why are there so many banking crises? In: *The Politics and Policy of Bank Regulation*. Princeton University Press. Princeton.
- Stiroh, K. J. (2004). Diversification in Banking: Is Noninterest Income the Answer? *Journal of Money, Credit and Banking* 36(5): 853-82.

- Townsend, R.M., and K. Ueda (2010). Welfare gains from financial liberalization. *International Economic Review* 51(3): 553–597.
- Wheelock, D.C. and P.W. Wilson (1995). Bank Failures: Deposit Insurance, Regulation, and Efficiency. *Review of Economics and Statistics* 77(4): 689-700.
- Winkelmann, R., and Boes, S. (2009). *Analysis of Microdata*, 2d ed. Berlin: Springer.
- Winton, A. (1999). Don't put all your eggs in one basket? Diversification and specialization in lending. Working paper. University of Minnesota.
- Wooldridge, J.M. (2002). *Econometric Analysis of Cross Section and Panel Data*. MIT Press.

Data Appendix

All bank data are obtained from unconsolidated balance sheets, profit and loss accounts, and audit reports reported annually by all banks to the German central bank (*Deutsche Bundesbank*). Variables used for both the productivity estimation and the CAMEL vector are corrected for outliers by truncating at the 1st and 99th percentiles, respectively. Level variables are deflated with the consumer price index.

Bank-level variables

Acquisitions: The number of acquisitions per regional agglomeration area.

Assets: Gross total assets. An indicator variable based on the size distribution of total assets per year ranging from 1 (low) to 5 (high).

Banking groups: An indicator variable ranging from 1 to 4 for large banks, regional commercial, regional savings, and cooperative banks. “Large” banks comprise the head institutions of the savings (*Landesbanken*) and cooperative bank sector as well as the largest commercial banks. “Commercial banks” are privately owned, but not necessarily publicly listed banks. “Savings” banks are (local) government owned regional banks. “Cooperative” banks are mutually owned regional banks.

Branches: The number of branches per bank relative to total assets.

Capitalization: Core capital in per cent of gross total assets.

Cost efficiency: Cost efficiency obtained from a latent stochastic cost frontier analysis with two technology regimes.

Cost-income ratio: Personnel expenditure in per cent of total administrative cost.

Customer loans: Loans to corporate customers and individuals.

Equity: Gross total equity in millions of euro.

Herfindahl index (output categories): Diversification indicator across four output categories of banks, interbank loans, customer loans, bonds and stocks, and notional values of granted guarantees and credit commitments, calculated as the sum of squared shares of each product category.

Interbank loans: Loans to banks and other depository institutions.

Loan-loss-provisions: Stock of loan-loss provisions in per cent of gross total loans.

Non-performing loans: Loans with latent risks according to central bank auditors in per cent of total audited loans.

Off-balance sheet items: Granted credit guarantees and commitments.

Physical capital: Fixed assets including IT-capital stock in millions of euro.

Profit efficiency: Profit efficiency obtained from a latent stochastic profit frontier analysis with two technology regimes.

Publicly incorporated banks: Indicator variable equal to 1 if the bank is publicly incorporated, either as joint stock or public limited company (*Aktiengesellschaft (AG)*; *Kommanditgesellschaft auf Aktien (KG a.A.)*; *Gesellschaft mit beschränkter Haftung (GmbH)*).

Reserves: Hidden reserves according to §340f of the German commercial code in per cent of gross total assets.

Return on equity (ROE): Operating result including net interest, fee, commission and trading income in per cent of equity capital.

Securities: Bonds and stocks.

Share of fee income: Provision and fee income relative to total operating gross revenues.

External Position Report

Data on the international assets of German banks are taken from the External Position report (*Auslandsstatus*) of the *Deutsche Bundesbank*. They are confidential and can be used on the premises of the *Bundesbank* only.

