Do bank regulations have uniform effects?

Evidence from changes in deposit insurance*

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Abstract

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Abstract

We study changes in the moral hazard effects of deposit insurance on the financial performance of large banks in financially and economically developed countries. We find that the effects of changes in deposit insurance coverage vary depending on the level of economic freedom, rule of law and corruption in the bank's home country. The data do not support the uniform-effects hypothesis, which says that the effects of regulations are uniform across countries. Forcing all countries to have the same level of deposit insurance would result in a significant wealth transfer among bank shareholders in different countries.

1. Introduction

Should banking regulations be uniform across countries or tailored to each country? On the one hand, regulators, like those at the Basel Committee, and academics such as Allen, Carletti and Leonello (2011), argue that uniformity is necessary to prevent regulatory arbitrage by banks and to ensure fair consumer protection. On the other hand, Kane (2000) and Romano (2012) argue that institutional context matters for the efficacy of regulations.[1] The quality of local domestic institutions such as rule of law, economic freedom and corruption affect the ability of regulators and private monitors to enforce rules in the intended ways. Consequently, regulatory uniformity in the presence of institutional heterogeneity may not prevent regulatory arbitrage nor lead to equitable consumer protection.

[1] Romano's main argument is that harmonized regulations increase systemic risk by inducing financial institutions to follow similar strategies. But, she also notes that less developed institutions adversely affect a country's ability to implement a given set of regulations. Acharya (2003) and Neuberger and Rissi (2012) also argue that institutional context affects the impact of banking regulations.

Prior research shows that banks' risks are higher in countries with more generous deposit insurance, but strong institutions temper these effects. However, the evidence is clouded by the ad hoc specification of control variables, the heterogeneity of countries, the existence of endogenous events surrounding banking crises, and a limited set of performance measures that can hinder interpretation of the findings.

We base our analysis on a value-maximizing model of a bank's behavior. This model, plus evidence from prior studies, generates a set of regressors that we use to explain banks' behaviors. Because previous authors did not always begin with an explicit economic model of bank behavior, the control variables in some studies appear without a well-specified theoretical basis. This raises concerns that the hidden influences of omitted variables may be driving some of the results.

We limit our sample to a relatively small set of financially and economically developed countries (16 in all). This sample allows us to test whether institutions matter even across a set of homogeneous countries with strong institutions. The efficacy of regulations may depend on the strength of the institutions that enforce them. Much of the existing evidence is drawn from samples with countries and institutions that differ widely in their financial discipline. Our test, with a more uniform set of countries, is less likely to find institutional effects.

Endogeneity is also a concern as many of the sample periods in existing studies include years with banking crises, which makes it difficult to disentangle cause from effect. For most of our tests, we examine performance in a period of relatively stable bank earnings, at least seven years after any banking crisis. For additional evidence, we estimate banks' responses to deposit insurance changes during the recent financial crisis.

We look at changes in regulations and performance, rather than levels, to reduce endogeneity and to control for time-invariant unobservable factors.

We examine the effect of changes in deposit insurance coverage[2] on seven measures of performance: two measures of risk (leverage and nonperforming loans); three measures of revenues and costs (interest income, interest expense, and overhead); and two measures of returns (return on equity (ROE) and franchise value). With the full set of results, we are able to trace the effects of institutions and regulations through all aspects of performance. Prior papers look at only one or two aspects of bank performance, which leaves uncertainty about the channels through which regulations and institutions affect banks' financial performance.

Our main findings are:

- In the financially stable period, 1999-2006, expanded deposit insurance coverage that increased moral hazard by bank managers led to increases in non-performing loans and leverage. Banks' higher risk taking was not matched by a sufficiently large increase in net income to offset the increase in bad loans that the banks bore. As a result, increased deposit insurance coverage reduced banks' market values.
- In the crisis period, 2006 - 2010, relatively high growth in leverage was associated with expanded deposit insurance, suggesting regulators increased the safety net in response to higher bank risk. Banks in countries with stronger deposit insurance had higher interest income, interest expense, and ROE. Perhaps in response to the expanded government guaranty, higher deposit insurance was also accompanied by higher market values.

[2] We use an index of seven aspects of deposit insurance to proxy for moral hazard. Details on the construction of the index are in Section 4.1 and Appendix A.

- In both the stable and crisis periods, stronger institutions tempered the effects of deposit insurance on bank performance. The main exception was that during the crisis period, the tendency for increases in bank leverage to be associated with expanded deposit insurance was strongest in the strong institution countries.
- Forcing all countries to have the same deposit insurance coverage would entail substantial wealth transfers from bank stockholders in countries that increase coverage to bank stockholders in countries that decrease coverage.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 describes our value maximization model. Section 4 introduces the dataset. Section 5 outlines our empirical methods and discusses the results. Section 6 concludes.

2. Literature review

Under-priced deposit insurance may induce an insured bank to increase its risk exposure because the bank keeps its gains and the government reimburses depositors for catastrophic losses that might stem from the bank's risky lending (Merton, 1977; Dewatripont and Tirole, 1994; Benston and Kaufman, 1996; and Buser, Chen, and Kane, 1981). To combat this risk shifting, governments may require insured banks to hold more capital, limit the assets banks can purchase and monitor banks' risks.

Market forces may limit risk taking at banks that have substantial amounts of uninsured deposits and funding. Gropp and Vesala (2004) argue and provide evidence from banks in Europe that if deposit insurance credibly leaves out non-deposit creditors, then monitoring by uninsured subordinated debt holders could reduce banks' risk taking. Even if large, uninsured depositors do not monitor, Hannan and Hanweck (1988) show

they require higher returns to compensate them for their greater risks. The Too-Big-To-Fail (TBTF) doctrine may negate the incentives of large, uninsured depositors to monitor and require higher returns. O'Hara and Shaw (1990) report a significant increase in the stock prices of U.S. banks that the *Wall Street Journal* declared to be TBTF on September 20, 1984. In contrast, the stock prices of other banks did not change.

Table 1 summarizes the empirical literature that investigates the effect of country-level institutions on the relation between deposit insurance coverage and bank performance. Deposit insurance is positively associated with the incidence of banking crises (Demirguc-Kunt and Detragiache, 2002), bank fragility (Barth et al., 2004), and bank risk leading up to the recent financial crisis (Anginer, Demirguc-Kunt, Zhu, 2012), but negatively associated with financial development and growth (Cull et al., 2005).[3] All four papers provide evidence that the relations are weaker or even non-existent for countries with stronger institutional environments.

Deposit insurance coverage increases risk shifting by banks (Hovakimian, Kane and Laeven, 2003) and banks' implicit deposit insurance subsidy (Laeven, 2002a). However, strong institutions that enforce the rule of law and limit corruption reduce risk shifting and the size of the subsidy. Concentrated ownership exacerbates deposit insurance's affect on risk taking (Laeven and Levine, 2009), while foreign ownership diminishes it (Distinguin, Kouassi and Tarazi, 2011).

Gonzalez (2005) finds that the effect of deposit insurance on risk and franchise value varies across the level of regulations and legal regime, and on whether regulations are treated as endogenous. Demirguc-Kunt and Huizinga (2004) find that market

[3] In a relatively new paper, Bergbrant et al. (2012) provide evidence that adoption of deposit insurance retards the development of equity and overall financial sector development (as well as the sub-sector of banking), but that strong law and order "mitigates or even reverses" this tendency.

discipline (via interest expense and deposit growth) in response to deposit insurance is stronger in countries with higher levels of institutional development. Demirguc-Kunt, Laeven and Levine (2004) examine net interest margins and overhead and find that bank regulations have no explanatory power for these two measures when controlling for economic freedom or property rights protection.

In spite of these documented differences in the effects of regulations on banks, bank regulators often treat regulations as having uniform effects across countries. For example, the three Basel accords (I in 1988, II in 2006, and III currently under discussion), which harmonize capital ratio regulation across more than 100 countries, provide very limited options to countries to accommodate the rules for different country-level institutional factors such as legal regime, the state of law and order, or the degree of banking competition in the local market.[4] The recent financial crisis sparked additional, similar harmonization discussions in areas such as derivatives trading and the treatment of failing cross-border banks.[5] Allen et al. (2011) argue in favor of international harmonization of deposit insurance to guarantee fair consumer protection across countries and to avoid regulatory arbitrage.

We call the implicit view that bank regulations have uniform effects on banks in countries with different institutional environments the "uniform-effects" hypothesis. We

4 For example, a November 2005 review of the Basel 2 Framework, found at the BIS website http://www.bis.org/publ/bcbs118.htm says: "the Framework also allows for a limited degree of national discretion in the way in which each of these options may be applied, to adapt the standards to different conditions of national markets. These features, however, will necessitate substantial efforts by national authorities to ensure sufficient consistency in application. The Committee intends to monitor and review the application of the Framework in the period ahead with a view to achieving even greater consistency. In particular, its Accord Implementation Group (AIG) was established to promote consistency in the Framework's application by encouraging supervisors to exchange information on implementation approaches."

5 See "EU Commission to push tighter trading controls," by M. Dalton in the 9-21-10 *Wall Street Journal*; "CFTC, EU vow cooperation on swaps oversight," by S.N. Lynch in the 11-2-10 *Wall Street Journal*; and "Bank group seeks task force for wind-down system," by A. Bradbery in the 5-24-10 *Wall Street Journal*.

call the alternative view the "institutions-matter" hypothesis. We test the uniform-effects hypothesis by seeing whether the effects of changes in deposit insurance on banks' risk taking and performance depend on economic freedom, the rule of law, or corruption. We find that changes in deposit insurance affect banks' risk taking and performance, and the effects vary across countries. The data do not support the uniform-effects hypothesis.

3. Theoretical predictions on the relation between regulation and performance

3.1 Predictions from a simple value-maximization model

According to Modigliani and Miller (1958) how a business enterprise finances its assets does not affect its business risk, which for a bank stems from the composition of its assets. If a bank increases its holdings of risky assets in response to an increase in under-priced deposit insurance, its uninsured funders may require a higher expected rate of return. The higher cost of the bank's uninsured debt and equity increases its funding cost and offsets the increase in its economic profits from its increased revenue from riskier assets. If the TBTF doctrine holds, and if deposit insurance is underpriced, Modigliani and Miller's hypothesis may not hold and banks may increase their asset and financial risks to gain higher returns without appropriately higher interest or insurance costs.

