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The Effects of Bank Regulation Stringency on Seasoned Equity Offering Announcements

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Abstract

We study the relation between bank regulation stringency and announcement effects of seasoned equity offerings across 21 countries. Under a low to moderate bank regulation environment, the market reacts more positively to the bank SEO announcements for an increase in the level of bank regulation. However, the bank SEO announcement effects become more negative if the bank regulation becomes too stringent. This inverted U-shaped relation is robust after we use the exogenous cross-country and cross-year variation in the timing of the Basel II adoption as an instrument to assess the causal impact of bank regulation on SEO announcement effects. Bank regulation has no significant impact of SEO announcement effects if the equity offering is involuntary.

JEL codes: G21; G18; G01; G14;

Keywords: bank regulation, seasoned equity offerings, moral hazard, involuntary issuance

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1 Introduction

The issue of bank capital and its regulation has received renewed attention in the aftermath of the Global Financial Crisis (GFC). [2] This event led to calls for an increase in bank regulation across the world. However, studies have highlighted that stringent bank regulation can have ambiguous effects on bank performance and risk-takings (Hellman, Murdock, and Stiglitz, 2000). In this paper, we provide new evidence of the impact of bank regulation on banks by examining the stringency of cross-country bank regulation on bank Seasoned Equity Offerings (SEOs) announcement effects. This issue is important because SEO announcement effects are a substantial portion of SEO flotation costs (Eckbo, Masulis and Norli, 2007).

Markets in general respond negatively to firm seasoned equity offering (SEO) announcements because the issuance is interpreted as an overvaluation signal by the market (Myers and Majluf, 1984). Commercial bank SEO announcements may also convey such an overvaluation signal. However, such an announcement can also mean that banks issue equity to maintain capital standards. In this case, the issuance should not contain any information about the prospects for the bank. Hence, markets may respond to the bank SEO announcements less sensitively, because their issuances contain information that can be interpreted in different ways. This argument is supported by empirical evidence (Poloncheck, Slovin, and Shuska, 1989; Wansley and Dhillon, 1989; Li, Liu, Siganos, and Zhou, 2016) that announcement effects of SEOs by commercial banks or bank holding companies are less negative than those found for industrial firms. However, there is potentially conflicting views on the impact of bank regulation environment on the extent of such overvaluation signal.

Prudential capital regulation forces banks to hold more capital at risk and hence reduces the moral hazard of excessive risk taking by internalizing the inefficiency of gambling (Gorton and Huang, 2004 and Dam and Koetter, 2012) (*capital at risk effect*). The reduced moral hazard may lead to lower information asymmetry between bank and investors. Other types of regulation that directly monitor bank behavior, such as activity restrictions, entry barriers, and deposit insurer power, may also induce truthful revelation by banks (Baron and Besanko, 1984). This revelation

[2] We use the terms bank, commercial bank, and bank holding companies interchangeably throughout the paper. Investment banks are not considered in this study.

of private information by banks may help investors to better understand the banks and reduce the information asymmetry between issuers and outside investors. Based on the news of equity offerings, investors are likely to less heavily discount their valuation of a bank operating in more regulated banking markets to consider the smaller agency problems and adverse selection risk that investing in such a bank entails. Hence, we should observe a positive relation between bank regulation and bank SEO announcements.

However, Hellman, Murdock, and Stiglitz (2000) provide a competing view that excessive bank regulation increases the moral hazard problem (*franchise value effect*). They reason that bank profits are reduced under capital regulation.[3] These reduced profits imply lower franchise values, and hence lower incentives for banks to make good quality loans. Thus, if investors find that the existing regulation induces a net moral hazard problem, the market reaction to the SEO announcements would be more adverse for banks operating in more regulated environments compared to those in less regulated environments.

In view of the conflicting perspectives noted above, this paper provides direct evidence of the impact of bank regulation on bank SEO announcement effects using global data on bank SEOs announcements from 1982 to 2012. Following Laeven and Levine (2009) we consider five aspects of bank regulation adopted from Barth, Caprio, and Levine (2004). The first four aspects are activity restriction, initial capital stringency, deposit insurer power, and prompt corrective action. We use factor analysis to collapse these four regulation measures into a single regulation measure – total regulation. The bank SEO announcement effect is measured by the cumulative abnormal return (CAR) over the three-day event window around the announcement date.

Our results show that when the stringency of bank regulation is below a certain threshold, a result like the *capital at risk effect* holds: the bank SEO announcement effects are more positive in a more regulated banking market because of reduced information asymmetry between banks and investors. As the stringency of bank regulation crosses certain thresholds, a result like the *franchise value effect* holds: the bank SEO announcement effects are more negative in a more regulated banking market because reduced bank franchise value leads to higher moral hazard and

[3] The reduction in profits is partly caused by increased competition, as argued by Hellman et al. (2000). It may also be caused by the "underinvesting" of banks in loans with positive net present values (Stanton, 1998).

information asymmetry.[4] We thus find an inverted U-shaped relation between the stringency of bank regulation and bank SEO announcement effects. This finding is consistent with the model of Calem and Rob (1999) that suggests a U-shaped relation between bank capital and risk taking. In this relation, undercapitalized banks first take less risk when the bank capital increases and then take more risk when the bank capital continues to increase beyond a certain threshold. Their findings reconcile the two opposite strands of the literature that find that on one hand bank risk-taking declines with an increase in capital and, on the other hand, bank risk-taking rises with an increase in capital.[5]

We identify the causal impact of bank regulation on SEO announcement effects. Bank regulation tends to be strengthened from various aspects after the adoption of Basel II, which varies across country and time. Hence, our identification strategy uses the exogenous country-time variation in the dynamic process of the Basel II adoption as the instrument for bank regulation stringency.

We also consider the impact of involuntary equity issuance on the relation between bank regulation stringency and SEO announcement effects. Previous research suggests that moral hazard exists mainly in under-capitalized banks that take excessive risks to exploit the risk-shifting benefits of deposit insurance. Well-capitalized banks take more risks because they are remote from insolvency (Calem and Rob, 1999) or because of factors exogenous to the portfolio decisions, such as managerial incompetence or a lack of lending opportunities (Gorton and Rosen, 1996). Hence, the relation between bank capital regulation and bank SEO announcement effects may be different between under-capitalized (involuntary) and well-capitalized (voluntary) bank issuance (Gorton and Rosen, 1996). We include an indicator for involuntary issues as well as the interaction of this indicator with both the linear and the quadratic terms of initial capital stringency. We find that the stringency of the regulation on the source of funds that can be counted as regulatory capital does not have any impact on the announcement effects of *involuntary* issuances. These results are consistent with the finding of Cornett and Tehranian (1994) that the issuance of equity required

[4] We do not argue that there is an optimal level of regulation determined by the threshold where the impact of bank regulation on bank SEO announcement effects switches. The optimal level of bank regulation is determined by factors that are beyond the scope of this study.

[5] See, for example, Furlong and Keeley (1989) and Keeley (1990) for arguments in favour of a decline in bank risk-taking with a capital increase; Koehn and Santomero (1980) for arguments that bank risk-taking rises with an increase in capital. Williams (2014) finds a U-shaped relation between bank risk and bank capital.

maintaining capital standards (involuntary issuance) does not convey any signal of the prospects of the firm.

Our results are consistent with the previous literature in that stringent bank regulation may have ambiguous effects on bank performance and risk taking. Blum (1999) suggests that over-regulation has two effects on banks. First, it lowers bank profits, and the banks have less to lose in the event of a bankruptcy. Therefore, banks are likely to increase risks. Second, under a binding regulation environment, equity is more valuable to the bank. However, because equity issuance is expensive or even impossible for some banks, the only way for a bank to increase equity is to increase risk. Using a comprehensive database on bank regulation and supervision across 107 countries, Barth et al. (2004) find a negative relation between various regulation and supervision measures, bank development, performance, and stability. Their findings raise a red flag regarding extensive bank regulation and supervisory practices that involve direct government oversight of and restrictions on banks.