International assets: Loans and advances to banks, companies, governments, bonds and notes, foreign shares and other equity, participation abroad, denominated or converted into Euro. Irrevocable credit commitments are included but other off-balance sheet items are not. For a more detailed description of this data base see (Fiorentino et al. 2010).

Branches and subsidiaries: Foreign affiliates of German parent banks. Branches do not have an independent legal status, whereas subsidiaries do. We attribute assets held by affiliates to the country in which they are located.

List of countries:

Argentina	Estonia	Mauritius	Slovakia
Australia	Finland	Mexico	Slovenia
Austria	France	Morocco	South Africa
Belgium	Greece	Netherlands	South Korea
Bosnia	Hong Kong	Netherlands Antilles	Spain
Brazil	Hungary	New Zealand	Sri Lanka
Bulgaria	India	Norway	Sweden
Canada	Indonesia	Pakistan	Switzerland
Cayman Islands	Ireland	Panama	Taiwan
Chile	Israel	Peru	Thailand
China	Italy	Philippines	Turkey
Colombia	Japan	Poland	Ukraine
Cote d'Ivoire	Jordan	Portugal	United Arab Emirates
Croatia	Latvia	Qatar	United Kingdom
Cyprus	Lithuania	Romania	United States
Czech Republic	Luxemburg	Russia	Uruguay
Denmark	Malaysia	Saudi Arabia	Vietnam
Egypt	Malta	Singapore	

Data on Bank Risk

To measure the soundness of the German banking sector, we use confidential information from the distress database of the *Deutsche Bundesbank* for individual banks at an annual frequency. These data allow for a distinction between different distress categories that differ in terms of severity of distress observed:

- Mandatory announcements by individual banks to the supervisory authority (Distress Category I),
- Official warnings by the *Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin)* (Distress Category II),
- Direct interventions into the ongoing business of a bank by the *BaFin* (Distress Category III), and
- All events that reflect the disappearance of a bank from active business operations such as closure of a bank or restructuring mergers (Distress Category IV).

Table 1: Descriptive Statistics Internationalization

This Table gives the descriptive statistics for the measures of portfolio diversification and the market power in foreign markets described in Section 3.2. The number of observations (n) gives the number of bank-year observations.

	Full sample used in regres- sions ($n = 6,752$)	Banks with for- eign subsidiar- ies ($n = 129$)	Banks with for- eign branches ($n = 137$)
<u>Extensive margin</u>			
Number of destination countries	13.670	46.920	42.550
Number of foreign branches of bank i	0.921	4.240	4.540
Number of foreign subsidiaries of bank i	0.726	3.798	3.124
<u>Intensive margin</u>			
Foreign assets (cross-border) / total assets	4.171	22.828	23.630
Foreign assets (branches) / total assets	0.250	10.416	12.311
Foreign assets (subsidiaries) / total assets	0.135	7.088	4.633

Table 2: Descriptive Statistics

This Table gives the descriptive statistics for explanatory variables used in the regressions for risk (probability of distress) and market power (Lerner index). All ratios and changes are measured in percent. Moments are based on lagged values used in regressions. 7,752 observations.

	Mean	Standard deviation	1st percentile	99th percentile
<u>Internationalization</u>				
Total foreign assets / total assets	4.75	8.51	0.01	46.48
Extensive margin	13.74	9.48	2.00	54.00
<u>Market power (Lerner index)</u>				
Acquisitions	1.92	2.47	0.00	12.00
Branches	29.21	21.28	0.20	100.45
Cost efficiency	84.43	9.84	56.25	98.34
Herfindahl index (output categories)	46.29	8.85	29.42	71.10
Lerner index	0.23	0.11	-0.07	0.05
Profit efficiency	73.43	12.79	27.50	92.29
Public incorporated (0/1)	0.04	0.19	0.00	1.00
Share of fee income	12.21	5.05	2.29	28.93
Size quintile	3.08	1.39	1.00	5.00
<u>Risk (Probability of distress)</u>				
Capitalization	5.64	2.13	2.60	10.86
Customer loans	58.99	12.70	22.73	83.75
Non-performing loans	8.68	7.13	0.31	32.91
Probability of distress	0.03	0.16	0.00	1.00
Reserves	1.54	1.04	0.00	4.60
Return on equity	0.12	0.09	-0.15	0.34