To trace the effects of regulations on bank performance, we build a value-maximization model of a bank that incorporates many of the contributions to banking theory that are in the literature. The model has two types of assets, risky and risk free, that differ in the cost to a lender of obtaining information on likely repayment, two types of deposits (insured and uninsured), and a cost function that depends on the bank's asset and deposit choices, and the value to the bank of fixed-rate deposit insurance.

In the model the bank has two decision variables: the interest rate r_b it charges on loans to risky borrowers and r_δ the interest rate it pays on insured deposits. The exogenous variables that determine the value-maximizing values of these two variables are:

- r_f The risk free interest rate that the bank earns on its risk free assets.
- r_n The interest rate that risky borrowers pay on funding sources other than bank loans.
- δ The fraction of the bank's deposits that are insured; if TBTF holds, $\delta = 1$.
- r_d The interest rate that competing banks pay on insured deposits.
- $r_u\left(A_b, K, \kappa\right)$ The interest rate the bank pays on its uninsured debt r_u, which depends on its asset risk as determined by its risky assets A_b its capital K, which determines its financial risk, and its concentration ratio κ, which measures its market power.[6]
- λ The equity premium that compensates stockholders for bearing systematic risk.
- $C\left(A_b, \delta, r_b, C, L, O\right)$ The bank's cost of providing financial services, which is made up of employee costs, overhead and loan loss provisions. Overhead and employee costs increase with the bank's monitoring efforts, which increase with its loans to risky borrowers A_b; the amount of insured deposits it has that subject it to the Buser et al. (1981) costs imposed by the insurer δ; and the interest rate it charges on risky loans that incorporates the Stiglitz-Weiss (1981) effect from adverse selection and moral hazard caused by charging higher loan rates to risky borrowers r_b. The bank's loan losses depend on the likelihood of default and recovery given default. Banks in countries with stronger rule of law L may have lower operating costs because (1) they are better able to enforce loan covenants, which reduce the chance of default, (2) and to collect on nonperforming loans. Corruption C may increase (1) the chance that self-serving managers make undetectable risky loans, (2) borrowers' propensities to default with reduced fear of punishment, and (3) banks' abilities to recover from defaulting borrowers. Ownership concentration O may affect bank owners' gains from exploiting mispriced deposit insurance and lead the bank to make riskier loans, which may increase their monitoring and collection costs.

We use state variables to identify cross sectional and time series changes in banks' operating costs.

[6] Buser, Chen, and Kane (1981) argue that governments control entry, which increases banks' franchise values and induces them to limit their risk taking.

- To allow for economies of scale we include the beginning-of-period book values of banks' assets, A_{t-1}.

- To allow for cyclical variation in loan quality we include GDP growth rates, ΔGDP. Business downturns beget decreases in the probability of loan repayment and recovery given default. Banks might rationally respond by increasing their monitoring efforts, which will drive up their operating costs.

- We include regulations on banks' permissible activities, entry and capital. Restrictions on banks' activities have theoretically ambiguous effects on banks' operating costs. If banks can inexpensively reduce risk through diversification or if they have economies of scope, activity restrictions can increase costs by reducing banks' scope of activities. On the other hand, if regulators expand banks' scope of activities, insured banks may enter markets in which they do not have economies of specialization, which can increase banks' operating costs. As shown by Keeley (1990) entry restrictions increase banks' market power and their charter values. This makes the banks' charters more valuable and induces banks to reduce risk so as to maintain their charters. Capital restrictions that tie capital to banks' risks may induce TBTF banks to reduce their asset risk so they can fund themselves with relatively cheaper insured deposits.

Using K for the bank's equity cost of capital, the bank's value function in Gordon growth model form is:

$$\pi = \left\{ \begin{array}{l} r_f \cdot A_f + r_b \cdot A_b\left(r_b, r_n\right) - \left[r_\delta \cdot \delta\left(r_\delta\right) \cdot + r_u\left(A_b\left(r_b, r_n\right), K, \kappa\right) \cdot \left(1 - \delta\left(r_\delta\right)\right) \right] \cdot \left[A_f + A_b\left(r_b, r_n\right) - K \right] \\ -C\left(A_b\left(r_b, r_n\right), \delta\left(r_\delta\right), r_b, C, L, O\right) \end{array} \right\} \Big/ k$$

The first two terms on the right-hand-side are interest revenue from risk free and risky assets. The second term, which is in brackets, is interest expense that the bank pays on both insured and uninsured deposits. The third term is the cost of operating a bank.

The value-maximizing conditions show that each of the two interest rates that the bank sets depends on the exogenous variables per:

$$r_{b,t} = F\left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O\right) \quad (1)$$

$$r_{\delta,t} = G\left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O\right) \quad (2)$$

The bank's value-maximization process works as follows. The bank simultaneously solves equations (1) and (2) for the rate r_b it charges on risky loans and r_δ the rate it pays on insured deposits. Given the state of the economy as measured by GDP growth, the competitive condition of loan and deposit markets measured by the concentration ratio, borrowers' alternative funding interest rates and the value-maximizing rate the bank charges on risky loans, risky borrowers decide how much to borrow from the bank. Combining the bank's risky loans with its capital determines the interest rate it has to pay on uninsured deposits. The bank posts this rate and receives uninsured deposits.

Given the value-maximizing interest rate the bank pays on its insured deposits, and the insured deposit rate paid by competing banks, depositors decide how much money to place in insured deposits. The sum of the bank's insured and uninsured deposits plus its initial capital determine its total funding. Subtracting the amount of risky loans it makes from its total funding gives the amount of risk free assets it buys.

The bank's monitoring activities depend on its holdings of risky loans, any additional monitoring activities imposed by the deposit insurer and the bad borrowers induced by the Stiglitz-Weiss (1981) effect. Monitoring determines the bank's operating costs, which we take to include both due diligence costs and write offs of bad loans. Subtracting the bank's operating costs from its net interest income determines its earnings.

The uniform-effects hypothesis says that banks ignore the effects of rule of law, economic freedom and corruption when choosing their value-maximizing loan and deposit interest rates. Kane (2000, p. 40) argues instead that local systems for

"transparency, deterrence and accountability" affect "private and government regulator's capacity for valuing banking institutions, for disciplining risk-taking and resolving insolvencies promptly and (above all) for being held accountable for how well they perform these tasks." All else equal, stronger institutional environments should deter bank risk taking. Thus, the institutions-matter hypothesis says that institutional conditions affect banks' choices. According to the institutions-matter hypothesis, the responses of banks to changes in deposit insurance will differ systematically across countries based on the strength of their institutions.

3.2 Measures of a bank's risks

Moral hazard theory predicts that increases in the moral hazard incentives of deposit insurance coverage induce a bank to increase its business risk by making loans to riskier borrowers and to increase its leverage. If a bank increases its risky lending, eventually more of its borrowers will be unable to meet their loan repayment terms and the bank will have an increase in its nonperforming loans. An increase in failed loans reduces the bank's book value of equity and the chance that it will lose its charter because it does not meet its minimum capital requirements. As has been amply documented in the finance literature, as a bank's capital ratio decreases closer to its regulatory lower bound, the bank increases its risk taking and becomes in Kane's (2000) words, a Zombie bank.

The moral hazard/zombie bank model gives two empirically testable implications: An increase in under-priced deposit insurance induces banks to increase their risky lending and leverage. The value-maximizing model treats a bank's asset choice and leverage as endogenous and therefore responsive to the exogenous variables and the

structure of the bank's cost functions in equations (1) and (2). Thus, we use regression versions of equations (5) and (6) to test for the effects of deposit insurance on risky lending and leverage controlling for the influences of the exogenous variables.

$$NPL_t / A_{b,t} = R_{NPL}\left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O\right). \quad (5)$$

$$A_t / K_t = R_L\left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O\right). \quad (6)$$

To summarize, banking theory predicts that deposit insurance coverage that is structured so as to increase bankers' moral hazard, may lead an insured bank to increase its asset risk and leverage and these changes may show up in leverage and nonperforming loans. The uniform-effects hypothesis says the effects are the same across countries whereas the institutions-matter hypothesis says the effects vary across countries based on the strength of their institutions. We allow for the institutions-matter hypothesis by including cross-product terms between deposit insurance and rule of law, economic freedom, and corruption in the regressions. If the uniform-effects hypothesis describes the data, the cross-product terms should be insignificant. If institutions affect banks' choices, the cross product terms should be significantly different from zero.

3.3 Measures of a bank's revenues and costs

If increases in the moral hazard aspect of deposit insurance coverage induces banks to switch from risk free to risky assets, banks' interest revenues to assets, *IR/A*, should increase because banks earn higher risk premiums on their risky loans. This gives another testable prediction of the effect of deposit insurance on banks' risk taking that we examine in the context of the equation:

$$IR_t / A_t = R_U \left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O \right). \quad (7)$$

If deposit insurance is valuable to depositors, they should be willing to earn a lower interest rate on their insured deposits than on their uninsured deposits. However, per Hannan and Hanweck (1988) if banks respond to deposit insurance by increasing their risk exposure, uninsured depositors may require a higher interest rate, which could cause an insured-bank's interest expense to increase. We study this in the context of the interest expense equation:

$$IE_t / A_t = R_{IE} \left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O \right). \quad (8)$$

Moral hazard due to deposit insurance induces bankers toward laxity in the monitoring of their borrowers. This alone might lead to a decrease in the bank's operating expenses that the bank would have spent on monitoring. However, presumably the deposit insurer is aware of this potential increase in laxity and to control insured banks' risk taking, the deposit insurer may attempt to impose additional operating conditions on the insured banks. These conditions will tend to increase the banks' operating expenses, *OE*. Theory does not tell us which of the two offsetting effects on operating expenses will prevail. We examine these potentials cost changes by estimating the effects of deposit insurance changes on banks' operating costs per equation:

$$OE_t / A_t = R_{OE} \left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O \right). \quad (9)$$

In these three revenue and cost regressions we include cross-product terms between deposit insurance and the three measures of institutional strength. If the uniform effects hypothesis holds, the cross-product terms will be jointly insignificant. If the institutions-matter hypothesis holds, the cross-product terms will be jointly significant.

