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# Impact of compensation structure and managerial incentives on bank risk taking

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ABSTRACT

We analyze the impact of managerial compensation structure in publicly-traded banks on their risk taking behavior, specifically the changes in risk taking through the changing regulatory environment for these banks. We perform a simulation analysis to study the impact of the interaction between regulatory changes and competitiveness in banking on managerial compensation, and in turn their joint impact on a bank's riskiness. The three hypotheses we examine using the simulation analysis are, (1) increase in competitiveness after deregulation results in higher levels of risk for banks, (2) regulatory changes can result in change in the composition of managerial compensation, which creates an environment of incentives for enhanced risk taking, (3) regulatory changes accompanied by certain governance or managerial compensation controls can bring prudence in the risk taking behavior. The simulation model allows isolating each factor for its impact on a particular bank's riskiness due to the regulatory changes. This impact is then correlated with the governance characteristics of the bank. We observe that competition uniformly increases the risk in firm value and shareholder-equity of all the banks, more severely for some than others. Its effect on change of firm value through regulatory changes observed is opposite from its effect on shareholder-equity for some banks. Change in competition combined with change in managerial compensation captures significantly more of the increased risk in firm value and shareholder-equity. Lastly, the governance characteristics show that risk differential between competition alone and competition combined with compensation is low for banks with good governance.

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## 1. Introduction

The impact of managerial incentives on risk taking behavior in corporations is widely studied in the literature (Aggarwal & Samwick 1999; Coles, Daniel, & Naveen, 2006; Gray & Cannella, 1997; Nam, Ottoo, & Thornton, 2003; Raith, 2003). In the banking sector, this relationship takes on unique significance due to the role banks perform in the economy (Chen, Steiner, & Whyte, 2006; Houston & James, 1995; Hubbard & Palia, 1995; Haq, Williams, & Pathan, 2010), as well as the special regulatory features of the industry (Agoraki et al., 2008; Brewer, Hunter, & Jackson, 2003, 2004). A careful look at this relationship has become more important at this time to understand its role in the creation and propagation of financial crises emanating from the banking sector (Elsinger, Lehar, & Summer, 2006), as well as to understand the role of regulatory changes (Hetzel, 2009; Tung, 2011). In this article, we analyze the impact of managerial compensation structure in publicly-traded banks on their risk taking behavior as described by the types of loans being extended, and the changes in this behavior through the changing regulatory environment for these banks.

Unlike some other industries, in banking there are certain factors that lend themselves to convenient observation of their risk taking behavior. These factors include the individual or aggregate yield spreads of the portfolio of loans extended by the bank, the levels of non-performing loans, the maturity structure of the loans, frequency of need to acquire funds for short-term liquidity, the off-balance-sheet activities of the bank, and change of all the above with time. These risk-taking factors are influenced by how diversified the bank is in its activities, such as whether the loans in the portfolio are extended to single or multi-segment industry, the frequency, extent and quality of syndication the bank works in, diversity and innovation in products, geographical location of the bank's activities, and its regulatory environment.

It is known from earlier investigations reported in the literature that managerial compensation structure affects a firm's risk taking behavior. Studying this relationship and its change with time, specifically for the banking sector, holds merit for several reasons. Managers in banks have to act within the auspice of an exogenously created

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regulatory environment, changes in which have over the years created new competitive pressures. Securitization, for instance, has existed in banking for decades; however it became more popular in recent years in response to the new competitive pressures triggered by changes in the regulatory environment for banks in the US. Therefore, managerial decisions may be affected by not only their compensation structure, but also due to implications of changes from the exogenous regulatory shocks and competitive pressures. The experience of each bank through these changes can be quite different, as can their responses. The sum total of all these factors can paint a very unique picture for each bank, which can help indicate what works and what does not in the implementation of regulatory changes. Studying the impact of the changes in regulatory environment on managerial compensation structure, managerial risk taking behavior, or both, besides the changes in competition due to regulatory changes, can therefore, shed light on the efficacy of the regulatory structure, and given their unique conditions, how each bank responds and adapts to these changes.

We build a model to study the impact of the interaction between managerial compensation, regulatory changes and competitiveness in the sector on a single bank's risk taking behavior. Based on a simulation study using the model, we will examine the following three hypotheses, (1) increase in competitiveness after deregulation results in higher levels of risk for banks, (2) regulatory changes can result in change in the composition of managerial compensation, which creates an environment of incentives for enhanced risk taking, (3) regulatory changes accompanied by certain governance or managerial compensation controls can bring prudence in the risk taking behavior. We utilize the following data sources to conduct our study; the data are used to develop the structural framework for the simulation model, calibrate it, and use it for the analysis of the above three hypotheses. The broad range of data covers the financial, managerial compensation, competitive environment and governance characteristics of a sample of 45 banks for periods ranging from 15 to 20 years, obtained from the call reports of the Federal Reserve Bank of Chicago, ExecuComp and the IRRC databases.