Table 3: Baseline Regression Results

This Table gives regression results for simultaneously estimating the probability of distress and the market power of banks (Lerner index) as described in Section 4.1. Estimations of the Lerner index in Table (a) use OLS, estimations of the probability of distress in Table (b) use a probit model. All explanatory variables are lagged by one period. Dummies for different banking groups, time, and regional fixed effects are included but not reported. Extensive margin = number of countries in which bank is present, intensive margin = foreign assets / total assets. Table (a) depicts standardized coefficients in brackets, Table (b) reports marginal effects. ***, **, * = significant at the 1%, 5%, 10%-level drawing on bootstrapped standard errors.

(a) Market Power (Lerner Index)

	(1)	(2)	(3)	(4)	(5)
Predicted risk	-0.0546*** (-0.420)	-0.0545*** (-0.420)	-0.0546*** (-0.422)	-0.0547*** (-0.427)	-0.0551*** (-0.426)
Share of fee income	0.00213*** (0.0951)	0.00226*** (0.101)	0.00227*** (0.101)	0.00225*** (0.100)	0.00220*** (0.0982)
Size quintile	-0.00525*** (-0.0648)	-0.00223 (-0.0275)	-0.00213 (-0.0263)	-0.00321** (-0.0396)	-0.00274** (-0.0338)
Herfindahl index (output categories)	0.00139*** (0.109)	0.00144*** (0.113)	0.00149*** (0.117)	0.00127*** (0.0993)	0.00134*** (0.105)
Publicly incorporated (0/1)	-0.0258* (-0.0427)	-0.0254** (-0.0420)	-0.0252* (-0.0417)	-0.0177 (-0.0293)	-0.0264** (-0.0436)
Branches	0.000268*** (0.0505)	0.000259** (0.0489)	0.000260*** (0.0491)	0.000275*** (0.0520)	0.000265*** (0.0501)
Acquisitions	0.00164*** (0.0361)	0.00152*** (0.0334)	0.00144*** (0.0316)	0.00185*** (0.0407)	0.00167*** (0.0367)
Extensive margin		-0.000771*** (-0.0644)	-0.000751*** (-0.0628)	-0.000423** (-0.0353)	-0.000592*** (-0.0494)
Foreign assets / total assets		0.000787*** (0.0592)			
Foreign assets (cross-border) / total assets			0.00104*** (0.0587)		
Foreign assets (subsidiaries) / total assets				-0.00929*** (-0.108)	
Foreign assets (branches) / total assets					0.00244*** (0.0586)
Observations	6,752	6,752	6,752	6,752	6,752
Adjusted R^2	0.415	0.419	0.419	0.418	0.423

(b) Risk (Probability of Distress)