3.4 Measures of bank's returns

Deposit insurance coverage may lead to higher interest earnings at banks as they shift to risky loans, to changes in interest expense, and to higher operating costs. Their net effects on a bank's financial performance are ambiguous. To gain an overall evaluation of the effects of deposit insurance on banks' operating profits we regress changes in ROE on changes in the exogenous factors and changes in deposit insurance coverage:

$$ROE_t = R_{ROE}\left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O\right). \qquad (10)$$

If under-priced deposit insurance induces a value-maximizing bank to increase its risk, the risk increase should lead to a return increase that more than compensates for the risk increase. O'Hara and Shaw (1990) show that when the TBTF doctrine was initiated in the U.S. the stock prices of the protected, large banks increased. However, the market value of the deposit insurance put option is an intangible asset that is not reported on bank's audited financial statements. According to Buser et al. (1981) at least in the U.S. the FDIC combines underpriced deposit insurance with entry regulations that protect banks' charter values. These charter values may show up in banks' market values but not in their book values.

Thus, the values of TBTF and entry restrictions may be in bank's market values but not in their book values. We use the ratio of a bank's market value of equity to its book value of equity (MVE/BVE) to capture the intangible value of under-priced deposit insurance coverage. The prediction is that controlling for the effects of the exogenous variables, an increase in deposit insurance should increase this ratio.

$$MVE_t / BVE_t = R_{MVE}\left(r_{f,t}, r_{n,t}, r_{d,t}, \lambda_t, \delta_t, K_{t-1}, A_{t-1}, \kappa_t, \Delta DGP_t, C, L, O\right). \qquad (11)$$

There is a possible countervailing effect of deposit insurance coverage on a bank's market value. If a bank's managers' private interests diverge from the stockholders' interests, and if it is costly for the stockholders to monitor and discipline the managers, increased deposit insurance coverage may induce managers to take on risks that benefit them at the expense of shareholders. This could lead to a decrease in the bank's market value. If increased deposit insurance coverage causes market values of banks' equities to increase in our sample, this supports the TBTF doctrine finding of O'Hara and Shaw (1990). If instead increased deposit insurance coverage causes market values of banks' equities to decrease, this supports the agency cost view that managers do not always act in the best interests of the stockholders.

If institutions matter, the responses of ROE and MVE/BVE to changes in deposit insurance should vary across countries. We allow for this by including the cross-product terms in the return regressions.

In summary, we use two risk measures, three revenue and cost measures and two return measures to examine the effects of deposit insurance on banks' activities.

4. Data Description

4.1 Regulatory indices

The World Bank began collecting information on banking regulations across multiple countries in the late 1990s.[7] They followed up their 2001 initial survey with

[7] The data set is described in Barth, Caprio and Levine (2001, 2013). The survey results are available at: http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

additional surveys in 2003, 2007, and 2011-12. While these surveys allow us to document changes in banking regulations, they do not provide information on the exact dates of the regulatory changes. Moreover, an extensive search of the academic literature and public press does not provide enough information to date all of the changes across all of the countries.[8] We do know that the regulations documented in the three surveys were in place during 1999, 2002, 2006, and 2010. As a result, in our analyses we measure the link between the regulatory changes documented in the four World Bank surveys with changes in bank performance over their 1999, 2002, 2006 and 2010 financial statements.

Analyzing first differences of regulations and performance reduces concerns about endogeneity that are more severe with levels.[9] We split our sample into two periods: a stable period which tracks changes over 1999 – 2002 – 2006, and the crisis period which tracks changes from 2006 to 2010. The stable period of 1999-2006, as well as at least seven years prior to this period, do not include a banking crisis in any of our sample countries, further lessening concerns that poor or extreme bank performance is driving changes in deposit insurance. First differences also allow us to control for any time-invariant unobservable factors that might affect both regulation and bank performance.[10] Comparisons of the relation between regulation and bank performance between the stable and crisis periods provide some evidence on the endogeneity concerns.

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[8] Demirguc-Kunt, Karacaovali, and Levine (2005) document a World Bank data set focused on deposit insurance regulations as of 2003. They provide some time series information on the introduction and revisions to deposit insurance regulations. The information in this data set is a sub-set of what we use from the four World Bank bank regulation and supervision surveys.

[9] Barth et. al. (2010) also analyze first differences of regulations and bank performance.

[10] Another method to control for endogeneity in this environment is a two stage procedure with instrumental variables in the first stage estimation to generate fitted values for regulations that go into the second stage performance regressions. Barth et. al. (2004), Demirguc-Kunt and Detragiache (2002), and Hovakimiam et. al. (2004) all find these methods do not alter their conclusions about the effect of institutions and regulations on bank performance.

Details on how we build our four regulatory indices are in Appendix A. To construct our measure of deposit insurance, *DepIns_Reg*, we closely follow Demirguc-Kunt and Detragiache's (2002) index of deposit insurance moral hazard. For each aspect of deposit insurance that increases moral hazard in the banking system we add one to the index. For example, the presence of explicit deposit insurance, no coverage limits, coverage of foreign currency deposits or interbank deposits, or the inability of the deposit insurance agency to take legal action for bank violations of laws or regulations would each add one to the index because they are consistent with insulating bank managers and increasing moral hazard.

The index for banking activities, *Activities_Reg*, adds a one for each additional activity banks are allowed to do: securities trading, insurance, real estate, ownership of non-financial firms. The capital index, *Capital_Reg*, adds one for each rule that allows more latitude in calculating capital ratios. The entry index, *Entry_Reg*, adds one for each requirement that makes it easier to establish a banking institution.

Summary statistics for the four regulatory indices are presented in the first three columns of Table 2. Australia is the only country with a zero value for deposit insurance, indicating no explicit deposit insurance (over the 1999-2006 period). At the other end of the spectrum, Netherlands and Switzerland have the highest values for the deposit insurance index, indicating the possibility of higher moral hazard. Higher values for the other three regulatory indices indicate a more lax, less restrictive regulatory environment. The UK has the highest value, i.e. most permissive environment, for banking activities, Norway and the US the lowest. Canada has the highest value, i.e. least restrictive rules,

for capital regulations, Australia the lowest value. And, Finland has the loosest entry restrictions (highest entry index value), Austria, Canada, and Italy the strictest.[11]

4.2 Bank sample

To prevent differences in financial and economic development levels from driving our results, we focus our analysis on banks in financially and economically developed countries.[12] Demirguc-Kunt and Levine's (2001) Table 12 classifies 29 countries as financially developed. From these, we exclude emerging markets, such as Jordan, Korea, and Panama.[13] We are left with 18 countries: Australia (AL), Austria (AU), Belgium (BL), Canada (CA), Finland (FI), France (FR), Germany (GE), Italy (IT), Japan (JP), Netherlands (NL), New Zealand (NZ), Norway (NO), Portugal (PO), Spain (SP), Sweden (SW), Switzerland (SZ), United Kingdom (UK), and United States (US). We exclude New Zealand from the analysis due to lack of sufficient observations, and Japan because it had a prolonged banking crisis over the sample period, which included substantial government intervention and capital infusions that might distort earnings composition estimates.[14] No country in the remaining sample had a banking crisis during the stable

[11] The correlation for *DepIns_Reg* and *Entry_Reg* for levels is -0.30, for changes is 0.08. The levels result is consistent with Keeley's (1990) observation that more generous deposit insurance is often associated with more restrictive entry rules. But, for our sample countries, we do not find evidence that increases in deposit insurance are associated with more restrictions on entry (a negative move in our *Entry_Reg* index).
[12] Levine (2002) provides evidence that financial development has a significant effect on economic growth.
[13] We exclude Panama, Tunisia, Cyprus, Jordan, Israel, Thailand, S. Africa, Korea, Singapore, Hong Kong, and Malaysia. Some, but not all country classifications, e.g. MSCI, list Israel, Hong Kong and Singapore as developed economies. To keep our sample as homogeneous as possible, we exclude these 3 countries from our set of developed countries.
[14] Analyses of the Japanese bank data reveal earnings patterns that differ significantly from all of the other countries. Their inclusion in the data set strongly affects coefficient estimates and inferences.

sample period (1999-2006), or for at least seven years prior according to the Laeven and Valencia (2008) list of banking crises.[15]

For our 16 countries, we search the Bankscope data set for publicly listed commercial banks with international operations, total assets above $10 billion, and accounting data in at least two contiguous years in the years for which we have regulatory indices: 1999, 2002, 2006, 2010.[16] This search yields 91 banks. Within this set, we have 65 banks that have data for all seven measures of bank performance for at least one of the first differences across our 4 years (54 banks with 97 first differences in the stable period, and 58 banks with 58 first differences in the crisis period). Appendix B provides a list of the banks.

4.3 Measures of bank performance

With data from annual reports in Bankscope and stock price movements in Datastream, we build seven measures of bank performance. Our two measures of risk are bank leverage, *A/K*, defined as average assets to average net worth, and *NPL*, defined as non-performing loans to gross loans. The three measures of revenues and cost are *IR/A*, equal to interest revenue to average total assets, *IE/A*, equal to interest expense to average total assets, and *OE/A*, equal to overhead and wage expenses to average total assets. The two revenue measures are *ROE*, net income after tax to net worth, and *MVE/BVE,* a proxy

[15] According to Laeven and Valencia (2008), Norway and Sweden had banking crises in 1991, the United States in 1988, and Spain in 1977. An earlier paper by Demirguc-Kunt and Detragiache (2002) gives slightly different dates for banking crises, suggesting the most recent crisis among our sample countries was in Italy and ended in 1995, four years prior to our first sample year of 1999.

[16] As stated on the BIS website: It should be stressed that the revised (Basel 2) Framework is designed to establish minimum levels of capital for internationally active banks. http://www.bis.org/publ/bcbs118.htm

for franchise value, defined as the ratio of market to book value of equity. We winsorize each of the seven dependent variables to ± three standard deviations.

Table 3 presents summary statistics for these seven variables, plus two bank-specific control variable (*Assets(-1)* and *Largest_Shldr*) described below. The table reports the average and standard deviation for levels and first differences of each variable. The sample banks are large, with average assets of US$282.55 billion. Average *ROE* is 0.139. On average, leverage, *ROE*, *MVE/BVE*, and assets grow over the stable period, while all other variables decrease. During the crisis period, all variables fall except *NPL* and *Assets(-1)*.