Our findings are also consistent with the "tollbooth hypothesis" of Djankov, La Porta, Lopez-de-Silanes, and Shleifer (2002), which states that regulation is pursued for the benefit of politicians and bureaucrats. In addition, the cross-country differences in banking regulations encourage the flow of bank capital from highly regulated banking markets to those less regulated, a phenomenon also referred to as the "race to the bottom" (Barth, Caprio, and Levine, 2006; Houston, Lin, and Ma, 2012). Hence, the existence of regulation differences across countries may limit the banks in more regulated banking markets to explore their economic opportunities. This evidence is consistent with the notion that a stringent regulation only positively impacts bank performance if the benefits of higher standards exceed the costs, including both the direct compliance costs and the indirect negative costs due to increased risk taking or regulation arbitrage.

The remainder of this paper is organized as follows. Section 2 describes the data set and methodology. Section 3 presents our empirical results of the inverted U-shaped relation between bank regulation and SEO announcement effects. Section 4 concludes.

2 Data and variables

2.1 Data sources and sample selection

We select data from the Bank Regulation and Supervision Survey (BRSS) (2001, 2003, 2007, 2011) database of the World Bank. These four world-wide surveys on bank regulation are conducted by Barth et al. (2004, 2006, 2008, 2012).[6] This comprehensive survey-database is compiled from answers provided by official regulatory and supervisory authorities and includes various measures on bank regulation.

We collect global SEOs made by commercial banks (SIC codes 6000 to 6199) from Securities Data Company's (SDC) Platinum's Global New Issues database. We collect the full sample of global common stock offerings during the sample period from January 1, 1982, to December 31, 2012, excluding initial public offerings, units, rights, and mutual conversions.[7] We match the bank-level information with the bank regulation measures to explore the link between bank regulation and the wealth effects associated with the announcements of bank-issued SEOs. Following Barth, Lin, Ma, Seade, and Song (2013), the values of the regulatory variables for the year 2001 are taken from the first survey for 2001; the values of the regulatory variables for the 2002-2004 period are taken from the second survey for 2003; the values of regulatory variables for the 2005-2008 period are taken from the survey for 2007; and the regulatory measures for the 2008-2012 period are taken from the fourth survey for 2011.[8] We then merge the bank regulation data with the stock price and accounting data from Datastream.

The banks included in our sample are chosen based on data availability: 1) we only include the countries with index price data in Datastream; 2) we exclude New Zealand because all its major banks are subsidiaries of Australian banks and these are already included in the sample; 3) we exclude those countries with less than 10 SEOs during the entire sample period to allow for a meaningful sample of banks to represent each country. Our sample finally consists of 1,307 SEOs from 21 countries over the sample period of 2001-2012.

2.2 Bank regulation variables

[6] The first three surveys capture information as of 1999, 2001, and 2005, respectively. The 2012 survey covers the period from 2008 to 2010.

[7] We do not consider the issuance of Contingent Convertible bonds (CoCos) in our analysis because these hybrid capital securities are different from equity in nature, although they may be treated as tier 2 bank capital.

[8] We also attempt alternative methods for assigning values, such as moving all the thresholds one year before or one year after, and find that the results are robust. These results are available upon request from the authors.

We consider four aspects or measures of bank regulation adopted by the BRSS. First, *Activity Restriction* is an indicator of the degree to which national regulatory authorities allow banks to engage in three fee-based activities, i.e., securities market activities (e.g., underwriting, brokering, dealing, and all aspects of the mutual fund industry), insurance (e.g., insurance underwriting and selling), and real estate businesses (e.g., real estate investment, development, and management). Second, *Initial Capital Stringency* measures whether the source of funds that count as regulatory capital may include assets other than cash or government securities or borrowed funds and whether the regulatory/supervisory authorities verify the sources of capital. Third, *Deposit Insurer Power* is an index of deposit insurer power to measure each country's deposit insurance regime and to trace its evolution from 1999 to 2011. It measures the extent to which the regulator has the authority to make the decision to intervene in a bank and take legal action against bank directors or officials and whether it has ever taken any legal action against bank directors or officers. Fourth, *Prompt Corrective Action* measures the extent to which the law establishes pre-determined levels of bank solvency deterioration that force automatic enforcement actions, such as intervention, and the extent to which supervisors have the requisite, suitable powers to do so.

Finally, we collapse these four regulation measures into a single measure of bank regulation – *Total Regulation* – by using factor analysis. Higher values of all the five regulation measures indicate more stringency. We estimate the following equation:

$$Y_{i,s,t} = \beta_i Regulation_{i,s,t} + \varepsilon_{i,s,t} \quad (1)$$

where the subscripts i, s, and t correspond to respectively the country, the four regulation measures (*Activity Restriction, Initial Capital Stringency, Deposit Insurer Power,* and *Prompt Corrective Action*), and years, respectively. The left-hand-side variables ($Y_{i,s,t}$) are the four regulation measures, all of which are stacked into a single factor, whereas *Regulation* is not observed and is estimated along with the factor loadings β. We follow the standard practice of normalizing proxy measures included on the left-hand side to have a mean of zero and a variance of one before we conduct the factor analysis. The estimation of Equation (1) generates predicted values for both a set of factors ($Regulation_{ist}$) and a set of factor loadings, β_i. We focus on the single factor that has the greatest explanatory power. It turns out that our data are well described by a one-factor

model that captures approximately 55% of the variation in the four regulation measures. We take this factor with the greatest explanatory power as our measure of total regulation.[9,10]

2.3 CAR and control variables

We use the 3-day event window (day -1 to day +1) to measure the cumulative abnormal return (*CAR*) associated with the SEO announcements using the ordinary least squares (OLS) market model regression (Brown and Warner, 1985) with an estimation window of (day -250 to day -10). We estimate CARs using national stock market indexes. The announcement day reported by SDC is denoted as day 0, one day before this date is denoted as day -1, and the day after is day +1.[11] A 240-day (day -250 to day -10) period for each observation is used for the estimation of the abnormal returns.

We include bank-specific, market-specific, and country-specific variables in our analysis of SEO announcement stock returns. *Ln*(*TA)* is the natural logarithm of total assets, which measures the size of the bank. Previous studies (for example, Kang and Stulz, 1996) suggest that larger firms are likely to have a lower level of information asymmetry and may be associated with less negative announcement effects. The capital level of the bank is measured as the ratio of *Equity/Total Assets*. Firms with a lower capital level are considered riskier, facing higher expected costs of financial distress, and hence more negative announcement effects. *Diversification* is a control variable for the level of bank diversification and is measured as non-interest income divided by total operating income. In previous studies, bank diversification is assumed to have a conflicting impact on bank risk-taking (Stiroh, 2004, and Beck, Demirguc-Kunt, and Levine, 2006), which may have implications for the bank's moral hazard and the SEO announcement effects.