	(1)	(2)	(3)	(4)	(5)
Lerner	-0.165*** (0.0459)	-0.123** (0.0560)	-0.122*** (0.0404)	-0.113** (0.0560)	-0.122** (0.0476)
Lerner residuals	0.138*** (0.0426)	0.0963* (0.0529)	0.0952** (0.0419)	0.0879* (0.0485)	0.0961** (0.0452)
Core capital ratio	0.00143 (0.00110)	0.00105 (0.00149)	0.000907 (0.000836)	0.000853 (0.00104)	0.000989 (0.00132)
Reserves	-0.00568*** (0.00150)	-0.00658*** (0.00158)	-0.00655*** (0.00176)	-0.00652* (0.00356)	-0.00650*** (0.00118)
Customer loan share	0.000104 (9.47e-05)	0.000101 (8.54e-05)	0.000116 (7.73e-05)	6.36e-05 (5.34e-05)	9.03e-05 (5.92e-05)
Non-performing loans	-9.51e-05 (0.000108)	-6.78e-05 (8.49e-05)	-7.29e-05 (0.000104)	-5.95e-05 (0.000132)	-6.76e-05 (0.000102)
Cost-income ratio	0.000122 (0.000134)	0.000112 (0.000158)	0.000119 (0.000138)	0.000111 (0.000149)	0.000111 (0.000133)
Return on equity	-0.0337*** (0.00947)	-0.0365*** (0.0119)	-0.0365*** (0.0110)	-0.0368* (0.0190)	-0.0366*** (0.0105)
Cost efficiency	-0.000203*** (7.38e-05)	-0.000229*** (8.24e-05)	-0.000224** (9.85e-05)	-0.000211** (9.85e-05)	-0.000229*** (6.84e-05)
Profit efficiency	0.000151* (7.75e-05)	0.000103 (9.44e-05)	0.000104 (6.52e-05)	8.57e-05 (7.85e-05)	0.000103 (0.000108)
Extensive margin		0.000178 (0.000113)	0.000167 (0.000161)	0.000228 (0.000163)	0.000188 (0.000122)
Foreign assets / total assets		3.84e-05 (0.000152)			
Foreign assets (cross-border) / total assets			0.000143 (0.000194)		
Foreign assets (subsidiaries) / total assets				-0.00266 (0.0202)	
Foreign assets (branches) / total assets					8.52e-05 (0.000290)
Observations	6,752	6,752	6,752	6,752	6,752
Pseudo R ²	0.245	0.247	0.248	0.252	0.248

Table 4: Regression Results by Banking Group

This Table gives regression results for simultaneously estimating the probability of distress and the market power of banks (Lerner index) as described in Section 4.1. Estimations of the Lerner index in Table (a) use OLS, estimations of the probability of distress in Table (b) use a probit model. All explanatory variables are lagged by one period. Dummies for different banking groups, time, and regional fixed effects are included but not reported. Extensive margin = number of countries in which bank is present, intensive margin = foreign assets / total assets. Table (a) depicts standardized coefficients in brackets, Table (b) reports marginal effects. ***, **, * = significant at the 1%, 5%, 10%-level drawing on bootstrapped standard errors.

(a) Market Power (Lerner Index)

	(1) Full sample	(2) Commercial banks	(3) Savings banks	(4) Cooperative banks
Predicted risk	-0.0545*** (-0.420)	-0.00364** (-0.219)	-0.0156*** (-0.538)	-0.0756*** (-0.604)
Share of fee income	0.00226*** (0.101)	0.00127 (0.109)	0.00372*** (0.111)	0.00330*** (0.121)
Size quintile	-0.00223 (-0.0275)	-0.0670*** (-0.481)	-0.0135*** (-0.142)	0.00572*** (0.0647)
Herfindahl index (output categories)	0.00144*** (0.113)	0.00259*** (0.257)	0.00219*** (0.239)	0.000553*** (0.0430)
Publicly incorporated (0/1)	-0.0254** (-0.0420)	-0.0308 (-0.0805)		0.0181* (0.0135)
Branches	0.000259*** (0.0489)	-0.00153 (-0.0903)	0.00106*** (0.120)	0.000463*** (0.0987)
Acquisitions	0.00152*** (0.0334)	-0.000658 (-0.0161)	-0.00293*** (-0.0777)	0.00356*** (0.0769)
Foreign assets / total assets	0.000787*** (0.0592)	0.00150*** (0.235)	-0.00242*** (-0.0982)	-0.000419 (-0.0140)
Extensive margin	-0.000771*** (-0.0644)	0.000628 (0.0526)	0.000530* (0.0632)	-0.000396 (-0.0234)
Observations	6,752	218	1,173	4,710
Adjusted R^2	0.419	0.246	0.448	0.390

(b) Risk (Probability of Distress)