4.4 Measures from the value maximization model

The value-maximization model suggests six control variables: three interest rates, lagged bank assets, and two country-level measures, concentration ratio and GDP. All of the referenced interest rates are drawn from Datastream. The risk free interest rate, *Risk_Free*, is the government short term T-bill rate, with the exception of Australia, Austria, Finland, Netherlands and Norway where short term T-bill rates are not available, so we use the shortest term government bond rates available. The deposit interest rates, *Deposit_Rate*, are from the Economist Intelligence Unit, except for Australia's which is supplied by the Reserve Bank of Australia. Corporate bond rates, *Corp_Bond*, are available for Australia, Austria, Canada, France, Germany, Sweden Switzerland, the UK and the US (identified in Datastream as "Corporate bond yield, middle rate"). For the other seven countries, we use bank lending rates from the Economist Intelligence Unit.[17]

[17] For countries that have both the corporate bond yield and the bank lending rates, the correlation between these two numbers is above 0.50. If we just use the measure of bank lending rates for all countries in the

Assets(-1) equals the bank's US$ billion total assets from the 1998, 2001, 2005, and 2009 annual reports.[18] Concentration ratio, *CR*, constructed from data in Bankscope, is the sum of total assets for the largest four banking institutions (defined as commercial banks, saving banks, cooperatives and real estate banks) in a country divided by the sum of total assets for the largest 20 banking institutions in the country in each year.[19] GDP growth, *GDP*, is calculated from nominal, local currency, annual GDP levels, also sourced from Datastream.

The middle columns in Table 3 provide summary statistics for the six country-level model variables. It shows that changes in interest rates vary by country and by period. Over most but not all countries, GDP growth is lower in the crisis period. Concentration ratios vary quite a bit across countries; the average ranges from 0.47 in the UK to 0.92 in Switzerland, with only small changes over the period.

4.5 Institutional variables

Prior papers that examine the effect of country-level institutions on the relation between deposit insurance and bank performance tend to include proxies for four aspects of institutions: legal origin (civil vs. common law, shareholder's rights, or creditor's rights); economic freedom; the rule of law (also referred to as law and order and contract enforceability); and corruption. See Table 1 for examples. We include an index for creditor's rights as our proxy for the legal system because we believe it is the most

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regressions that follow, the basic results hold, although significance levels move around (both up and down).

[18] When the prior year reports are not available, we use current year data.

[19] If a country has less than 20 financial institutions, then the ratio is the sum of total assets for all banks in the denominator.

directly relevant aspect of the legal regime for bank performance.[20] *Creditor*, equal to each country's creditor rights index, is sourced from La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1998). The last column of Table 2 shows that the UK has the highest value for creditor's rights, while France has the lowest.

We test for a link between changes in institutions, deposit insurance, and bank performance with proxies for economic freedom, rule of law and corruption. Our proxy for economic freedom, *EcFreedom*, is the Heritage Foundation's overall index of economic freedom. This index summarizes scores in 10 "freedom" sub-indices: business, trade, fiscal, government spending, monetary, investment, financial, property rights, corruption, and labor. Higher values indicate more freedom. We use the rule of law data from the World Bank World Governance Indicators, *RuleLaw*. Their rule of law index "captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence."[21] The Corruption Index, *Corruption*, is from Transparency International's 1999, 2002, and 2006 survey of political corruption. Higher values of the *RuleLaw* and *Corruption* indices signify stronger institutions.

The far right columns in Table 2 provide the country-specific values for these three indices. The UK, US and Australia have the highest average values for *EcFreedom* index, France the lowest. The average *RuleLaw* index value is highest for Finland, Norway, and Switzerland, and lowest for Italy. The average *Corruption* index value is

[20] Djankov et al. (2007) note that "Creditor rights are remarkably stable over time." (abstract). See, Qian and Strahan (2007) and Houston, Lin, Lin, and Yue (2010) for two additional papers that link bank performance with legal regimes.

[21] The World Bank World Governance Indicators can be found at: http://info.worldbank.org/governance/wgi/sc_chart.asp#

highest (signifying the lowest levels of corruption) for Finland and lowest for Italy. Across our sample banks, the correlations between these three institutional variables for levels are above 0.70, but the correlations for the first-differences are all below 0.40 (not tabulated).

4.6 Other variables

We use levels, not first differences, for three additional control variables. In the stable period specifications, we split the Constant term into two parts, *YR9902* set equal to one for observations associated with changes from 1999 to 2002, and *YR0206* set equal to one for observations associated with changes from 2002 to 2006. These two variables pull out conditional average changes in the dependent variable for each period. The crisis period specification includes just one constant term, *YR0610*.

Finally, Laeven (2002b) and Laeven and Levine (2009) show that banks with more concentrated ownership tend to take on more risk. Laeven and Levine go further and show that the relation between bank regulation and bank performance varies with ownership concentration: concentrated ownership tends to exacerbate the risk taking incentives of deposit insurance. With much work, Laeven and Levin calculate the cash flow rights of the largest shareholder. We do not have these data, so instead we use the percent of shares owned by the largest shareholder (voting rights as opposed to cash flow rights). Laeven and Levine note that these two measures of ownership are highly correlated (2009, p. 262). Unfortunately, Bankscope does not systematically report these data until 2006. Therefore, we can only include the level of shares owned by the largest shareholder as of the middle of the sample period, *Largest_Shldr*. The bottom row of

Table 3 shows that the average value of the *Largest_Shldr* variable is 20.2 (21.4) in the stable (crisis) period. The value of *Largest_Shldr* ranges from a minimum of 0.00 to a maximum of 81.1.

5. Effects of regulations on banks' performance

5.1 Panel regression results for the stable period

Table 4 reports seven panel regressions, one for each of the seven measures of bank performance: leverage; nonperforming loans; interest revenue to assets; interest expense to assets; operating expenses to assets; *ROE*; and the ratio of the bank's market value to its book value of equity. We estimate the regressions using first differences of the dependent and independent variables (represented by "D( )"), unless otherwise stated, and cross section weights. For each regression, the table reports the coefficient estimates with p-values in parentheses, the weighted and unweighted R^2, the test statistics for a series of F-tests of whether specified sets of coefficients are redundant, and the standardized regression coefficient for a one standard deviation increase in the change in deposit insurance. Coefficient estimates and F-statistics significant at the five or one percent level are in bold type. For the F-tests, *, **, and *** signify significance at the ten, five and one percent levels, respectively.

We start our series of hypothesis tests (using the F-statistics reported at the bottom of Table 4) by examining whether the value-maximizing model of banking theory helps us to understand the behavior of the banks in our sample. We do this using the F-tests in the row labeled "7 model variables = 0". For each performance measure, this F-statistic tests the null hypothesis that the coefficients of the seven variables from the

value-maximizing model are jointly zero. These are the seven variables in Table 4 in the "Model variables" category. Reading across the columns we see that the value-maximizing model has significant F-statistics for all of the banks' performance measures except leverage.

Inclusion of the model variables significantly affects inferences about the effects of deposit insurance. If we run the regressions without the model variables, still including *Assets(-1)* since it is the most common bank-specific variable included in comparable studies (see Table 1), then the *DepIns_Reg* coefficient estimate loses significance in the interest revenue, interest expense, and *ROE* regressions. Coefficient estimates for several of the interaction terms with *DepIns_Reg* also change signs and/or significance levels. Armed with the knowledge that the value-maximization model helps to explain the behavior of banks, we use it as the framework to conduct our tests.

Next, we test whether it is important to control for simultaneous changes in other regulations. The F-test "3 "Chg other Reg" variables = 0" indicates that these three variables are jointly significant in all regressions except *ROE* (*MVE/BVE* is significant at ten percent).

Now, we inquire as to whether deposit insurance affects value-maximizing banks' financial performances. We do this in three steps. First, we look at the coefficient of deposit insurance D(*DepIns_Reg*) by itself. We find that increases in deposit insurance lead banks to increase their leverage, make more risky loans, have greater interest revenue and expense and lower operating expense. We find no effects on ROE or the ratio of *MVE/BVE*.

These findings are in textbook alignment with the moral hazard aspect of greater deposit insurance coverage. As the deposit insurance agency increases the moral hazard aspects of deposit insurance, banks have the opportunity to increase their interest revenue by lending to riskier borrowers without having to bear the full cost of their increased risk exposure. Banks' riskier lending leads to higher interest revenue and expenses and more nonperforming loans. Banks reduce their operating expenses, which theory says is due to them reducing their monitoring. Banks also increase their leverage.

For our second test of deposit insurance effects we use the F-statistics in the row labeled "Uniform Effects: 3 interactions = 0." The hypothesis being tested is whether the coefficient of deposit insurance varies across countries depending on characteristics of the countries, represented by the last three variables in the "Deposit insurance" category of Table 4. The results show that the effect of changes in deposit insurance varies across countries for nonperforming loans, interest expenses and operating expenses. The p-value for leverage is 0.08 and for *ROE* is 0.12. There are no significant cross-product effects for interest revenue and *MVE/BVE*. If the uniform-effects hypothesis described the data, all of the cross-product coefficient should be zero. Because the cross-product effects are not all zero, the data reject the uniform-effects hypothesis in favor of the institutions-matter hypothesis for three of the seven performance measures.

Our third test of the effects of changes in deposit insurance uses the results in the row labeled "5 *DepIns_Reg* variables = 0." These tests combine the direct effects of deposit insurance with the indirect effects that vary across countries and banks. They test whether the five variables in the "Deposit insurance" category affect the regression results. Our main finding is that deposit insurance affects all of the measures of bank

performance (*ROE* at the ten percent level, p-value = 0.09), and the effects vary across countries. Banks' responses to changes in deposit insurance depend on concentrated share ownership in the bank, the country's economic freedom, rule of law and level of corruption. These results are consistent with the institutions-matter hypothesis.

We next examine the importance of each of the three institutional variables: economic freedom; rule of law; and corruption. Because each institutional variable enters as a stand-alone regressor and as a cross-product with deposit insurance, we use F-tests. The row labeled "2 *EcFreedom* variables = 0" tests the joint significance of *D(EcFreedom)* and *D(EcFreedom)*D(Depins_Reg)*. We observe that economic freedom affects banks' interest revenue and expense and operating expense, but not their risk taking. Looking at the economic freedom coefficients individually, we observe that banks in countries with greater freedom have lower interest expense, but higher operating expense. Economic freedom reduces the effects of deposit insurance on interest revenue, *ROE* and franchise values, while it exacerbates effects on operational expenses.

Going down to the next row labeled "2 *RuleLaw* variables," we see from the F-test that rule of law affects both measures of banks' risk taking and their operating expenses, but none of the other performance measures. Looking at the individual coefficients, we find that banks in countries with stronger rule of law have higher interest revenue and expense and lower operating expense and *ROE*. One of our more interesting findings is that the cross product terms show that rule of law reduces the effects of deposit insurance on banks' risk taking. Both leverage and nonperforming loans respond less to deposit insurance in countries with stronger rule of law.