Market run-up is the cumulative stock return over the window (-60,-2) relative to the announcement date. It measures the overall market and economic conditions, as well as the growth

[9] The detailed definitions and the calculation of the regulation variables are described in Appendix 1.
[10] Barth et al. (2004) also consider a capital stringency index that measures the extent of regulatory requirements about the amount of capital that banks must hold. However, most of our sample countries have adopted the Basel II/III regulation, and the capital requirements do not vary significantly between countries. In addition, banks generally hold more capital voluntarily than the required level, and the changes in capital regulation do not affect the capital structures of banks (Allen, Carletti, and Marquez, 2011). For that reason, we do not consider the capital stringency index in our empirical analysis.
[11] We use the filing date reported by the SDC as the announcement date. If the filing date is not available, then we use the issue date instead.

expectations, during the period leading up to the security offer (see, for example, Korajczyk and Levy, 2003, and Lowry, 2003). Choe, Masulis, and Nanda (1993) argue that investor reactions are typically less negative following the increases in stock market prices due to the lower costs of external equity financing during market expansions. Therefore, investors react less negatively in good economic conditions. *Stock Run-up* is the cumulative stock return over the window (-60,-2) relative to the announcement date. Lucas and McDonald (1990) argue that after a period of positive abnormal returns, overvalued firms have incentives to issue equity directly, which may be associated with a more negative announcement effect. *Stock Volatility* is the annualized stock return volatility that measures the firm's riskiness calculated from daily returns over the day interval from day -250 to day -10 relative to the equity announcement date. Several previous studies assume that firms with a higher stock volatility face higher costs of attracting new debt financing (see, for example, Lewis, Rogalski, and Seward, 1999, 2003), and hence more negative announcement effects.

Finally, we control for a group of country-specific variables: *inflation*, the *KKZ-index* (an index of institutional development), *Economic Freedom*, and *GDP Growth*. The *KKZ-index* is from Kaufmann, Kraay, and Mastruzzi (2008). A higher value of the *KKZ-index* indicates a more advanced level of institutional development. *Economic Freedom* is derived from the Heritage Foundation and is the average value of an index of economic freedom (freedom from government interference afforded to businesses and individuals) for the 2001-2012 period. It measures the extent of how much freedom individuals and firms can obtain from their governments to conduct their business. *GDP Growth* is the annual growth rate of the country's GDP. A nation with higher *GDP Growth* is more likely to have efficient domestic financial systems (Sturm and Williams, 2008). We expect that the bank SEO announcement effect is associated with lower inflation, higher GDP growth, better institutional development, and more economic freedom. We scale all the regulation measures so that they are bounded between 0 and 1.

2.4 Descriptive statistics

Table 1 shows the characteristics of the regulatory restrictions across countries.

[Please Insert Table 1 here]

We observe a wide variation in all aspects of our regulation measures of *Activity Restriction*, *Initial Capital Stringency*, *Deposit Insurer Power*, *Prompt Corrective Action*, and *Total Regulation*. Each number of these indices measure the extent to which banks are regulated, with 1 being extremely stringent and 0 being no restrictions. These numbers are on an ordinal scale, so they do not have economic meanings by themselves. In order to interpret the numbers, it is necessary to compare numbers between countries with different values. For example, *Activity Restriction* varies from a low of 0.13 in Germany and 0.14 in Thailand to a high of 0.75 in China. These results indicate that China forbids banks from engaging in most non-banking activities, such as securities, insurance, and real estate activities. Germany and Thailand, on the other hand, have relatively low restrictions for banks that want to participate in these markets. The UK has the highest value of *Initial Capital Stringency* (1.00). We find that on average, developing countries have lower *Deposit Insurer Power*. The average value for *Deposit Insurer Power* in Brazil, China, and India are all zero, which indicates that in these countries, the regulators do not have much authority to make the decision to intervene in a bank and take legal action against bank directors or officials.[12] Indonesia has the greatest supervisory power with the highest *Prompt Corrective Action* level (1.00), indicating the greatest power to force automatic enforcement actions when the level of bank solvency deterioration is reached.

Table 2 provides the summary statistics for the key variables for the sample.

[Please Insert Table 2 here]

We observe a wide variation of the characteristics of the regulatory restrictions across countries in all aspects of our regulation measures of *Activity Restriction*, *Initial Capital Stringency*, *Deposit Insurer Power*, *Prompt Corrective Action*, and *Total Regulation*. We find that on average *Activity Restriction* is 0.45, which indicates that most of the banks have limited ability to engage in the businesses of securities underwriting, insurance, and real estate and of the regulatory restrictiveness of banks to own shares in non-financial firms. Banks on average have an *Initial Capital Stringency* measure of 0.72, indicating that most banks can include funds other than cash, government securities, and borrowed funds as regulatory capital. We find that on average *Deposit Insurer Power* is 0.41, which indicates that most countries have limited power to intervene in

[12] Low deposit insurer power is not only limited to developing countries: Greece and Austria also score low on deposit insurer power (all have scores of 0.01 or 0).

banks during the sample period. On average the supervisory power is high since the *Prompt Corrective Action* level is at 0.83. This result indicates that most countries have the power to force automatic enforcement actions when the level of bank solvency deterioration is reached.

The *Total Assets* of the banks in our sample range from $0.04 billion to $3.06 trillion, with the average total assets being $197 billion. The capital level is measured as *Equity/Total Assets*. The results for this variable show that, on average, banks hold a ratio of 7.27% equity to their total assets. The *Diversification* variable shows that, on average, 32.16% of the total operating income of the banks in our sample is from non-interest income, with the minimum and maximum being 6.93% and 71.85%, respectively. Bank SEOs announcements are, on average, preceded by a *Market Run-up* (4.00%) and individual *Stock Run-ups* (4.32%), indicating that banks tend to announce SEOs after a period of stock price appreciations. The *KKZ-index* ranges from -0.93 to 1.69, which indicates wide variations in institutional development across the sample countries. The *Economic Freedom* index also shows significant variations among sample countries from 51 to 90, with the mean value being 72.38.

To capture stock price reactions to bank SEOs announcement, we calculate cumulative abnormal returns (CARs) using different event windows. These results are included in Table 3.

[Please Insert Table 3 here]

The result for the event window (-1,+1) shows that banks on average experience a -0.74% CAR over the 3-day period surrounding the announcement. The median CAR over the same event window is -0.45%. Both the mean and the median are significant at the 1% significance level. As a robustness check, we also calculate CARs for different event windows. As seen in Table 3, all these CARs have means and medians that are negative and that are significantly different from zero at the 1% level.

3. Empirical results

3.1 Main regression analysis

We estimate five model specifications to assess the impact of bank regulation on bank SEO announcement effects. The results are presented in Table 4.

[Please Insert Table 4 here]

The dependent variable is the *CAR* over the 3-day interval between Days -1 and +1 around the announcement date. Columns (1) to (5) include our five regulation measures, i.e., *Activity Restriction*, *Initial Capital Stringency*, *Deposit Insurer Power*, *Prompt Corrective Action*, and *Total Regulation*, respectively.

More specifically, we estimate the following equation:

$$CAR_{b,c} = \delta * R_c + \Omega * R_c^2 + \alpha * X_{b,c} + \beta * Y_{b,c} + \gamma * Z_c + u_{b,c} \qquad (2)$$

where $CAR_{b,c}$ is the CAR of bank b in country c; R_c is a matrix of bank regulation variables; $X_{b,c}$ is a matrix of bank-level control variables, such as bank size, equity to assets ratio, and diversification; $Y_{b,c}$ is a matrix of issue-specific variables, such as market run-up, stock run-up, and stock volatility; Z_c is a matrix of country-level control variables, including inflation, KKZ-index, Economic freedom, and GDP growth; $u_{b,c}$ is the error term; and δ, Ω, α, β, and γ are vectors of the coefficient estimates. We include the square terms of the bank regulation variables to examine the possible non-linear relation between bank regulation and SEO announcement effects. We include year fixed effects in all regressions to control for other plausible time-invariant characteristics that may affect stock price reactions to the SEO announcements. We cannot use bank fixed-effects because there is limited cross sectional variations in the time period studied.[13]

