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Article

# The impact of interbank and public debt markets on the competition for bank deposits☆

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ABSTRACT

The growth in the interest rates paid on Spanish public debt since 2008 and the impairment of the interbank market have generated concerns about their effects on competition for bank deposits in Spain. I combine a nested logit model of bank deposit supply with a structural model of competition to measure the impact of the reference interest rates on public debt and interbank markets on the returns on deposits and funding policy of Spanish banks during 2003–2010. The interbank rate is found to be more closely correlated with the return on deposits than the interest rate on public debt, but the connection between interbank rates and deposit returns is significantly weaker in the crisis period 2008–2010. Counterfactual analysis shows an important effect of the interbank rate and investment opportunities in public debt on deposit rates and bank profits, and that observed deposit rates are on average 115 bp above collusive levels.

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## 1. Introduction

Empirical research has shown in the past that the interbank rate worked as a reference for the interest rates of loan and deposit products offered by Spanish banks. In particular, the remuneration of bank deposits has been historically set equal to the interbank rate minus a margin discount. However, the interest cost of term deposits has been generally above the interbank rate since 2008. This observation is surprising if we use as framework of analysis a standard model of banking competition, where banks have some degree of market power in the loan and deposit markets and have access to an interbank market with a perfectly elastic supply of funds.[1] In such a framework, it is not possible to observe a market equilibrium with an interest rate on bank deposits above the interbank rate, as banks would then have the incentive and the ability to substitute deposits for interbank funding. The addition to the standard model of disruptions in the interbank market and bank investments in public debt can help to solve this puzzle and explain the observed deposit rates in recent history. In this article, I estimate a structural model of the Spanish bank deposit market to examine its relation with interbank and public debt markets and the intensity of competition.

The operation of the European interbank market has been disrupted following the financial crisis of 2008. The reduced volumes of transactions, raising spreads and the recourse to European Central Bank, ECB henceforth, liquidity operations have signaled the difficulties of borrowers to access the interbank market, ECB (2008, 2010). For the particular case of Spain, the negative difference of the interbank rate and deposit rates since 2008 implied also that it would be unprofitable for Spanish banks to use deposit funding to participate as lenders in the interbank market. Even with limited participation of Spanish banks in the interbank market, a significant fraction of Spanish loans are still referenced to the Euribor interbank rate.[2] The referencing of loans to interbank rates implies that this market can still impact the expected return on bank loans after 2008, and therefore the incentives of Spanish banks to set deposit rates and obtain funds to

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[1] In particular, Klein (1971) and Monti (1972) models of multiproduct monopoly in which the bank determines the amounts of loans and deposits. These models can be generalized to a Cournot oligopoly model and to models of monopoly and oligopoly with price as strategic variable. See Freixas and Rochet (2002).

[2] For example, Bank of Spain interest rate reports (model I.2 described in BOE (2010)) show that approximately 90% of mortgages for home acquisitions are granted with a revision period of less than a year. The mortgage rate is commonly referred to the Euribor interbank rate in contract revisions.

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finance these loans. The relation between the interbank rate and bank deposits is nonetheless expected to change depending on whether normal access to the interbank market is available, or interbank rates impact the banks only through the referencing of loan rates.

The funds obtained from bank deposits can also be invested in public debt. The growth in the rates paid on Spanish public debt since 2008 increases the interest margin of these securities relative to the interest cost of bank deposits. Public debt assets bring an additional option value originating from its possible future use to obtain liquidity in the repo market or with the ECB.[3] Spanish public debt was an investment option for Spanish banks before the financial crisis, and this already created a connection between the markets for public debt and bank deposits. However, the high interest rates on public debt and its heightened importance as a liquidity instrument after 2008 plausibly altered its relation with the bank deposit market.

This article uses regulatory data at the individual bank level on the deposit volume and interest rates of bank deposits in Spain during the period 2003–2010 to estimate the deposit supply function. The estimates of the deposit supply model are combined with a structural Nash pricing model of competition in the deposit market to infer the expected returns on deposit funds. These implied returns on deposits are calculated from the profit-maximization conditions of the formal competition model evaluated at the observed deposit rates. I then study the statistical relation of implied returns with the interest rates on the interbank and public debt markets. Counterfactual exercises are used to compute the sensitivity of deposit rates and bank profits to the interbank rate, interest rates on public debt and the intensity of competition.