The "2 *Corruption* variables" row shows that corruption has joint effects on banks interest revenue and expense and operating expense. Banks in countries with less corruption have higher interest revenue and *ROE*. Low corruption reduces the effects of deposit insurance on interest revenue, but increases its effect on operating expense.

The results show that institutional factors affect how banks' financial performance responds to changes in deposit insurance. Stronger rule of law reduces the risk increasing effects of deposit insurances. Economic freedom and corruption affect banks' revenues and costs, but not their risk taking.

Laeven and Levine (2009) show that banks respond differently to regulatory changes depending on the concentration of share ownership. The row labeled "2 *Largest_Shldr* variables = 0" shows that dominant shareholders affect each performance measure except interest revenue. When deposit insurance increases, banks with dominant shareholders have smaller increases in leverage and interest expense, smaller decreases in operating expense, and a reduction in both ROE and franchise value. By itself, larger holdings by the largest shareholder are associated with higher interest and operating expense, and franchise value.[22]

5.2 Discussion of stable period results

The standardized regression coefficients in the bottom row of Table 4 bring cohesion to the myriad results we present. In response to an increase in deposit insurance, banks:

[22] The *MVE/BVE* result is consistent with Caprio, Laeven and Levine (2007) who show that larger cash flow rights by the controlling owner boost bank valuations.

- Increase leverage;
- Have greater nonperforming loans;
- Have lower interest revenue, but by an economically small amount;
- Have greater interest expense;
- Have lower operating expense;
- Have no change in ROE;
- Have a decrease in market value of equity relative to book value of equity.

A theoretical story that is consistent with these results is that in response to deposit insurance increases banks increase both financial risk (leverage) and business risk (nonperforming loans) and reduce operating expense, which may be the result of reduced due diligence and monitoring.[23] Uninsured deposits require higher interest rates to compensate for their increased risk exposure. The offsetting changes in interest revenue and expenses leaves ROE unchanged. Because banks are not able to increase their ROE, but their risks increase, the market value of their equity decreases. To wit, investors perceive banks as taking on risks for which they are not compensated.

Prior papers link deposit insurance to bank franchise values through the effect of other regulations (Keeley (1990) via entry restrictions and Gonzalez (2005) via activity restrictions). Our results provide a direct transmission from deposit insurance to market value of equity via uncompensated risk.

5.3 Panel regression results for the crisis period

Table 5 presents results for the seven performance regressions estimated over the crisis period using changes from 2006 to 2010. We do not combine all observations into

[23] Our finding that during a relatively stable period of bank profits increased deposit insurance is associated with higher risk is consistent with the findings in Anginer, Demirguc-Kunt and Zhu (2012).

one regression because we are concerned not only about endogeneity (particularly poor bank performance causing changes in regulation), but also that the global financial crisis was so severe that the relation between performance and the explanatory variables, or all slope coefficients, could differ between the stable and crisis period. Due to the relatively small number of observations, 58 banks having 58 first difference observations between 2006 and 2010, we cannot include any of the value-maximizing model variables except bank size.

Our first observation is that during the crisis period leverage, interest revenue and expense, operating expense, and the market value of equity all increase with increases in deposit insurance.[24] Of particular interest, in contrast to the stable period, during the crisis period market values of equity increase for banks headquartered in countries that increase deposit insurance.

The uniform-effects hypothesis F-tests (the Row labeled "Uniform Effects: 3 interactions") show that during the crisis the responses of banks' leverage and nonperforming loans differ depending on the strength of the country's economic freedom, rule of law, and corruption. Note that the cross-product coefficients between economic freedom and deposit insurance are negative for six of the seven performance measures. During the crisis, banks increased their leverage as their deposit insurance increased, however the increase was smaller in countries with greater economic freedom. The *RuleLaw* and *Corruption* interaction terms suggest that the relation between regulation

[24] Anginer, Deniz, Asli Demirguc-Kunt, and Min Zhu. 2012 show bank risk and systemic fragility are lower in crisis period and conclude that the moral hazard effect dominates in good times while the stabilization effect dominates in turbulent times. Our finding of lower NPL is consistent with their risk finding

and bank risk is strongest in the strong-institution countries, opposite to what we found in the stable period.

The standardized regression coefficients show a substantial difference in the effects of regulations on bank performance between the stable and crisis periods. For example, even though higher deposit insurance is associated with higher leverage in both periods, the standardized regression coefficient in the stable period is 0.295 while in the crisis period it is 1.186. The other coefficients differ in size, and in some cases signs, between the stable and crisis periods.

The crisis period results are consistent with the endogeneity story: governments expanded the deposit insurance safety net in the countries that had banks with rapidly expanding leverage. Increased riskiness at these banks was accompanied by higher interest revenue, higher interest expense, and slightly lower operating expense, which led to higher ROE. The expanded safety net of deposit insurance was associated with higher market values of equity, in contrast with the stable period. The results indicate investors believed governments were supporting the banks according to the TBTF doctrine.

5.4 Robustness issues

5.4.1 Sample size

Our requirement that the sample banks have all data items allows us to interpret results across specifications with more certainty. We are not concerned that results in one specification may be driven by banks that are not included in another specification.

However, the requirement that sample banks have all data items leaves us with a sample of just 65 banks.

Our initial data screen, publicly-traded banks with international operations, total assets above $10 billion, and at least two contiguous years of any accounting data over 1999, 2002, 2006 and 2010 yields 91 banks. Table 6 reports the number of banks and observations, and the standardized regression coefficients for both our sample of 65 banks with all performance measures, as reported in Tables 4 and 5, and for specifications including all available data for the 91 banks with any accounting data.[25] For the stable period, the number of observations across these full sample specifications ranges from 58 banks/109 observations for nonperforming loans, *NPL*, to 78 banks/147 observations for leverage, *A/K*, and *ROE*. For the crisis period, the number of observations ranges from 60 for *NPL* to 68 for *A/K* and *ROE*.

The estimated effect of a one standard deviation increase in the deposit insurance index with these expanded samples gives a similar story. In the stable period, increases in deposit insurance are associated with higher risk (clearly with NPL, more weakly with leverage), changes in interest revenue are negligible while interest expense rises and overhead falls. In this sample, *ROE* does go up slightly, but still not enough to compensate for the added risk as *MVE/BVE* falls. In the crisis period, higher deposit insurance is still associated with markedly higher leverage and lower *NPL*, large increases in interest revenue and expense, marginal changes in overhead, higher ROE and

[25] For the stable (crisis) period, we have a maximum of 55 (17) additional observations. From these, we eliminate 9 observations for banks whose assets more than doubled or shrank by more than half. For these banks, their leverage, operating expenses, and *ROE* (when reported) exhibited unusually large changes that significantly affect coefficient estimates.

MVE/BVE. These results give us confidence that our sub-sample of 65 banks is representative of large banks in financially and economically developed economies.

5.4.2 Franchise value and risk

Keeley (1990) argues that a bank's franchise value affects its willingness to take on risk: banks will try to protect high franchise values by limiting their risk taking. Gonzalez (2005), with a sample of banks across 36 countries, examines the endogeneity of bank charter values, proxied with Tobin's *Q*, with bank risk taking, including fitted values for Q in his bank risk regressions. He finds that his measure of Q affects risk taking only in countries with relatively weaker regulations and relatively poor quality legal systems. Fitted values of Q do not significantly affect risk taking in countries with relatively strict regulations.

In untabulated results, we replicate Gonzalez' approach to include predicted franchise values in the risk regressions. We conduct a two-stage estimation with our data, first deriving fitted values of franchise value (*MVE/BVE*) from a regression that begins with the augmented value-maximizing regressors as shown in the last columns of Tables 4 and 5, but excludes the redundant variables as per the F-tests at the bottom of the tables. We then include the fitted values of *MVE/BVE* in the two risk specifications: leverage and nonperforming loans (columns 1-2 in Tables 4 and 5).

In the stable period estimations corresponding to the results in Table 4, the fitted *MVE/BVE* coefficient estimates are never significant at the ten percent level, consistent with results in Gonzalez. The deposit insurance coefficient estimates or significance levels are not affected. In the crisis period estimations corresponding to Table 5, the fitted

franchise value coefficient estimate is significant in only the *NPL* regression, but its coefficient is positive. The only interaction term estimate that differs from the original estimates is *Largest_Shldr*D*(*DepIns_Reg*) which goes from positive and significant to insignificant. Otherwise, the crisis period results do not vary when we include a fitted value for franchise value. We conclude that our risk regressions are correctly specified.

5.5 Wealth transfer

If proponents of the uniform-effects hypothesis were to force all countries to have the same deposit insurance coverage, some countries would have to increase deposit insurance coverage and some would decrease coverage. According to our estimated standardized regression coefficient for *MVE/BE* in the stable period, which is negative, stock prices of banks in countries that were required to increase deposit insurance would decrease, while stock prices of banks in countries that decrease deposit insurance would increase.

To gauge the economic significance of our results, we estimate, for each country, the change in that country's 2010 banking sector's market value if the country moved its deposit insurance index to the sample group's 2010 median level of six. Table 7 show the results. We group countries according to whether their deposit insurance index would increase (six countries), stay the same (six countries), or decrease (three countries). We exclude Sweden because the World Bank data set had no information on Sweden's 2010 deposit insurance. The second column in the table gives the change in the country's 2010 deposit insurance index to get to the median level of six. The third column gives the year

end 2010 market value of banks included in the FTSE banking index for that country, from Datastream.

We use the five deposit insurance coefficient estimates in the stable period *MVE/BVE* regressions of Table 4 to estimate the change in market value.[26] Those estimates suggest a one point increase in the deposit insurance index would be associated with a -0.112 drop in market value, assuming book values stay constant. The resulting estimates suggest that moving to median deposit insurance levels would result in a fall of approximately $300 billion in banking sector market value across the six countries that would expand deposit insurance and an increase of approximately $4.5 billion in banking sector market value across the three countries that would cut back deposit insurance. These changes equal approximately twenty percent of total banking sector market value across those countries.

6. Summary

An ongoing debate in international bank regulation is whether banks in different countries should be subject to the same set of regulations. Proponents of what we have termed the uniform-effects hypothesis say they should to provide fair consumer protection and reduce regulatory arbitrage. Proponents of what we have termed in the institutions-matter hypothesis say that the effects of regulations on banks vary depending on the strength of local institutions in the bank's home country such as corruption, economic freedom and the rule of law.

[26] Across the five coefficients, we sum the product of 1 (projected change in deposit insurance) x coefficient estimate x average value of the interaction term (e.g., average value for d(*Corruption*)).