The overall results presented in Table 4 imply a curvilinear, non-monotonic relation between these regulation measures and the *CARs* over the (-1, +1) window associated with bank SEO announcements.[14] The results highlight the importance of the level of bank regulation on CARs. We find a positive and significant coefficient for *Initial Capital Stringency*, *Deposit Insurer Power*, *Prompt Corrective Action*, and *Total Regulation* and a negative and significant coefficient for their respective quadratic terms. These results suggest that there is an inverted U-shaped relation between the stringency of bank regulation and bank SEO announcement effects. Under a low to moderate bank regulation environment, the market perceives that more regulation facilitates the taking of less risk and the reduction in the moral hazard of banks. Hence, the market reacts

[13] We also don't use country fixed effects because they essentially remove country variations.
[14] We also try a specification with only linear terms of bank regulation variables and find no significant results. To save space, we do not report these results in the paper but they are available upon request.

more positively to the bank SEO announcements compared to a less regulated market. However, if bank regulation becomes too stringent and increases beyond a certain level, investors are likely to become concerned that the too stringent regulation reduces the franchise value of the banks and that this regulation will induce more risk-taking, and hence a net moral hazard, by the banks. Thus, the market may react more negatively to the bank SEO announcement in more regulated markets.

We calculate the inflection point of the quadratic function and compare it with the distribution of the data. In Column (2), the inflection point is 0.63. The CAR initially increases and reaches the maximum value as *Initial Capital Stringency* reaches 0.63, and then it declines as *Initial Capital Stringency* reaches 1. The inflection points for *Deposit Insurer Power*, *Prompt Corrective Action*, and *Total Regulation* are 0.51, 0.44, and 0.60, respectively, which are 51%, 44% and 60% of the distribution of the measures.

The only regulation variable for which we do not find significant results is *Activity Restriction*. Barth et al. (2004) suggest that restricting bank activities is associated with an increase in the likelihood of suffering a major crisis because broad banking power allows a bank to diversify income sources and enhance stability. However, broad financial activities may also intensify moral hazard problems and provide more opportunities for banks to increase risk taking (Boyd, Chang, and Smith, 1998). Moreover, broad activities may lead to the formation of extremely large and complex entities that are extraordinarily difficult to monitor and that are "too big to discipline" (Laeven and Levine, 2007). Thus, banks with broader activities are more likely to experience a more negative announcement effect upon equity issuance because investors may perceive these banks to be too complex and opaque. Therefore, investors may have less confidence in equity issuance by these banks. Our finding of insignificant coefficients for *Activity Restriction* may be the result of these two canceling effects of bank diversification on bank performance.[15]

To a large extent, the signs and significance levels of the control variables are in line with our expectations. For example, bank size, measured as *Ln(TA)*, is a significant determinant of the SEO announcement effect, where SEOs by large banks are more likely to be associated with higher CARs. This result is consistent with Abhyankar and Dunning (1999), who find that larger banks are more efficient and have less information asymmetry problems. We observe that *Market Run-*

[15] This result is also consistent with the non-significant results of *diversification* as a control variable in the regression model.

up tends to be positively associated with the bank SEO announcement effect. This finding is consistent with Choe et al. (1993), who find that investor reaction is less negative following increases in stock market prices. We also observe that *GDP Growth* is positively associated with the bank SEO announcement effect. This result is expected because, with higher GDP growth, banks may have more business opportunities and can sustain positions of abnormal profitability (Goddard, Liu, Molyneux, and Wilson, 2011).

We perform additional tests to verify the robustness of our results and present the results in Table 5.

[Please Insert Table 5 here]

First, we consider the predominance of the bank SEOs in the U.S. in our sample (49%) may bias our results and that the effect of the stock price reactions around bank SEOs is driven by the U.S. banks issued SEOs. We hence also use the sample without the U.S. data. Second, we consider the heterogeneity of the transparency environment across the sample countries that may distort our findings. We present the results of the stock price reactions around bank SEOs announcement using only the SEOs issued by banks in the OECD countries.[16] Finally, we examine the stock price reactions around bank SEO announcement using the sample without rights offerings and secondary offerings. Both offerings are for existing shareholders only and may have a different stock market reaction around the announcement date compared to ordinary seasoned equity offerings. We focus on *Initial Capital Stringency*, *Deposit Insurer Power*, *Prompt Corrective Action,* which are found significant in the main regression analysis. Overall, our main findings continue to hold when using these three robustness checks. We still find that there is still an inverted U-shaped relation between the stringency of bank regulation and bank SEO announcement effects.

3.2 Instrumental variable analysis

The above-mentioned results demonstrate that bank SEO announcement effects are strongly associated with the stringency of bank regulation across countries. While we argue that these results are consistent across specifications, endogeneity remains a possibility. The reverse

[16] There are 13 OECD countries in our sample, i.e. Australia, Austria, Canada, Chile, France, Germany, Greece, Italy, Japan, Portugal, Spain, UK, and USA.

causality is probably not a serious concern in our regression analysis because SEO announcement effects are not likely to impact on bank regulation. However, simultaneity may exist; for example, the observed inverted U-shaped relation between our bank regulation measures and the SEO announcement effects may be driven by some unknown factors that have an impact on both bank regulation and the bank SEO announcement effects. We exploit the variations in the country-specific process of the adoption of the Basel II framework to identify exogenous changes in bank regulation. The Basel II accord adopts a "three pillars" concept. The first pillar addresses the maintenance of regulatory capital, calculated for three major components of risk that a bank faces: credit, operational, and market risk. The second pillar is supervisory review, giving regulators more tools to supervise banks from different aspects. The third pillar is the development of a set of disclosure requirements that allow the market participants to gauge the capital adequacy of a bank. Bank regulation tends to be strengthened from different aspects after the adoption of Basel II and varies across countries and over time. For example, Austria adopted Basel II in 2005, whereas Malaysia adopted it only in 2010. Consequently, we use the exogenous cross-country and cross-year variation in the timing of the Basel II adoption as the instrument to measure bank regulation stringency to assess the causal impact of bank regulation on SEO announcement effects. We define the *Basel II* dummy that equals 1 for the time after the country adopted Basel II and 0 otherwise. We use a two-stage least squares model (2SLS) to conduct the analysis and the results are presented in Table 6.

[Please Insert Table 6 here]

Panel A of Table 6 presents the first stage results of the two-stage least squares regressions. We find that the coefficients of *Basel II* are significantly positive for *Activity Restriction, Initial Capital Stringency*, *Prompt Corrective Action*, *Deposit Insurer Power*, and *Total Regulation*. These results indicate that bank regulation became more stringent after the adoption of *Basel II* by the respective countries.

Panel B of Table 6 presents the second stage results of the two-stage least squares regressions. We find that the coefficients of the linear terms of *Initial Capital Stringency*, *Prompt Corrective Action*, and *Total Regulation* are positive and significant. Also, the squared terms of these bank regulation measures are significantly negative. These findings confirm our main

findings that the relation between bank regulation and bank SEO announcement effects is an inverted U shaped non-linear relation.

3.3 Involuntary equity issuance

In this section, we consider the impact of involuntary equity issuance on the relation between the bank SEO announcement effects and the stringency level of bank regulation. Due to bank capital regulation, particularly after the implementation of the Basel Accord, banks are sometimes forced to involuntarily issue stock to meet government capital requirements. Besanko and Kanatas (1996) argue that forcing undercapitalized banks to issue equity to meet government requirements reduces the expected surplus available to bank "insider" shareholders, who therefore provide less effort to monitor loan repayments. Hence, the reduction in insider effort reduces the equity value of the bank. For the 1975-1986 period, Keeley (1989) documents a more negative announcement effect for involuntary bank stock issues compared to voluntary issues. He proposes three explanations for this finding: the reduction of the value of the deposit insurance guarantee, the distortion of the capital structure optimum, and the conveyance of unfavorable information about the firm.