I use a nested logit specification for the supply of bank deposits, which allows me to control for the possible endogeneity of deposit rates, through instrumental variables estimation, and recover different substitution patterns across commercial and savings banks. The existing empirical industrial organization literature, as reviewed below, has shown the importance of this class of discrete choice methods to accurately estimate price elasticities, which are a key input to the counterfactual exercises and the recovery of implicit returns. I find an elasticity of individual bank deposit supply with respect to its own deposit rate of 0.93 and that the correction for endogeneity bias is relevant. The analysis of the relation of deposit returns and reference interest rates reveals that the Euribor 12 months is clearly correlated with the implied return on deposits through the sample, though this relation is weaker after 2008. The interest rates on public debt are found to have a greater impact on the return on deposits after 2008. These findings offer some support for the concern that the exposure of Spanish banks to interbank and public debt markets changed during the financial crisis.

The counterfactual analysis in this article reveals that collusion in the deposit market can increase bank profits, but the variations of the reference rates in the interbank and public debt markets are found to have a larger impact on bank profits than the relaxation of competition.[4] These results point to reference interest rates with impact on bank deposit returns as more relevant indicators of financial stability than measures of concentration in the Spanish bank deposit market.

The banking literature has long been concerned with the effects of competition on deposit rates. Berger and Hannan (1989) estimate the impact of concentration on deposit rates in the U.S. within a structure conduct performance framework, Hannan and Berger (1991) study the impact of market concentration and bank characteristics on bank level deposit rate decisions and Amel and Hannan (1999) estimate the deposit rate elasticity of bank deposits to measure the possibilities of substitution to nonbank financial institutions. Hannan and Berger (1991) consider the impact of changes in the average return of the securities market on deposit rates, but their objectives and data are not oriented to study the impact of the reference rates of different markets on deposit rates.

The developments in the empirical industrial organization literature, in particular, the extension of the use of discrete choice models and structural assumptions following Berry et al. (1995), BLP henceforth, provide new tools to examine the behavior and welfare of depositors and they have been applied to the study of the U.S. bank deposit markets in a series of recent articles. Adams et al. (2007) fit a generalized extreme value model to the market share data of deposit institutions in the U.S. to estimate the cross elasticities between the interest rates offered by commercial banks and thrifts. Dick (2008) uses different multinomial logit models to estimate the relation between the deposit supply in the U.S. and deposit rates, service fees and branch network density. Dick (2008) uses this deposit supply model to measure the consequences in welfare of the merger process initiated after the Riegel-Neal Act of 1994. Knittel and Stango (2008) also employ a logistic model to estimate the deposit supply in the U.S. as a function of deposit rates and ATM network characteristics.[5]

Ishii (2008) estimates the supply of deposits in the U.S. with a mixed logit model with the purpose of evaluating the impact on consumer welfare of ATM fees charged to consumers belonging to different networks and obtaining an estimate of the investment costs of expansion of ATM networks. Ho and Ishii (2011) improve the estimation technique in Ishii (2008) incorporating an outside option to bank deposits and detailed geographic data to obtain a more precise estimate of the welfare impact of the geographic expansion of banks as result of the Riegel-Neal Act. The financial crisis started on 2008 has increased the interest in the analysis of the relation between sovereign debt and the banking sector,[6] and the current article contributes to this literature with new structural analysis of the effects of tensions in the public debt market and impairment of the interbank market on the competition for bank deposits.

The deposit and loan markets in Spain have been the objects of different empirical studies. Carbó et al. (2005) estimate a linear demand model for loans and deposits and they use it to infer the strategic reaction of commercial and savings banks to changes in the interest rates and advertising policies of competitors. Martín-Oliver and Salas-Fumás (2008) estimate a production function and a logit demand model for loans and deposits, which allow them to identify the contribution of information technology to the production process, measure the impact of advertising on demand and verify the strategic rationality of interest rate and advertising policies. Martín-Oliver et al. (2007) study the dispersion in the deposit and loan rates in the Spanish banking sector and they find evidence of imperfect long term convergence of interest rates to marginal

[3] The ECB documents the continued use of its liquidity transactions by European banks since 2008. See Section 3 of the ECB Financial Stability Review in ECB (2008, 2010). The ECB provides an overview of its open market operations at http://www.ecb.int/mopo/implement/intro/html/index.en.html.

[4] The concern over the impact of competitive tensions on the level of deposit rates lead to the Bank of Spain to introduce penalty contributions to the Deposit Guarantee Fund as a function of the level of deposit rates offered. See BOE (2011).

[5] Additional international studies of deposit institutions include Cohen (2004), Cohen and Mazzeo (2007), Corvoisier and Gropp (2002), Focarelli and Panetta (2003) and Guo (2003).

[6] Recent novel theoretical contributions include Broner et al. (2010), Bolton and Jeanne (2011) and Acharya and Rajan (2013). Acharya and Steffen (2013) analyze empirically the incentive of banks to raise short term finance and invest in public debt and Gennaioli et al. (2012) study the impact of sovereign default on private sector credit with a panel of countries.

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