We constructed our sample of banks to give the benefit of doubt to the uniform-effects hypothesis by considering only large, exchange-traded banks in economically and financially developed countries. Thus, we have attempted to remove differences that might arise when comparing large and small banks, when comparing publicly traded with privately held banks, and when comparing banks in developed countries with active financial markets and developing countries with relatively less developed financial markets. We find that even in the presence of relatively homogeneous banks and across countries with relatively strong institutions, changes in deposit insurance have dissimilar effects on banks across countries.

Taken separately and jointly, economic freedom, corruption and the rule of law affect how banks respond to changes in deposit insurance. Their disparate responses negate the uniform-effects hypothesis. During a period of relatively stable bank earnings, increases in deposit insurance induce banks to increase their risk taking by more than they are compensated by increased net income. As a result, increases in deposit insurance reduce banks' market values. Our estimates suggest that forcing countries to have the same deposit insurance coverage would entail a significant transfer of wealth from investors in banks in countries with increases in insurance to investors in banks in countries with decreases in coverage. More broadly, the results support the argument that institutions matter and one-size-fits-all financial regulations may impose unintended consequences on bank performance.

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Table 1: Summary of empirical papers that examine the effect of the institutional environment on the relation between deposit insurance and bank performance

Paper	Dependent variable	# of countries and banks, years covered	Bank- and Country-level Controls	Regulations Covered
Anginer, Demirguc-Kunt Zhu (2012)	Bank z-score, stock return volatility, conditional value at risk	96 countries 4,109 banks 2004-09	Bank: total assets, leverage, provisions, deposits, ROA Country: Pre-Crisis and Crisis dummy variables; supervisory quality, GDP per capita, GDP growth volatility, population, trade/GDP, stock market cap/GDP, private credit/GDP	Deposit insurance
Barth, Caprio, Levine (2004)	Country level bank development, performance, and stability (claims on private sector by deposit money banks)/ GDP, net interest margin, overhead, NPL, banking crisis dummy	107 countries 1999	Bank: NA Country: bank concentration, fraction of assets 50% or more foreign owned, government ownership of banks	Deposit insurance, bank activities, entry, and capital adequacy, supervisory powers, private sector monitoring
Cull, Senbet, Sorge (2005)	Country-level financial development: liquid liabilities/GDP, bank credit to the private sector/GDP	111 countries (Average over years after adoption of Dep Ins, 1960-2001)	Bank: NA Country: Indices for various aspects of deposit insurance; rule of law, and quality of bank supervision; inflation, real growth, % of state owned banks.	Deposit insurance

Table 1: Continued

Paper	Dependent variable	# of countries and banks, years covered	Bank- and Country-level Controls	Regulations Covered
Demirguc-Kunt, Detragiache (2002)	Country level: Probability of banking crises	61 countries 1980-97	Bank: NA Country: GDP: real growth and per capita level, external terms of trade, inflation, short term real interest rate, exchange rate depreciation, M2/foreign exchange reserves, credit growth, bureaucratic quality and delay, corruption, contract enforcement, law and order.	Deposit insurance, interest rate liberalization
Demirguc-Kunt, Huizinga (2004)	Sensitivity of bank interest rates (interest expense/bank debt) to bank risk (book value of capital/assets, pre-tax profits/assets, and liquid assets/assets), growth rate of deposits	51 countries ~2,500 banks 1990-97	Bank: overhead expenses/assets, short term debt/total debt Country: inflation, real GDP growth, real GDP per capita.	Deposit insurance
Demirguc-Kunt, Laeven, Levine (2004)	Net interest margin, overhead	72 countries, 1400+ banks 1995-99	Bank: total assets, liquid assets/total assets, equity/total assets, fee income, standard deviation ROA, market share Country: concentration, inflation, GDP growth, value equity shares traded/GDP, foreign and state ownership of banking assets, GDP per capita, KKZ institutions index, economic freedom, property rights	Entry, Activities, reserve requirements, banking freedom (Included in table even though it does not cover deposit insurance regulations because it still examines how local institutions affect the interactions of regulations and bank performance.)

Table 1: Continued

Paper	Dependent variable	# of countries and banks, years covered	Bank- and Country-level Controls	Regulations Covered
Distinguin, Kouassi, Tarazi (2011)	Bank Z-score, standard deviation ROA and ROE	10 Central and E. European countries 203 banks 1995-06	Bank: share of deposits from other banks, total assets, equity to total assets, net interest income to net operating income, foreign ownership > 50%. Country: growth GDP, law and order, power of deposit insurance authority, resolution procedures (=1 for combination bank liquidation and restructuring)	Deposit insurance
Gonzalez (2005)	Charter value (Tobin's q) Risk taking: NPL/ total loans, standard deviation of daily stock returns	36 countries, 251 banks 1995-99	Bank: total assets, tangible assets/total assets, investments in unconsolidated subsidiaries/total assets, total debt/total assets Country: civil vs common law, socialist dummy, law and order,	Deposit insurance, banking and finance restrictions (Heritage index)
Hovakimian, Kane, Laeven (2004)	Risk shifting = leverage, "fair" deposit insurance premium per dollar of deposits	56 countries, 390 banks 1991-99	Bank: Volatility of return on assets, Country: various aspects of dep insurance, economic freedom, corruption, political repression	Deposit insurance
Laeven (2002a)	Opportunity-cost value of deposit insurance	14 countries (7 = emerging markets), 144 banks 1991-98	Bank: ownership (dummy for > 50%) Country: GDP per capita, law and order	Deposit insurance

Table 1: Continued

Paper	Dependent variable	# of countries and banks, years covered	Bank- and Country-level Controls	Regulations Covered
Laeven (2002b)	Estimated cost of deposit insurance.	144 banks in 14 countries (7 = emerging markets) 1991-98	Bank: ownership forms (company, family, state, other financial institution, or widely held), net loans, loan growth, government and family ownership Country: GDP per capita, inflation, foreign bank assets, concentration, law and order	Deposit insurance
Laeven, Levine (2009)	Risk taking = z-score (plus variability of the bank's equity returns, earnings volatility ROA and leverage).	48 countries, 250+ banks (max279) 1996 - 2001	Bank: Ownership concentration (cash flow rights of largest shareholder), family and managerial ownership, large owners on board, revenue growth, market share, total assets, LLP, liquidity ratio Country: Per capita income, shareholder rights, concentration, M&Aactivity, enforcement of contracts	Deposit insurance, capital regs, and activity restrictions

Table 2: Summary statistics for country-level variables

	Regulatory Indices				Model Variables						Institutional Variables			
	DepIns	*Entry*	*Capital*	*Activities*	*Risk-_Free*	*Corp-_bond*	*Deposit-_rate*	*Market-_Return*	*GDP*	*CR*	*EcFree-dom*	*RuleLaw*	*Corrup-tion*	*Creditor*
Australia														
Avg 1999-06	0.000	1.667	0.000	6.333	5.597	6.740	3.533	11.902	6.765	0.683	77.067	1.750	8.300	1.000
2010	6.000	0.000	0.000	7.000	5.090	7.290	4.210	7.008	7.647	0.868	82.600	1.770	8.700	1.000
Austria														
Avg 1999-06	5.667	0.000	0.667	9.667	4.043	4.137	2.400	12.503	4.070	0.841	69.133	1.867	8.000	3.000
2010	8.000	1.000	1.000	10.000	2.470	2.670	1.180	19.377	3.678	0.609	71.600	1.790	7.900	3.000
Belgium														
Avg 1999-06	3.333	0.333	2.167	7.667	2.873	7.300	2.267	-2.524	4.087	0.802	68.467	1.233	6.567	2.000
2010	6.000	1.000	2.000	8.000	0.320	3.800	0.600	13.387	4.005	0.848	70.100	1.400	7.100	2.000
Canada														
Avg 1999-06	4.667	0.000	5.000	8.667	3.780	6.360	1.833	13.653	5.665	0.674	74.100	1.723	8.900	1.000
2010	5.000	1.000	2.000	8.000	0.600	4.730	0.100	18.109	6.254	0.660	80.400	1.790	8.900	1.000
Finland														
Avg 1999-06	4.000	4.333	2.000	8.000	4.493	4.567	1.903	48.562	4.432	0.912	70.067	1.943	9.700	1.000
2010	5.000	1.000	0.000	8.000	3.010	2.300	1.900	25.256	4.035	0.941	73.800	1.970	9.200	1.000
France														
Avg 1999-06	2.333	2.667	1.667	9.000	2.973	4.670	2.700	16.402	3.801	0.492	60.933	1.327	6.767	0.000
2010	6.000	0.000	0.000	5.000	0.380	3.050	2.700	10.263	2.211	0.622	64.200	1.540	6.800	0.000
Germany														
Avg 1999-06	4.667	2.667	3.000	9.667	2.977	5.313	2.567	8.220	2.542	0.645	70.100	1.650	7.767	3.000
2010	6.000	0.000	0.000	9.000	2.740	3.820	1.060	21.766	4.114	0.678	71.100	1.630	7.900	3.000
Italy														
Avg 1999-06	5.333	0.000	3.333	5.333	3.150	5.667	1.467	10.167	3.651	0.615	62.133	0.580	4.933	2.000
2010	6.000	1.000	2.000	6.000	1.130	4.000	1.330	-2.648	1.870	0.700	62.700	0.380	3.900	2.000
Netherlands														
Avg 1999-06	7.000	0.333	3.000	10.000	4.433	3.667	2.833	7.899	5.214	0.904	73.400	1.733	8.900	2.000
2010	8.000	0.000	0.000	9.000	2.990	3.100	1.100	12.079	2.960	0.897	69.400	1.810	8.800	2.000