However, Cornett and Tehranian (1994) argue that, for Keeley's sample, the regulator has the discretion to force involuntary bank stock issuance. Therefore, such an issue may convey inside information about the issuing bank. Cornett and Tehranian (1994) instead classify equity issues by "undercapitalized" banks with total capital ratios below 7% as involuntary issues. They find that these voluntary stock issuances have significantly lower negative abnormal stock returns than involuntary stock issues. This finding confirms their hypothesis that the issuance of equity, required to maintain capital standards, does not convey any signal about the prospects of the firm. Cornett, Mehran, and Tehranian (1998) find that banks that voluntarily (but not involuntarily) issue common stock experience a significant drop in the matched adjusted operating performance in the benchmark firm's adjusted stock prices following the issue. They also find that there is a negative stock market reaction to post-issue quarterly earnings announcements. These results confirm that banks with the discretion to issue equity do so when they are overvalued.

Using an extended data set from 1983 to 2005 that covers more recent bank regulation changes, particularly the Federal Deposit Insurance Corporation Improvement Act (FDICIA) in

1991, Krishnan, Ergungor, Lauz, Singh, and Zebedee (2010) find that both undercapitalized and well-capitalized banks have significantly negative mean abnormal returns around SEO announcements. This result indicates that investors do not perceive these two types of banks to be economically different. Therefore, the theories and empirical evidence on the relation between involuntary and voluntary bank SEO announcement effects are not conclusive.

Calem and Rob (1999) suggest that although banks engage in more risk-taking when capital levels are very low or very high (hence, a U-shaped relation between bank capital and risk-taking), the incentives behind the risk-taking are different. Undercapitalized banks take more risks to exploit the risk-shifting benefits of deposit insurance. Hence, they reflect moral hazard problems. However, well-capitalized banks take more risks because they are remote from insolvency. Gorton and Rosen (1996) also argue that well-capitalized banks take excessive risks due to factors exogenous to portfolio decisions, such as managerial incompetence or a lack of lending opportunities. Therefore, the relation between bank regulation and the bank SEO announcement effects may be different between under-capitalized (involuntary) and well-capitalized (voluntary) bank issuance.

We conduct two empirical tests to investigate this relation. First, we classify bank voluntary and involuntary SEOs based on the capital requirements of their own countries. We define a dummy variable, *involuntary*, that takes a value of one if the bank SEO is issued when either of the following ratios is less than the government requirement: the bank's equity-to-assets ratio, the Tier 1 capital ratio, or the total capital ratio. Otherwise, the value of the dummy variable is zero. We include this dummy variable in our main regression to examine whether involuntary bank SEOs have higher or lower announcement effects than their voluntary counterparts. Second, we include the interaction terms between the *Involuntary* dummy and both the linear and the quadratic terms of the *Initial Capital Stringency* variable. These are included in our main regression to examine whether the previously found inverted U-shaped relation between bank capital regulation and bank SEO announcement effects is different between voluntary and involuntary issues. We do not consider the other four regulation measures because voluntary/involuntary issuance is mainly related to bank capital regulation. Table 7 presents the results.

[Please Insert Table 7 here]

In column (1) we find that involuntary SEOs do not have lower CARs than voluntary SEOs. This result is inconsistent with Besanko and Kanatas (1996) and Keely (1989) that involuntary SEOs contain negative information about the bank and may decrease the bank's equity value. In Column (2), we find that the coefficients for *Initial Capital Stringency* and the interaction of *Involuntary* and *Initial Capital Stringency* are both significant and at a similar level in magnitude, but have opposite signs. When we sum the coefficients of *Initial Capital Stringency* and the interaction of *Involuntary* and *Initial Capital Stringency* to examine the impact of initial capital stringency on involuntary bank SEO announcement effects, the outcome is close to zero and is not significantly different from zero.[17] We also find a similar pattern for the coefficients of *Initial Capital Stringency Squared* and its interaction term with *Involuntary.* When we sum the coefficients of *Initial Capital Stringency square* and its interaction term with *Involuntary*, the outcome is close to zero and is not significantly different from zero.[18] These results indicate that bank capital regulation has no significant impact on the announcement effects of *Involuntary* bank SEOs.

4. Conclusions

The GFC has spurred renewed interest in assessing appropriate regulatory reforms. However, how the level of the stringency of bank regulation may impact the announcement effect on equity issuance announcements remains a question. Building on a recent world-wide survey, we examine the effects on bank regulation and the SEO announcement effects.

We find that bank regulation has a nonlinear relation with bank-issued SEO announcement effects. More specifically, we find an inverted U-shaped relation with the SEO announcement effect. This effect increases as the level of bank regulation increases and then decreases as the level of bank regulation continues to increase. Regarding bank regulation, we find that higher initial capital stringency, prompt corrective action, deposit insurer power, and total regulation particularly exert a positive impact on the SEO announcement effect initially but that the impact

[17] The F-test statistics is 0.53, with the p-value being 0.47
[18] The F-test statistics is 0.48, with the p-value being 0.49.

becomes negative when these regulations rise too high. The results imply that bank regulation may play a dual role in affecting the stock price reaction to SEO announcements.

We use the different timings of the adoption of the Basel II framework by different countries as a source of exogenous variation to address the endogeneity concern in our regressions. Our main findings hold. We further find that involuntary bank SEOs are associated with more negative SEO announcement effects than their voluntary counterparts and that the stringency of the regulation on the source of funds that can be counted as regulatory capital do not have any further impact on the announcement effects of these involuntary issuances.

Our paper has timely implications for the current debate over bank regulation after the GFC. The GFC has highlighted the importance of adequate bank regulation and supervision. The passage of the Dodd-Frank Wall Street Reform and the Consumer Protection Act in the United States in 2010 triggered an extensive debate on the effect of tighter bank regulation. Whereas regulators perceive that strengthened bank regulation may promote a more resilient banking sector (Furlong and Keeley, 1989; Demirguc-Kunt, Detragiache, and Tressel, 2008; and Repullo and Suarez, 2013), practitioners, and others cast doubt, noting that the cost of financial regulation may outweigh the benefits (Furlong and Kwan, 2000). Calem and Rob (1999) find a U-shaped relation between capital regulation and risk taking: as a bank's capital regulation increases, it initially takes less risk; but if the capital requirement is too high, then it may induce more risk taking by ex-ante well-capitalized banks that comply with the new standard.

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Table 1: Summary statistics for the regulation variables of equity issuers

This table includes the countries that are included in our study. Column N represents the number of SEOs by banks from this country in the sample period (January 2001 to December 2012). The remainder of the table reports the mean figures (in percentage form) of the regulation variables over the sample period for each country. A detailed description of the definitions of the variables is included in Appendix 1.

