



# Should I stay or should I go? Bank productivity and internationalization decisions <sup>☆</sup>



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## ABSTRACT

Differences in firm-level productivity explain international activities of non-financial firms quite well. We test whether differences in bank productivity determine international activities of banks. Based on a dataset that allows tracking banks across countries and across different modes of foreign entry, we model the ordered probability of maintaining a commercial presence abroad and the volume of banks' international assets empirically. Our research has three main findings. First, more productive banks are more likely to enter foreign markets in increasingly complex modes. Second, more productive banks also hold larger volumes of foreign assets. Third, higher risk aversion renders entry less likely, but it increases the volume of foreign activities conditional upon entry.

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## 1. Introduction

Large, internationally active banks are important channels for the integration of financial markets. But they can also contribute to the propagation of shocks across borders.<sup>1</sup> The

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<sup>1</sup> Cetorelli and Goldberg (2012) show how the degree of internationalization of banks affects the transmission of monetary policy shocks.

importance of global banks raises a number of questions. Are banks' internationalization decisions, as for non-financial firms, determined by productivity? Which factors affect the extensive margin (the foreign investment decision) and the intensive margin (the volume of activities)? And how do banks decide on the particular mode of foreign activities (international assets, foreign branches, foreign subsidiaries)? We answer these questions using a unique dataset and extend prior literature by explicitly modeling the role played by productivity, size, risk, other bank-specific, and country-specific factors.<sup>2</sup>

The international trade literature shows that larger and more productive non-financial firms are more likely to export and to engage in foreign direct investment (FDI).<sup>3</sup> The reason is that more productive firms find it easier to pay the higher fixed and variable costs of foreign market entry compared to domestic operations (Melitz, 2003; Helpman et al., 2008). Only productive firms self-select into increasingly fixed-cost intensive foreign modes of entry because their lower variable cost due to high productivity imply additional profits from abroad.

<sup>2</sup> See, for example, Berger et al. (2003), Buch and Lipponer (2007), Focarelli and Pozzolo (2005), Ruckman (2004), or Buch et al. (2011).

<sup>3</sup> See, for example, Bernard et al. (2006, 2007), Helpman et al. (2004), Tomiura (2007), and Yeaple (2009).

So far, applications to international banking are rare. This paper extends existing literature on cross-border banking in three regards. First, we theoretically model the internationalization decision of banks as a function of productivity and risk. We show that, both, the decision to enter a foreign market (the extensive margin) and the decision on the volume of activities (the intensive margin) are affected by bank productivity.

Empirically, we draw on a comprehensive dataset about the internationalization choices of all German banks. Most previous studies are confined to large, internationally active banks, thereby neglecting the selection of banks into foreign markets and the ensuing bias. The “External Position Report” of the Deutsche Bundesbank contains information about the international assets of all German banks, their foreign branches, and their foreign subsidiaries, year-by-year, and country-by-country. Bank risk aversion is measured by supervisory financial accounts data.

Second, we model the fixed cost of international banking by using an ordered probit model. To model self-selection of banks into the different modes of foreign activities, we enrich a conventional Heckman (1979) model and include hierarchical categories in the selection equation. This method may be relevant for studies of non-financial international firms as well (Barattieri, 2011). We use the 2011 version of the capital account openness indicator of Chinn and Ito (2006) and information on WTO bilateral trade agreements as exclusion restrictions to predict the self-selection of banks into foreign markets.

Third, we account for the endogenous relationship between banks’ factor demand and productivity by using the approaches of Olley and Pakes (1996) and Levinsohn and Petrin (2003). These estimators are frequently used in non-financial firm studies, but they are rarely applied to banks.<sup>4</sup> We use detailed financial accounts data reported to the supervisor to estimate bank productivity. When adapting the production function estimators to banks, we exploit supervisory information about all bank exits through mergers to identify productivity.

Our main results are as follows. First, as regards the extensive margin of internationalization, banks and non-banks differ. In contrast to non-financial firms, many (small) banks hold international assets. In line with evidence for non-financial firms, only very few banks have foreign affiliates. Productivity is especially important for entry choices of smaller banks such as savings and cooperatives. Second, more productive banks have larger volumes of international activities. This result is not driven by size effects, and it is robust to using alternative proxies for productivity. Correcting for the selection into different foreign modes has a significant impact on the volume of activities. Consequently, studies considering only a subsample of banks to analyze internationalization are likely to suffer from selection bias. Third, banks with a higher revealed degree of risk aversion are less likely to go abroad. But, conditional on foreign presence, the volume of their activities is larger.