	Regulatory Indices				Model Variables						Institutional Variables			
	DepIns	*Entry*	*Capital*	*Activities*	*Risk-_Free*	*Corp-_bond*	*Deposit-_rate*	*Market-_Return*	*GDP*	*CR*	*EcFree-dom*	*RuleLaw*	*Corrup-tion*	*Creditor*
Norway														
Avg 1999-06	6.000	1.000	1.500	7.000	5.213	5.400	4.900	22.343	6.395	0.723	66.900	1.927	8.733	2.000
2010	5.000	3.000	0.000	8.000	2.770	4.600	2.000	12.501	7.124	0.755	64.400	1.920	8.600	2.000
Portugal														
Avg 1999-06	5.000	2.000	1.000	5.667	4.567	5.133	2.600	9.824	5.414	0.699	64.267	1.163	6.533	1.000
2010	7.000	2.000	1.000	8.000	5.400	3.100	3.100	0.226	2.440	0.785	69.600	1.030	6.000	1.000
Spain														
Avg 1999-06	6.000	0.333	0.333	9.333	3.203	4.667	2.367	14.757	7.645	0.683	65.533	1.187	6.833	2.000
2010	6.000	0.000	0.000	10.000	1.690	7.200	2.430	-9.068	0.823	0.648	72.400	1.180	6.100	2.000
Sweden														
Avg 1999-06	6.000	2.000	4.667	7.000	3.173	4.647	1.933	23.847	5.326	0.733	67.833	1.820	9.300	2.000
2010	NA	NA	NA	0.000	0.500	5.300	0.950	29.215	7.027	0.767	81.100	1.950	9.200	2.000
Switzerland														
Avg 1999-06	6.667	0.333	1.333	9.333	1.157	3.317	0.933	4.115	2.872	0.917	78.333	1.890	8.833	1.000
2010	5.000	0.000	0.000	12.000	0.030	2.450	0.100	6.246	2.786	0.868	75.000	1.780	8.700	1.000
UK														
Avg 1999-06	5.667	1.000	0.333	11.333	4.517	5.747	1.750	6.111	5.610	0.473	78.433	1.713	8.633	4.000
2010	4.000	1.000	1.000	11.000	0.500	4.670	0.230	19.513	4.330	0.652	76.500	1.770	7.600	4.000
US														
Avg 1999-06	6.333	1.000	2.333	4.667	3.663	7.313	4.067	5.957	5.269	0.516	78.767	1.543	7.500	1.000
2010	4.000	1.000	2.000	6.000	0.130	6.180	0.310	16.543	4.216	0.599	78.000	1.600	7.100	1.000

Table reports the average value of the control variables at the country level across 1999, 2002, and 2006, and the value for 2010 for 16 countries identified by Demirguc-Kunt and Levine (2001) as financially and economically developed. Regulatory indices are from the World Bank, Bank Regulation and Supervision Data Sets. Breakdowns of the indices are provided in Appendix B. Institutional variables include: *EcFreedom* from the Heritage Foundation, *RuleLaw* (from the World Bank World Governance Indicators), *Corruption* (from Transparency International's Survey of Political Corruption), and *Creditor* for creditor's rights (from La Porta et al.1998). Model-based variables include: *Risk_Free* (government short term T-bill rate, from Datastream), *Corporate_Bond* (Corporate bond yield, middle rate, from Datastream), *Deposit_Rate* (bank deposit rates, from Economist Intelligence Unit, from Datastream), *Market_Return* (annual return on Datastream total stock market index, from Datastream), *GDP* (nominal GDP, from Datastream), and CR for concentration ratio (the ratio of the sum total assets of the 4 largest bank institutions (defined as commercial banks, saving banks, cooperatives and real estate banks) in the country to the sum of total assets for the 20 largest banking institutions in the country, from Bankscope). See text for alternative sources for missing value.

Table 3: Summary statistics for bank-specific variables

	Stable period: 1999-2006				Crisis period: 1996 - 2010			
	Levels		First differences		Levels		First differences	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
A/K	20.519	6.855	0.141	4.968	20.602	11.599	-0.843	7.563
NPL	0.018	0.020	-0.003	0.019	0.034	0.027	0.020	0.022
IR/A	0.050	0.012	-0.004	0.012	0.035	0.016	-0.012	0.012
IE/A	0.030	0.010	-0.002	0.011	0.018	0.013	-0.012	0.011
OE/A	0.021	0.007	-0.003	0.005	0.017	0.008	-0.002	0.004
ROE	0.139	0.068	0.009	0.086	0.091	0.075	-0.072	0.080
MVE/BVE	1.916	0.774	0.090	0.851	1.107	0.675	-1.045	0.675
Assets(-1)	282.55	346.39	109.75	182.16	461.89	474.71	114.31	157.24
Largest_Shldr	20.217	17.604			21.410	19.956		

Table reports summary statistics for financial statement variables for 65 banks, headquartered in 16 countries identified by Demirguc-Kunt and Levine (2001) as financially and economically developed, with total assets greater than US $10 billion, and financial statements in Bankscope (with all variables reported) and stock market data in Datastream available for at least two of the three years in the stable period: 1999, 2002 and 2006 (54 of the 65 banks), or for both 1996 and 2010 in the crisis period (58 of the 65 banks). *A/K* equals the ratio of average assets to average net worth. *NPL* equals the ratio of impaired loans to gross loans. *IR/A* equals the ratio of interest revenue to average assets. *IE/A* equals the ratio of interest expenses to average assets. *OE/A* equals the ratio of wages and other overhead expenses to average assets. *ROE* equals the ratio of net income after tax to net worth. *MVE/BVE* equals the ratio of market equity to book equity. *Assets(-1)* equal gross total assets in billions of dollars, lagged one year. *Largest_Shldr* equals the voting shares owned by the largest shareholder. All financial statement data are from Bankscope and are winsorized to plus/minus 3 standard deviations.

Table 4: Panel regressions for changes in bank performance measures over stable period: 1999 – 2002 - 2006

	Risk Measures		Revenue and Cost Measures			Value Measures	
	A/K	*NPL*	*IR/A*	*IE/A*	*OE/A*	*ROE*	*MVE/BVE*
Control variables							
YR9902	-1.949	**-0.011**	**0.009**	**0.006**	0.001	**-0.030**	**-0.652**
	(.090)	**(.010)**	**(.005)**	**(.027)**	(.378)	**(.040)**	**(.001)**
YR0206	0.406	-0.007	0.002	**0.011**	**-0.008**	**0.052**	**0.981**
	(.775)	(.106)	(.482)	**(.000)**	**(.000)**	**(.000)**	**(.000)**
Creditor	-0.111	**0.005**	**-0.003**	**-0.003**	0.000	**-0.011**	**-0.242**
	(.779)	**(.000)**	**(.000)**	**(.000)**	(.555)	**(.000)**	**(.000)**
Largest_Shldr	0.024	0.0001	0.000	**0.0001**	**0.000**	0.000	**0.016**
	(.229)	(.042)	(.228)	**(.003)**	**(.001)**	(.137)	**(.000)**
D(EcFreedom)	-0.102	-0.002	0.000	**-0.001**	**0.001**	0.003	0.034
	(.675)	(.061)	(.620)	**(.032)**	**(.003)**	(.329)	(.359)
D(RuleLaw)	8.701	-0.002	**0.029**	**0.039**	**-0.010**	**-0.079**	-0.342
	(.068)	(.812)	**(.003)**	**(.000)**	**(.002)**	**(.046)**	(.549)
D(Corruption)	-0.445	-0.002	**0.006**	0.003	-0.001	**0.031**	-0.056
	(.740)	(.526)	**(.011)**	(.081)	(.079)	**(.009)**	(.713)
Change in other regulations							
D(Activities_Reg)	-0.553	**-0.005**	**0.003**	**0.002**	0.001	**0.012**	0.038
	(.163)	**(.000)**	**(.014)**	**(.028)**	(.104)	**(.002)**	(.405)
D(Capital_Reg)	-1.381	**-0.008**	0.001	-0.002	**0.001**	0.008	-0.219
	(.181)	**(.006)**	(.597)	(.104)	**(.001)**	(.437)	(.120)
D(Entry_Reg)	0.694	-0.001	**-0.002**	**-0.003**	**-0.001**	0.005	-0.084
	(.085)	(.631)	**(.030)**	**(.001)**	**(.001)**	(.346)	(.170)
Model variables							
D(Risk_Free)	-1.188	-0.004	**0.009**	0.001	**0.004**	0.020	**-0.495**
	(.391)	(.350)	**(.002)**	(.712)	**(.000)**	(.176)	**(.000)**
D(Corp_Bond)	0.680	0.003	0.000	**0.004**	**-0.004**	**-0.038**	-0.087
	(.424)	(.083)	(.925)	**(.001)**	**(.000)**	**(.000)**	(.251)
D(Deposit_Rate)	1.773	**0.008**	-0.003	0.004	**-0.003**	-0.028	0.195
	(.116)	**(.021)**	(.270)	(.136)	**(.001)**	(.063)	(.189)
D(Market_Ret - Risk_Free)	-0.035	-0.000	0.000	-0.000	**0.00001**	0.000	-0.001
	(.331)	(.119)	(.152)	(.287)	**(.000)**	(.710)	(.799)
D(Assets(-1))	**0.005**	**-0.00001**	-0.000	-0.000	0.000	**0.000**	-0.0004
	(.019)	**(.00)**	(.446)	(.479)	(.525)	**(.025)**	(.053)
D(CR)	-21.028	**-0.252**	0.056	-0.033	**0.036**	0.160	**-4.715**
	(.170)	**(.000)**	(.057)	(.163)	**(.000)**	(.341)	**(.033)**
D(GDP)	-0.378	**-0.007**	0.000	0.000	0.00	**0.014**	0.014
	(.449)	**(.000)**	(.696)	(.620)	(.303)	**(.011)**	(.780)
Deposit insurance							
D(Depins_Reg)	**3.243**	**0.011**	**0.005**	**0.004**	**-0.002**	0.015	-0.173
	(.000)	**(.000)**	**(.015)**	**(.016)**	**(.024)**	(.113)	(.123)
*Largest_Shldr*D(Depins_Reg)*	**-0.168**	0.0001	0.000	**-0.0001**	**0.0001**	**-0.001**	**-0.010**
	(.000)	(.070)	(.686)	**(.038)**	**(.000)**	**(.048)**	**(.045)**
*D(EcFreedom)*D(Depins_Reg)*	0.333	-0.0001	**-0.002**	0.000	**-0.001**	**-0.006**	**0.092**
	(.254)	(.921)	**(.001)**	(.779)	**(.000)**	**(.037)**	**(.005)**
*D(RuleLaw)*D(Depins_Reg)*	**-26.331**	**-0.139**	0.032	-0.023	**0.048**	0.180	-1.167
	(.036)	**(.000)**	(.142)	(.186)	**(.000)**	(.136)	(.438)
*D(Corruption)*D(Depins_Reg)*	1.237	-0.002	**-0.010**	-0.007	**-0.007**	-0.015	-0.024
	(.618)	(.770)	**(.050)**	(.054)	**(.001)**	(.614)	(.934)