Country	obs	Activity restriction	Initial capital stringency	Depositor protection	Prompt corrective action	Total regulation
Australia	89	0.44	0.78	0.19	0.88	0.54
Austria	13	0.51	0.46	0.03	0.78	0.36
Brazil	11	0.70	0.64	0.00	0.86	0.48
Canada	19	0.52	0.82	0.79	0.47	0.82
Chile	11	0.51	0.33	0.61	0.95	0.56
China	8	0.75	0.00	0.00	0.83	0.22
France	13	0.38	0.67	0.54	0.51	0.63
Germany	46	0.13	0.57	0.07	0.56	0.32
Greece	43	0.46	0.88	0.01	0.64	0.52
Hong Kong	9	0.64	0.56	0.22	0.82	0.52
India	122	0.45	0.33	0.00	0.76	0.27
Indonesia	34	0.70	0.33	0.75	1.00	0.68
Israel	20	0.42	0.73	0.02	0.81	0.44
Italy	39	0.50	0.75	0.00	0.31	0.47
Japan	72	0.49	0.64	0.18	0.94	0.50
Malaysia	16	0.38	0.67	0.52	0.63	0.63
Portugal	17	0.37	0.69	0.06	0.76	0.43
Spain	22	0.46	0.45	0.61	0.58	0.59
Thailand	22	0.14	0.52	0.03	0.73	0.27
UK	15	0.39	1.00	0.02	0.35	0.55
USA	666	0.46	0.84	0.64	0.92	0.78
Mean		0.45	0.72	0.41	0.83	0.62
Min.		0.00	0.00	0.00	0.00	0.22
Max.		1.00	1.00	1.00	1.00	1.00
Std. dev.		0.16	0.25	0.44	0.21	0.27

Table 2 Summary statistics for the regulation, bank-specific and country-specific variables

This table provides the summary statistics for the control variables of the regulation, bank-specific and country-specific variables over the sample period of January 2001 to December 2012. The sample consists of 463 banks in 20 countries for a 4-period panel. The variables are defined as outlined in Appendix 1. Total assets are in billion U.S. dollars. N denotes the number of observations.

Variable	N	Mean	Std.dev	Median	Min.	Max.
Dependent variable						
CAR (-1, 1)	1307	-0.74	5.31	-0.45	-22.45	17.38
Regulation variables						
Activity Restriction	1307	0.45	0.16	0.44	0.00	1.00
Initial Capital Stringency	1307	0.72	0.25	0.67	0.00	1.00
Deposit Insurer Power	1307	0.41	0.44	0.33	0.00	1.00
Prompt Corrective Action	1307	0.83	0.21	0.83	0.00	1.00
Total Regulation	1307	1.00	0.44	0.93	0.35	1.61
Bank-specific variables						
Total Assets	1307	197	518.00	14.00	0.04	3060.00
Equity/Total Assets	1307	7.27	3.22	6.88	1.53	16.38
Diversification	1307	32.16	15.21	30.73	6.93	71.85
Market Run-up	1307	4.00	8.30	5.44	-21.54	22.21
Stock Run-up	1307	4.32	14.87	4.56	-33.28	42.81
Stock Return Volatility	1307	80.50	63.84	47.60	9.79	174.77
Country-specific variables						
Inflation	183	2.61	2.66	2.23	-6.01	18.15
KKZ-index	183	0.96	0.63	1.20	-0.93	1.69
Economic Freedom	183	72.38	9.87	78.00	51.00	90.00
GDP Growth	183	2.19	3.34	2.55	-7.10	14.20

Table 3 Cumulative abnormal return

This table provides the mean and median values of the cumulative abnormal return (CAR) for different event windows over the sample period from January 2001 to December 2012. CARs are estimated using the standard market model procedure with the time window (day -250, day -10) as the estimation window. Day 0 is the announcement date. N represents the number of observations. The *t*-statistics are used to assess whether the CARs are significantly different from zero. *** represents a 1% significance level using a two-tailed test.

Event window	Observations	Mean	Median
(-10,10)	1307	-0.79***	-0.68***
(-10,1)	1307	-1.22***	-0.84***
(-5,5)	1307	-0.71***	-0.60***
(-1,1)	1307	-0.74***	-0.45***
(-1,0)	1307	-0.67***	-0.32***
(-1,2)	1307	-1.02***	-0.71***
(-2,1)	1307	-0.96***	-0.52***
(0,1)	1307	-0.79***	-0.35***
(0,2)	1307	-0.55***	-0.54***

Table 4 Bank regulation and bank SEO announcement effect: OLS approach

This table presents the results of the regression analyses of stock price reactions around bank SEOs from 21 countries for the period from January 2001 to December 2012. The dependent variable is the cumulative abnormal return (CAR) measured over the window (-1, 1) relative to the announcement date, calculated using standard event study methodology with the estimation period from -250 days to -10 days. The t-statistics are computed as heteroskedasticity-robust standard errors clustered for banks and are presented in brackets. Detailed definitions of the variables can be found in Appendix 1. N denotes the number of observations. *, **, and *** represent statistical significance at the 10%, 5%, and 1% significance level, respectively.

	(1)	(2)	(3)	(4)	(5)
	Activity Restriction	Initial Capital Stringency	Deposit Insurer Power	Prompt Corrective Action	Total Regulation
Bank Regulation	0.711	9.195***	5.278*	3.376**	8.590**
	(1.180)	(2.826)	(1.707)	(2.245)	(2.404)
Bank Regulation Squared	-0.149	-7.260***	-5.209**	-3.847**	-7.133**
	(-1.000)	(-3.130)	(-2.230)	(-2.273)	(-2.459)
Ln(TA)	0.166**	0.155*	0.121	0.136*	0.144*
	(2.068)	(1.941)	(1.520)	(1.699)	(1.804)
Equity/Total Assets	0.042	0.038	0.043	0.041	0.036
	(1.135)	(1.017)	(1.144)	(1.135)	(0.978)
Diversification	0.005	0.003	0.004	0.004	0.004
	(0.439)	(0.272)	(0.353)	(0.286)	(0.319)
Market Run-up	-0.028*	-0.030*	-0.029*	-0.029*	-0.027*
	(-1.731)	(-1.870)	(-1.804)	(-1.800)	(-1.722)
Stock Run-up	0.055**	0.056**	0.053**	0.054**	0.050**
	(2.266)	(2.340)	(2.228)	(2.252)	(2.060)
Stock Return Volatility	-0.003	-0.002	-0.003	-0.002	-0.001
	(-1.092)	(-0.817)	(-0.900)	(-0.716)	(-0.487)
Inflation	0.052	0.037	0.035	0.033	0.014
	(0.744)	(0.575)	(0.539)	(0.497)	(0.209)
KKZ-index	-1.300**	-1.475**	-1.597***	-1.432**	-1.432**
	(-2.234)	(-2.512)	(-2.773)	(-2.484)	(-2.475)
Economic Freedom	0.083**	0.082**	0.103***	0.088**	0.089**
	(2.334)	(2.346)	(2.847)	(2.395)	(2.436)
GDP Growth	0.165**	0.177**	0.149*	0.155**	0.198**
	(2.149)	(2.260)	(1.886)	(2.029)	(2.528)
Constant	-9.244***	-10.751***	-9.613***	-8.301***	-10.677***
	(-3.650)	(-4.048)	(-3.831)	(-3.297)	(-4.092)
Time Fixed Effects	Yes	Yes	Yes	Yes	Yes
N	1307	1307	1307	1307	1307
adj. R-sq	0.030	0.035	0.034	0.032	0.033

Table 5 Robustness tests

This table presents the results of regression analyses of stock price reactions around bank SEOs using the sample without the U.S. data, the sample including only OECD countries, and the sample without right offerings and secondary issuances respectively. The dependent variable is the cumulative abnormal stock return (CAR) measured over the window (-1, 1) relative to the announcement date, calculated using standard event study methodology with the estimation period from -250 days to -10 days. *t*-statistics are computed by the heteroskedasticity-robust standard errors clustered for banks and are presented in brackets. Detailed definitions of variables can be found in Appendix 1. N denotes the number of observations. *, **, *** represent statistical significance at the 10%, 5%, and 1% significance level, respectively.