	(1) Full sample	(2) Commercial banks	(3) Savings banks	(4) Cooperative banks
Lerner	-0.123** (0.0572)	4.24e-05 (0.0256)	7.97e-05 (0.0217)	-0.217*** (0.0650)
Lerner residuals	0.0963* (0.0566)	-0.000128 (0.0828)	-0.000109 (0.0289)	0.180*** (0.0656)
Core capital ratio	0.00105 (0.00134)	-6.86e-07 (0.000620)	-1.45e-05 (0.00448)	0.00308 (0.00220)
Reserves	-0.00658*** (0.00142)	-1.70e-05 (0.0148)	-2.32e-05 (0.00771)	-0.00657*** (0.00224)
Customer loan share	0.000101 (8.39e-05)	6.00e-08 (4.23e-05)	-1.23e-08 (5.80e-06)	8.08e-05 (0.000151)
Non-performing loans	-6.78e-05 (9.12e-05)	5.84e-07 (0.000525)	1.32e-06 (0.000453)	-0.000333** (0.000149)
Cost-income ratio	0.000112 (0.000117)	4.35e-07 (0.000478)	2.72e-07 (0.000116)	0.000122 (0.000167)
Return on equity	-0.0365*** (0.0112)	-0.000450 (0.338)	-6.53e-05 (0.0225)	-0.0375*** (0.0143)
Cost efficiency	-0.000229*** (6.79e-05)	-2.29e-09 (5.46e-05)	-1.61e-06 (0.000547)	-2.40e-05 (0.000132)
Profit efficiency	0.000103 (7.97e-05)	-1.02e-06 (0.000753)	-8.14e-07 (0.000257)	0.000363** (0.000147)
Foreign assets / total assets	3.84e-05 (0.000174)	4.72e-07 (0.000406)	-3.58e-06 (0.00127)	-0.000226 (0.000320)
Extensive margin	0.000178** (8.71e-05)	1.57e-06 (0.00109)	9.31e-07 (0.000313)	0.000388*** (0.000138)
Observations	6,752	218	1,181	4,710
Pseudo R^2	0.247	0.318	0.528	0.249

Table 5: Endogeneity of Foreign Status

This Table gives regression results for simultaneously estimating the probability of distress and the market power of banks (Lerner index) as described in Section 4.1. Estimations of the Lerner index in Table (a) use OLS, estimations of the probability of distress in Table (b) use a probit model. All explanatory variables are lagged by one period. Dummies for different banking groups, time, and regional fixed effects are included but not reported. *Entry (0/1)* is a dummy variable which is equal to one if a bank has increased the number of foreign countries in which it is active, *Exit (0/1)* is a dummy variable which is equal to one if a bank has lowered the number of countries. *Exit (number)* and *Entry (number)* are the corresponding variables using the absolute value of the count of countries from which a bank has withdrawn or into which a bank has newly expanded. Extensive margin = number of countries in which bank is present, intensive margin = foreign assets / total assets. Table (a) depicts standardized coefficients in brackets, Table (b) reports marginal effects. ***, **, * = significant at the 1%, 5%, 10%-level drawing on bootstrapped standard errors.

(a) Market Power (Lerner Index)