The rest of the paper is organized as follows. In the next section, we further build the rational for the hypotheses in the context of the extant literature on the impact of regulatory changes on competitiveness, the impact of managerial compensation on risk-taking in a firm, and finally, of governance. Section 3 will be devoted to developing the mathematical model for bank's structure, assets, liabilities, firm value, growth and shareholder-equity, as well as impact of regulatory changes on these directly or indirectly due to competition and compensation structure changes. In Section 4, we will present the calibration methodology utilized for the model, as well as develop the design of simulation study to examine the hypotheses using the model. We present our analysis of the hypotheses in Section 5 in terms of the 45 banks identified in this study. Finally, we will conclude with a summary of findings and discussions for future research in Section 6.

## 2. Discussion of the hypotheses and the simulation model

Deregulation is associated with increase in investment opportunities for a bank, as is witnessed for the United States banking sector geographical and product related deregulations of the 1990s, the 1994 Riegle-Neal Act (RNA) and the 1999 Gramm-Leach-Bliley Act (GLBA) (Berger, Demsetz, & Strahan, 1999; Brewer & Evanoff, 2000; Brewer et al., 2004; Laski, 2003). As these new opportunities are created for all banks and new entrants to participate in, competition to benefit from these new opportunities can intensify for a bank, or be made to intensify by creation of incentives for the managers to take advantage of the new investment opportunities. There is plenty of evidence of changing compensation structure in concurrence with the deregulations (Cuñat Martinez & Guadalupe, 2004).

The changing geographical deregulation in the industry led to a body of research investigating its impact and implications on loan availability, bank performance, and economic growth (see, e.g., Berger et al., 1999; Clark, 1996; Garmaise & Moskowitz, 2006). Strahan (2003) argued that interstate banking deregulation meant increased competition in the entire banking industry. From the bank customers' perspectives, deregulation meant better access to credit and finance, especially for small, privately held businesses (Berger, Saunders, Scalise, & Udell, 1998). Berger et al. (1999) showed that the deregulation results in major changes in the efficiency, profitability, and lending portfolios of banking organizations. Interstate banking deregulation contributed to the openness of the takeover market in bank industry (Black & Strahan, 2002). In fact, Jayaratne and Strahan (1996) revealed that large banking organizations created from bank consolidation in the post deregulatory environment are able to exploit economy of scales and achieve cost reduction. Kerr and Nanda (2009) found that banking reforms promoted entrepreneurship, whereas Beck, Levine, and Levkov (2010) concluded that branching deregulation can tighten the income gap. From a broader perspective, Strahan (2003) reported that banking deregulation led to substantial and beneficial real effects on the economy. Recently, Chava, Oettl, Subramanian, and Subramanian (2013) reported that interstate banking deregulation caused decrease in the local market power of banks and subsequently increased the level and risk of innovation by young and private firms.

The repeal of Glass-Steagall Act, i.e. the deregulation of product diversification constraints, generated numerous studies analyzing the possible benefits of separating traditional lending and the previously prohibited investment activities. The argument that dominated the literature was that securities underwritten by banks might be riskier because of conflicts of interest between the lending and underwriting businesses. On the other hand, securities underwritten by banks could be relatively safer as commercial banks might be better informed on their borrowers or simply have better credit screening abilities than investment banks, and thus can provide a more credible certification of credit risk. Puri (1994) reported that when banks' affiliates underwrite corporate securities then there is a lower probability of default. Gande et al. (1999) argued that securities underwritten by commercial banks performed better. Saunders and Stover (2004) found that when the same bank acts as underwriter and credit guarantor, interest rate spreads to the issuers are lower than average. Focarelli, Marques-Ibanez, and Pozzolo (2011) reported evidence on the impact of banks' business models on credit screening of corporate bonds underwritten by investment banks and commercial banks, finding that debt issues underwritten by commercial banks had a higher probability of default than those underwritten by investment banks. They claim that it is plausible that the repeal of the Glass-Steagall led to looser credit screening by newly universal banks, eager to gain market share. They also add that such findings could be due to increased competition without being prepared with intensive supervisory scrutiny. On the risk perspectives, it is Geyfman and Yeager (2009) who reported that the passage of Graham-Leach-Bliley Act (repeal of Glass-Steagall Act) caused universal banks to have higher total and unsystematic risk but no change in systematic risk.

Increased competition from deregulation can imply that a bank will need to make extra effort to stay as profitable as its pre-deregulation state. In making the extra effort, the central motivation for deregulation is that the banks will serve their customers more efficiently and effectively. However, one implication of higher effort to cope with increased competition can be that the bank's risk taking experiences an up-thrust. Brewer et al. (2004) find that in response to the deregulations of the 1990s in the US, banking organizations have shifted their investment mix, where these mix changes have affected firms' risk. Salas and Saurina (2003) and Jiménez et al. (2010) make similar observations for Europe, specifically from their study of Spanish banks. Salas and Saurina (2003) find that the regulatory changes

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