	Without US			OECD countries			Without rights and secondary offerings		
	Initial Capital Stringency	Prompt Corrective Action	Depositor Protection	Initial Capital Stringency	Prompt Corrective Action	Depositor Protection	Initial Capital Stringency	Prompt Corrective Action	Depositor Protection
Bank Regulation	4.227**	3.613***	0.075	9.394*	8.603***	4.057***	10.014***	9.701**	3.413*
	(2.208)	(3.894)	(0.033)	(1.875)	(2.643)	(2.589)	(2.583)	(2.206)	(1.802)
Bank Regulation Squared	-3.547**	-3.383***	-0.108	-7.666**	-9.900***	-5.298***	-7.797***	-8.822***	-4.878**
	(-2.382)	(-3.063)	(-0.039)	(-2.253)	(-3.668)	(-3.104)	(-2.900)	(-2.794)	(-2.311)
Ln(TA)	0.261**	0.215*	0.251**	0.221***	0.178**	0.220***	0.127	0.074	0.089
	(2.472)	(1.941)	(2.331)	(2.628)	(2.166)	(2.653)	(1.358)	(0.802)	(0.963)
Equity/Total Assets	0.048	0.061	0.053	0.036	0.039	0.038	-0.055*	-0.054	-0.051
	(0.810)	(1.040)	(0.922)	(0.930)	(0.994)	(1.000)	(-1.709)	(-1.614)	(-1.561)
Diversification	0.033**	0.033**	0.034**	-0.009	-0.011	-0.011	0.004	0.007	0.006
	(2.344)	(2.367)	(2.405)	(-0.600)	(-0.742)	(-0.752)	(0.245)	(0.468)	(0.388)
Market Run-up	-0.033**	-0.032**	-0.032**	-0.035*	-0.034*	-0.034*	-0.026	-0.026	-0.026
	(-2.256)	(-2.212)	(-2.202)	(-1.884)	(-1.831)	(-1.834)	(-1.345)	(-1.335)	(-1.323)
Stock Run-up	0.023	0.021	0.020	0.048*	0.046*	0.039	0.050*	0.045	0.044
	(0.958)	(0.880)	(0.837)	(1.831)	(1.834)	(1.549)	(1.728)	(1.644)	(1.589)
Stock Volatility	-0.014	-0.013	-0.014	-0.002	-0.004	-0.002	-0.002	-0.001	-0.001
	(-1.147)	(-1.109)	(-1.159)	(-0.813)	(-1.177)	(-0.537)	(-0.515)	(-0.429)	(-0.193)
Inflation	0.026	0.026	0.018	0.030	-0.245**	-0.020	-0.019	-0.036	-0.019
	(0.406)	(0.390)	(0.279)	(0.257)	(-2.008)	(-0.158)	(-0.219)	(-0.411)	(-0.214)
KKZ-index	-1.620**	-1.675***	-1.565**	-1.332*	-1.667**	-1.484**	-2.327***	-2.000***	-2.228***
	(-2.573)	(-2.707)	(-2.525)	(-1.836)	(-2.370)	(-2.015)	(-2.880)	(-2.703)	(-2.937)
Economic Freedom	0.072*	0.084**	0.072*	0.077*	0.169***	0.112**	0.138***	0.130***	0.153***
	(1.862)	(2.048)	(1.712)	(1.916)	(3.751)	(2.457)	(3.012)	(2.839)	(3.192)
GDP Growth	0.179**	0.166**	0.176**	0.204***	0.235***	0.198***	0.222**	0.162	0.163
	(2.248)	(2.042)	(2.237)	(2.649)	(3.082)	(2.581)	(2.043)	(1.505)	(1.535)
Constant	-11.341***	-10.767***	-10.231***	-11.409***	-14.089***	-11.052***	-12.768***	-10.537***	-10.572***
	(-3.460)	(-3.637)	(-3.297)	(-3.521)	(-4.812)	(-3.775)	(-3.661)	(-3.358)	(-3.335)
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	641	641	641	1085	1085	1085	797	797	797
adj. R-sq	0.07	0.07	0.067	0.024	0.034	0.027	0.036	0.040	0.036

Table 6 Bank regulation and bank SEO announcement effect: Instrumental variable approach

This table presents the results of regression analyses of stock price reaction to bank issued SEO announcement. The dependent variable is the cumulative abnormal stock return measured over the window (-1,1) relative to the announcement date, calculated using the standard event study methodology with the estimation period from -250 days to -10 days. We use a two-stage least squares (2SLS) model to address the endogeneity problem between the bank regulation and CARs. We use the exogenous cross-country, cross-year variation in the timing of the Basel II adoption as the instrument to bank regulation stringency to assess the causal impact of bank regulation on SEO announcement effects. We report both the first and second stage results. In the first stage regression, we regress bank regulation measures on all exogenous variables and the instrument variable Basel II dummy. In the second stage, we use the predicted value of bank regulation measures from the first stage as the independent variable. Panel A reports the corresponding first-stage regression results with the endogenous variable *bank regulation* as the dependent variable. Detailed definitions of variables can be found in Appendix 1. *t*-statistics are reported in parentheses. Panel B reports the second-stage regression results from the 2SLS analysis. The dependent variable is the CAR. N denotes the number of observations. *, **, *** represent significance at the 10%, 5%, and 1% significance level, respectively.

	(1) Activity Restriction	(2) Initial Capital Stringency	(3) Deposit Insurer Power	(4) Prompt Corrective Action	(5) Total Regulation
Panel A: First stage					
Basel II	1.652**	0.232***	0.168***	1.226***	0.194***
	(2.452)	(14.078)	(9.162)	(10.371)	(15.395)
Control variables	Yes	Yes	Yes	Yes	Yes
Panel B: Second stage					
Bank Regulation	0.089	11.146***	-1.691	7.990**	9.905**
	(0.094)	(3.167)	(-0.355)	(2.162)	(2.100)
Bank Regulation squared	-0.111	-7.244***	0.599	-3.785*	-9.807**
	(-0.368)	(-2.920)	(0.171)	(-1.911)	(-2.538)
Ln(TA)	0.165**	0.183**	0.146*	0.319**	0.156**
	(2.114)	(2.349)	(1.892)	(2.296)	(2.019)
Equity/Total Assets	0.043	0.034	0.040	0.027	0.034
	(1.096)	(0.868)	(1.024)	(0.675)	(0.853)
Diversification	0.001	-0.000	0.002	-0.005	0.004
	(0.058)	(-0.026)	(0.125)	(-0.409)	(0.360)
Market Run-up	-0.024	-0.025	-0.023	-0.019	-0.023
	(-1.531)	(-1.629)	(-1.491)	(-1.246)	(-1.500)
Stock Run-up	0.058**	0.057**	0.058**	0.042*	0.058**
	(2.459)	(2.428)	(2.450)	(1.674)	(2.442)
Stock Volatility	0.045	0.066	0.027	0.188*	0.013
	(0.646)	(1.001)	(0.404)	(1.706)	(0.191)
Inflation	0.157**	0.216***	0.176**	0.183**	0.196***
	(2.098)	(2.773)	(2.273)	(2.420)	(2.629)
KKZ-index	-0.002	-0.002	-0.002	-0.006	-0.002
	(-0.852)	(-0.562)	(-0.708)	(-1.236)	(-0.709)
Economic Freedom	0.086**	0.080**	0.091***	-0.011	0.072**
	(2.578)	(2.423)	(2.673)	(-0.174)	(2.095)
GDP Growth	-1.577***	-1.954***	-1.539***	-0.722	-1.541***
	(-2.950)	(-3.509)	(-2.985)	(-1.093)	(-2.950)
Constant	-8.371***	-11.836***	-7.704***	-6.100**	-9.016***
	(-3.361)	(-4.424)	(-2.864)	(-2.343)	(-3.721)
Time Fixed Effect	Yes	Yes	Yes	Yes	Yes
Country Fixed Effect	No	No	No	No	No
N	1307	1307	1307	1307	1307
adj. R-sq	0.035	0.040	0.035	0.039	0.037

Table 7 Bank regulation and bank SEO announcement effects, including involuntary issuance

This table presents the results of regression analyses of stock price reactions on bank-issued SEO announcements from 21 countries for the period from January 2001 to December 2012. The dependent variable is the cumulative abnormal return (CAR) measured over the window (-1,1) relative to the announcement date, calculated using the standard event study methodology with an estimation period from -250 days to -10 days. We include the dummy variable *Involuntary* and the interaction term of *Involuntary* and *Initial Capital Stringency*. Detailed definitions of the variables can be found in Appendix 1. The *t*-statistics are reported in parentheses. N denotes the number of observations. *, **, and *** represent significance at the 10%, 5%, and 1% significance level, respectively.