	(1)	(2)	(3)	(4)	(5)
Predicted risk	-0.0545*** (-0.420)	-0.0545*** (-0.420)	-0.0569*** (-0.454)	-0.0603*** (-0.497)	-0.0595*** (-0.494)
Share of fee income	0.00226*** (0.101)	0.00216*** (0.0964)	0.00213*** (0.0980)	0.00165*** (0.0813)	0.00163*** (0.0799)
Size quintile	-0.00223 (-0.0275)	-0.00561*** (-0.0693)	-0.00470*** (-0.0594)	-0.00167 (-0.0218)	-0.00222 (-0.0289)
Herfindahl index (output categories)	0.00144*** (0.113)	0.00147*** (0.116)	0.00122*** (0.0977)	0.00108*** (0.0872)	0.00108*** (0.0869)
Branches	0.000259*** (0.0489)	0.000266*** (0.0503)	0.000262** (0.0481)	0.000335*** (0.0618)	0.000324*** (0.0596)
Acquisitions	0.00152*** (0.0334)	0.00132** (0.0291)	-0.000519 (-0.0114)	-0.00281*** (-0.0468)	-0.00304*** (-0.0507)
Publicly incorporated (0/1)	-0.0254** (-0.0420)	-0.0277* (-0.0457)	-0.0194 (-0.0325)	0.00345 (0.00604)	0.00314 (0.00549)
Foreign assets / total assets	0.000787*** (0.0592)				
Extensive margin	-0.000771*** (-0.0644)				
Intensive margin (Frankel Romer)		0.000786*** (0.0586)			
Total foreign assets / total assets (t-2)			0.000491 (0.0358)		
Entry (0/1) (t-2)				0.000944 (0.00439)	
Exit (0/1) (t-2)				-0.0192*** (-0.0867)	
Entry (number) (t-2)					0.000967 (0.0182)
Exit (number) (t-2)					-0.00465*** (-0.0663)
Observations	6,752	6,752	4,938	2,881	2,881
Adjusted R ²	0.419	0.417	0.370	0.425	0.424

(b) Risk (Probability of Distress)

	(1)	(2)	(3)	(4)	(5)
Lerner	-0.123*** (0.0462)	-0.164*** (0.0412)	-0.161*** (0.0614)	-0.193*** (0.0664)	-0.184 (0.147)
Lerner residuals	0.0963** (0.0446)	0.137*** (0.0374)	0.137** (0.0548)	0.171*** (0.0643)	0.164 (0.139)
Core capital ratio	0.00105 (0.00111)	0.00137 (0.000847)	0.00264 (0.00171)	0.00413** (0.00189)	0.00387 (0.00370)
Reserves	-0.00658*** (0.00203)	-0.00565*** (0.00164)	-0.00297** (0.00143)	-0.00210 (0.00225)	-0.00227 (0.00221)
Customer loan share	0.000101 (7.36e-05)	0.000125** (5.47e-05)	8.34e-05 (0.000102)	2.78e-05 (0.000127)	3.22e-05 (0.000102)
Non-performing loans	-6.78e-05 (9.09e-05)	-0.000107 (0.000105)	-0.000153 (0.000110)	-7.10e-05 (0.000105)	-7.14e-05 (5.97e-05)
Cost-income ratio	0.000112 (0.000142)	0.000144 (0.000124)	8.17e-05 (9.76e-05)	0.000174 (0.000255)	0.000169** (8.23e-05)
Return on equity	-0.0365*** (0.0120)	-0.0340*** (0.0119)	-0.0228** (0.00946)	-0.0191 (0.0166)	-0.0194 (0.0142)
Cost efficiency	-0.000229*** (8.23e-05)	-0.000200*** (6.06e-05)	-0.000146** (7.01e-05)	-5.61e-05 (0.000113)	-6.74e-05 (0.000125)
Profit efficiency	0.000103 (8.21e-05)	0.000158** (7.10e-05)	0.000196* (0.000105)	0.000261** (0.000119)	0.000252 (0.000213)
Foreign assets / total assets	3.84e-05 (0.000164)				
Extensive margin	0.000178* (9.88e-05)				
Intensive margin (Frankel Romer)		0.000142 (0.000112)			
Total foreign assets / total assets (t-2)			-7.90e-06 (0.000207)		
Entry (0/1) (t-2)				0.000448 (0.00185)	
Exit (0/1) (t-2)				-0.00326** (0.00154)	
Entry (number) (t-2)					0.000264 (0.000462)
Exit (number) (t-2)					-0.000821 (0.000681)
Observations	6,752	6,752	4,938	2,881	2,881
Pseudo R ²	0.247	0.245	0.262	0.275	0.276