In Section 2, we derive theoretical hypotheses. Section 3 describes the data, the empirical model, and the measurement of bank productivity. We discuss the estimation results in Section 4, and we conclude in Section 5.

## 2. Theoretical hypotheses

We consider a simple, static portfolio model to analyze how bank-level productivity and the degree of risk aversion influence international banking choices. A static model allows separating more clearly the effects of productivity inspired by the goods trade

literature from risk considerations central to conventional banking models, which is our focus. It comes at the expense that we do not model exit choices explicitly. Our approach amounts to the assumption that the fixed costs associated with entry and exit are sunk after each period. Whereas this assumption is in line with many entry/exit choice problems (Bresnahan and Reiss, 1987, 1991), recent IO literature models market entry and exit choices as dynamic games (Pakes et al., 2007; Ryan, 2012).

We assume that banks can be active abroad either by holding foreign assets through their domestic headquarters (Mode 1) or through foreign affiliates (Mode 2).

We assume that banks invest but do not borrow abroad.<sup>5</sup> In each period, a representative bank chooses its optimal portfolio structure. The balance sheet restriction for bank  $i$  is:

$$W_i + D_i = L_i + L_{ij}^* + R_i, \quad (1)$$

where  $W_i$  is initial wealth,  $D_i$  are domestic deposits (liabilities),  $L_i$  are domestic loans (assets),  $L^*$  are foreign loans (assets) in country  $j$ , and  $R_i$  are risk-free assets.

The expected profit of a domestic bank  $i$  holding international assets in country  $j$  depends on the returns on domestic and international assets less variable costs and the fixed costs of foreign activities:

$$\begin{aligned} \Pi(1)_{ij} = & [r_L - c_{ij,L}(\omega_i)]L(1)_i + [(1 - \tau_i)r_{j,L}^* - c_{ij,L}^*(\omega_i)]L(1)_{ij}^* \\ & + r_F R(1)_i - [r_D - c_{ij,D}(\omega_i)]D(1)_i - F(1)_j, \end{aligned} \quad (2)$$

where  $F(1)_j$  are the fixed costs of Mode 1,  $r_L$  and  $r_D$  are interest rates on (risky) assets and liabilities,  $r_F$  is the risk-free rate,  $\tau_j$  denotes country-specific information costs that lower the return on international assets, with  $0 < \tau_j < 1$ , and  $c_{ij}$  are variable costs. The index (1) in this equation denotes the bank’s profit function under Mode 1. The fixed and variable costs of international operations vary across host countries. The fixed costs of domestic operations are normalized to 0.

In this static model, banks consider only contemporaneous profits. The upshot in dynamic structural models, such as Pakes et al. (2007) and Ryan (2012), is that agents learn about the fixed costs associated with entry and exit, and thus expected profits. Fixed costs can take different forms. They can be related to the periodical renewal of banking charters for foreign subsidiaries, or they can capture fixed costs due to allocating staff and other resources to maintaining country expertise. Fixed costs of exiting markets are not modeled because we observe hardly any retreat from a market by banks in our sample once the bank operates an affiliate in a country. In the empirical estimation below, we explicitly account for the possibility that parent banks cease to exist in the German home market by specifying exit through mergers when estimating bank productivity as in Olley and Pakes (1996).

Raising deposits and granting loans is costly. These costs reflect the resource inputs connected to handling loan applications, maintaining a branch network, and performing payment services. We assume that banks differ with regard to their productivity ( $\omega_i$ ) and that more productive banks incur lower costs:

$$c_{ij,\cdot} = c_{ij,\cdot}(\omega_i) \quad \text{with} \quad \frac{\partial c_{ij,\cdot}}{\partial \omega_i} < 0. \quad (3)$$

Each bank thus has a specific productivity level that transfers also to its foreign affiliates. The costs of supplying financial services abroad exceed those at home. Hence,  $c_{ij,L}(\omega_i) < c_{ij,L}^*(\omega_i)$ , holds due to the institutional and regulatory differences across financial systems

<sup>4</sup> Exceptions are Nakane and Weintraub (2005) and Koetter and Noth (2013). Most banking studies use a dual (cost function) approach (Kumbhakar and Lovell, 2000). This approach neglects the bias due to the simultaneity between input choices and productivity.

<sup>5</sup> Relaxing these assumptions leaves the main qualitative results of the following analysis unaffected.

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