	(1)	(2)
	CAR	CAR
Initial Capital Stringency	7.965**	12.857***
	(2.291)	(3.061)
Initial Capital Stringency Squared	-6.409***	-10.263***
	(-2.603)	(-3.577)
Involuntary * Initial Capital Stringency		-16.700***
		(-2.710)
Involuntary * Initial Capital Stringency Squared		13.239***
		(2.712)
Involuntary	-0.752	3.556**
	(-1.567)	(1.970)
Ln(TA)	0.166**	0.167**
	(2.075)	(2.067)
Equity/Total Assets	0.027	0.027
	(0.693)	(0.699)
Diversification	0.003	0.003
	(0.237)	(0.255)
Market Run-up	-0.029*	-0.029*
	(-1.795)	(-1.784)
Stock Run-up	0.056**	0.056**
	(2.350)	(2.368)
Stock Return Volatility	0.020	0.009
	(0.315)	(0.144)
Inflation	0.158**	0.162**
	(1.969)	(2.015)
KKZ-index	-0.002	-0.002
	(-0.871)	(-0.758)
Economic Freedom	0.067*	0.056
	(1.825)	(1.520)
GDP Growth	-1.250**	-1.108*
	(-2.044)	(-1.771)
Constant	-9.413***	-10.250***
	(-3.333)	(-3.559)
Time Fixed Effects	Yes	Yes
N	1307	1307
adj. R-sq	0.036	0.039

Appendix 1: Variable definitions

Variable name	Classification	Description
CAR	Bank-specific	The cumulative abnormal return over the three-day event window (-1,1) from one day before to one day after the SEO announcement date.
Activity Restriction	Regulation	A measure of a bank's ability to engage in the businesses of securities underwriting, insurance, and real estate and of the regulatory restrictiveness of banks to own shares in non-financial firms. The level of regulatory restrictiveness can be defined as "unrestricted" and coded as a score of 1. If the full range of activities can be conducted, but some or all must be conducted in subsidiaries, then it can be defined as "permitted" and coded as a score of 2. If less than a full range of activities can be conducted in a bank or subsidiaries, then it can be defined as "restricted" and counted as a score of 3. If the activity cannot be conducted in either the bank or subsidiaries, then it is defined as "prohibited" and counted as a score of 4. Activity restriction is calculated by the sum of the answers to these questions divided by 4. Greater values signify more restrictions.
Initial Capital Stringency	Regulation	Whether the source of funds that count as regulatory capital can include assets other than cash or government securities and borrowed funds and whether the regulatory supervisory authorities verify the sources of capital. This index is based on the following question (Yes=1, No=0): Are the sources of funds to be used as capital verified by the regulatory/supervisory authorities? Can the initial disbursement or subsequent injections of capital be performed with assets other than cash or government securities? Can the initial disbursement of capital be performed with borrowed funds? Initial capital stringency is calculated by the sum of the answers to these questions divided by 3. Higher values indicate greater stringency.
Deposit Insurer Power	Regulation	The deposit insurer power scheme is an index of the deposit insurer power to measure each country's deposit insurance regime and to trace its evolution from 1999 to 2011. This index is based on the answer to the following questions (Yes=1, No=0): (1) Does the deposit insurance authority make the decision to intervene in a bank? Can the deposit insurance agency/fund take legal action for violations of laws, regulations, and bylaws (of the deposit insurance agency) against bank directors or other bank officials? Has the deposit insurance agency/fund ever taken legal action for violations of laws, regulations, and bylaws (of the deposit insurance agency) against bank directors or other bank officials? Were any deposits not explicitly covered by the deposit insurance at the time of the failure compensated when the bank failed (excluding funds later paid out in liquidation procedures)? Deposit insurer power is equal to {[(1)+(2)+(3)]/3 + (4)}/2. This variable ranges from 0 to 1, where higher values indicate more power.

Prompt Corrective Action	Regulation	Prompt corrective action measures the extent to which the law establishes pre-determined levels of bank solvency deterioration that force automatic enforcement actions, such as intervention, and the extent to which supervisors have the requisite, suitable powers to do so. This variable is based on several questions (Yes=1, No=0): (1) Can the supervisory authority force a bank to change its internal organizational structure? Are there any mechanisms of cease and desist-type orders, whose infraction leads to the automatic imposition of civil and penal sanctions against the bank's directors and managers? Can the supervisory agency order the bank's directors or management to constitute provisions to cover actual or potential losses? Can the supervisory agency suspend the director's decision to distribute dividends? Can the supervisory agency suspend the director's decision to distribute bonuses? Can the supervisory agency suspend the director's decision to distribute management fees? Prompt corrective action is calculated as the sum of the score for each question and divided by 6. A higher value indicates greater supervisory power.
Total Regulation	Regulation	We collapse the four regulation measures into a single measure of bank regulation using factor analysis. We estimate the following equation: $Y_{i,s,t}=\beta_i$ $Regulation_{s,s,t}+\varepsilon_{i,t}$, where the subscripts i, s, and t correspond to the country, the four regulation measures (Activity Restriction, Initial Capital Stringency, Deposit Insurer Power, and Prompt Corrective Action), and years, respectively. The left-hand-side variables are the four regulation measures, all of which are stacked into a single factor, whereas regulation is not observed and estimated along with the factor loadings β. We follow the standard practice of normalizing the proxy measures included on the left-hand side to have a mean of zero and a variance of one before we conduct the factor analysis. We focus on the single factor that has the greatest explanatory power. It turns out that our data are well described by a one-factor model, which captures approximately 55% of the variation in the four regulation measures. We take this factor as our final measure of overall bank regulation.
Total assets	Bank-specific	A natural logarithm of total assets denominated in US dollars
Equity/Total Assets	Bank-specific	The ratio of capital over total assets.
Diversification	Bank-specific	The ratio of non-interest income over total operating income.
Stock Run-up	Bank-specific	The stock return over the window (-60,-2) relative to the announcement date.
Stock Return Volatility	Bank-specific	Annualized stock return volatility, calculated from daily returns over the window (-250,-10) relative to the SEO announcement date.

Involuntary	Bank-specific	A dummy variable that is equal to 1 if the bank SEO is issued when either one of the bank's capital ratio, equity-to-assets ratio, tier 1 capital ratio or total capital ratio is less than the government's requirement, and 0 otherwise.
Market Run-up	Market-specific	The return on the S&P 500 index over the window (-60,-2) relative to the announcement date.
Inflation	Country-specific	The percentage change of GDP deflator.
KKZ-index	Country-specific	An indicator of the quality of institutional development in the country. Calculated as the average of six indicators: voice and accountability, political stability, government effectiveness, regulatory quality, rule of law, and control over corruption. Greater values signify a better institutional environment.
Economic Freedom	Country-specific	An index based on trade freedom, business freedom, investment freedom, and property rights (ranging from 1 to 5). Calculated as 6 minus the economic freedom index of the Heritage Foundation.
GDP Growth	Country-specific	The annual growth rate of GDP.