Table 4: Continued

R^2							
Weighted, Adjusted	0.805	0.955	0.876	0.918	0.941	0.898	0.943
Unweighted	0.224	0.529	0.525	0.568	0.592	0.574	0.555
F-tests							
7 model variables = 0	1.12	**12.54*** **	**17.61*** **	**17.93*** **	**13.38*** **	**8.01*** **	**14.92*** **
3 "Chg other Reg" variables = 0	**4.25** **	**4.04** **	**7.75*** **	**13.79*** **	**8.39*** **	0.77	3.06*
Uniform Effects: 3 interactions = 0	2.56*	**18.78*** **	1.66	**7.34*** **	**29.79*** **	2.22	1.44
5 *Depins_Reg* variables = 0	**11.824*** **	**27.31*** **	**5.91*** **	**5.76*** **	**21.88*** **	2.11*	**3.79*** **
2 *EcFreedom* variables = 0	3.28*	0.05	**11.20*** **	**22.68*** **	**8.94*** **	3.29*	0.57
2 *RuleLaw* variables = 0	**4.82** **	**18.11*** **	1.54	2.44	**51.88*** **	1.64	0.57
2 *Corruption* variables = 0	0.51	0.13	**6.85** **	**6.97** **	**13.93*** **	0.79	0.04
2 *Largest Shldr* variables = 0	**39.77*** **	**5.76** **	0.10	**9.31*** **	**11.09*** **	**5.01** **	**20.08*** **
3 "Chg other Reg" variables = 0	**4.25** **	**4.04** **	**7.75*** **	**13.79*** **	**8.39*** **	0.77	3.06*
Standardized regression coefficient from 1 st. dev. increase in D(*DepIns_Reg)*							
	0.295	**0.833**	**-0.039**	**0.192**	**-0.511**	-0.202	**-0.110**

Table reports panel regressions with cross section weights where bank performance measures are regressed against regulatory and control variables. Sample includes 65 banks, headquartered in 16 countries identified by Demirguc-Kunt and Levine (2001) as financially and economically developed, with total assets greater than US $10 billion, financial statements in Bankscope (with all variables reported) and stock market data in Datastream available for the stable period in panel A (1999 and 2002 or 2002 and 2006, 54 banks with 97 first difference observations). All variables, unless otherwise noted, are in first differences, represented by "D( )". *A/K* equals the ratio of average assets to average net worth. *NPL* equals the ratio of impaired loans to gross loans. *IR/A* equals the ratio of interest revenue to average assets. *IE/A* equals the ratio of interest expenses to average assets. *OE/A* equals the ratio of wages and other overhead expenses to average assets. *ROE* equals the ratio of net income after tax to net worth. *MVE/BVE* equals the ratio of market equity value to book equity value. *YR9902* and *YR0206* are dummy variables set equal to one for the first differences between 1999 and 2002 and between 2002 and 2006, respectively. *Creditor* equals the creditor rights index from La Porta et al. (1998). *Largest_Shldr* equals the voting shares owned by the largest shareholder. *EcFreedom* is from the Heritage Foundation. *RuleLaw* is from the World Bank World Governance Indicators. *Corruption* is from Transparency International's Survey of Political Corruption. *DepIns_Reg, Activities_reg, Entry_Reg*, and *Capital_Reg* are indices of bank regulations from the World Bank, Bank Regulation and Supervision Data Sets. Breakdowns of the indices are provided in Appendix B. *Risk_Free* rate is the government short term T-bill rate, from Datastream. *Corp_Bond* rate is the Corporate bond yield, middle rate, from Datastream. *Deposit_Rate* is bank deposit rates, from Economist Intelligence Unit, sourced from Datastream. *Market_Rate* is the annual total stock market index return from Datastream. *GDP* is nominal GDP, from Datastream. Concentration ratio, *CR*, equals the ratio of the sum total assets of the 4 largest bank institutions (defined as commercial banks, saving banks, cooperatives and real estate banks) in the country to the sum of total assets for the 20 largest banking institutions in the country, from Bankscope. *Assets(-1)* equal gross total assets in billions of dollars, lagged one year. P-values are reported below coefficient estimates in parentheses. Bottom row of both panels reports the net effect of a 1 standard deviation increase in D(*DepIns_Reg*), from the five coefficient estimates that include deposit insurance, with other coefficients evaluated at their mean, scaled by the standard deviation of the dependent variable. Coefficients and test statistics significant at the 5 or 1 percent levels are in bold type. Test statistics significant at 10, 5 or 1 percent are marked with *, **, and *** respectively.

Table 5: Panel regressions for changes in bank performance measures over crisis period, 2006 - 2010

	Risk Measures		Revenue and Cost Measures			Value Measures	
	A/K	***NPL***	***IR/A***	***IE/A***	***OE/A***	***ROE***	***MVE/BVE***
Control variables							
YR0610	**11.502**	0.029	**0.013**	**-0.011**	0.002	0.013	0.393
	(.001)	(.107)	**(.007)**	**(.001)**	(.111)	(.734)	(.204)
Creditor	0.248	**-0.006**	**-0.003**	0.002	**-0.001**	**-0.024**	**-0.474**
	(.763)	**(.043)**	**(.041)**	(.271)	**(.025)**	**(.039)**	**(.000)**
Largest_Shldr	**-0.113**	-0.0001	-0.000	-0.000	**0.00002**	**-0.002**	**-0.008**
	(.010)	(.035)	(.117)	(.105)	**(.018)**	**(.000)**	**(.000)**
D(EcFreedom)	**-1.072**	0.000	**-0.003**	**-0.002**	**-0.0005**	0.000	**-0.105**
	(.000)	(.976)	**(.000)**	**(.000)**	**(.000)**	(.815)	**(.000)**
D(RuleLaw)	-5.777	**0.145**	0.029	**0.079**	-0.003	**-0.270**	**-6.921**
	(.412)	**(.000)**	(.249)	**(.000)**	(.564)	**(.000)**	**(.000)**
D(Corruption)	**10.159**	-0.017	**0.016**	0.007	**0.002**	**-0.050**	**-0.433**
	(.001)	(.164)	**(.003)**	(.090)	**(.010)**	**(.003)**	**(.000)**
Change in other regulations							
D(Activities_Reg)	**3.034**	-0.004	**0.003**	**0.003**	**0.001**	0.003	-0.042
	(.000)	(.057)	**(.000)**	**(.000)**	**(.012)**	(.472)	(.178)
D(Capital_Reg)	**4.286**	0.003	**0.008**	0.001	**0.001**	-0.002	0.024
	(.001)	(.631)	**(.000)**	(.288)	**(.001)**	(.815)	(.786)
D(Entry_Reg)	**1.534**	**0.00004**	**0.004**	0.001	0.000	0.004	**0.187**
	(.022)	**(.000)**	**(.001)**	(.115)	(.610)	(.458)	**(.003)**
Model variables							
D(Assets(-1))	**0.010**	-0.001	**0.00001**	0.000	**0.00001**	**-0.0001**	-0.000
	(.002)	(.806)	**(.000)**	(.193)	**(.000)**	**(.000)**	(.641)
Deposit insurance							
D(Depins_Reg)	**2.441**	-0.004	**0.007**	**0.003**	**0.001**	0.009	**0.195**
	(.000)	(.333)	**(.000)**	**(.001)**	**(.020)**	(.205)	**(.010)**
*Largest_Shldr*D(Depins_Reg)*	**0.042**	-0.00002	0.000	**0.0001**	**-0.00003**	**0.001**	**0.007**
	(.024)	(.337)	(.142)	**(.031)**	**(.012)**	**(.000)**	**(.000)**
*D(EcFreedom)*D(Depins_Reg)*	**-2.075**	0.001	**-0.003**	-0.001	**-0.0004**	**-0.008**	**-0.100**
	(.000)	(.788)	**(.000)**	(.058)	**(.005)**	**(.026)**	**(.008)**
*D(RuleLaw)*D(Depins_Reg)*	**55.841**	**-0.171**	0.012	**-0.030**	0.005	0.025	0.339
	(.000)	**(.000)**	(.592)	**(.024)**	(.187)	(.597)	(.765)
*D(Corruption)*D(Depins_Reg)*	-0.376	**-0.007**	-0.004	**-0.006**	-0.000	0.021	0.104
	(.685)	**(.005)**	(.138)	**(.009)**	(.824)	(.052)	(.425)
R^2							
Weighted, Adjusted	0.729	0.982	0.857	0.895	0.895	0.966	0.983
Unweighted	0.299	0.476	0.385	0.190	0.190	0.264	0.579

Table 5: Continued

	Risk Measures		Revenue and Cost Measures			Value Measures	
	A/K	*NPL*	*IR/A*	*IE/A*	*OE/A*	*ROE*	*Franchise Value*
F-tests							
Uniform Effects: 3 interactions = 0	**30.16*** **	**8.92*** **	1.09	1.35	1.35	2.74*	**3.87** **
3 "Chg other Reg" variables = 0	**5.50*** **	1.94	**12.04*** **	**7.56*** **	**7.56*** **	0.51	**25.95*** **
5 Depins_Reg variables = 0	**22.66*** **	**13.46*** **	**14.90*** **	**6.60*** **	**6.60*** **	**5.92*** **	**4.66*** **
2 *EcFreedom* variables = 0	**9.30*** **	0.22	0.09	0.05	0.05	**13.56*** **	0.01
2 *RuleLaw* variables = 0	**22.78*** **	**32.87*** **	0.20	0.92	0.92	**7.31*** **	**11.38*** **
2 *Corruption* variables = 0	**11.95*** **	0.64	**7.96*** **	**4.97** **	**4.97** **	**11.24*** **	**7.34*** **
2 *Largest Shldr* variables = 0	**7.06** **	2.86*	**4.32** **	**10.36*** **	**10.36*** **	**40.72*** **	**65.65*** **
Standardized regression coefficient from 1 st. dev. increase in D(*DepIns_Reg)*							
	1.186	**-0.425**	**1.441**	**1.016**	**-0.097**	**0.593**	**0.830**

Table reports panel regressions with cross section weights where bank performance measures are regressed against regulatory and control variables. Sample includes 65 banks, headquartered in 16 countries identified by Demirguc-Kunt and Levine (2001) as financially and economically developed, with total assets greater than US $10 billion, financial statements in Bankscope (with all variables reported) and stock market data in Datastream available for the the crisis period in panel B (2006 and 2010, 58 banks with 58 first difference observations). All variables, unless otherwise noted, are in first differences, represented by "D( )". *A/K* equals the ratio of average assets to average net worth. *NPL* equals the ratio of impaired loans to gross loans. *IR/A* equals the ratio of interest revenue to average assets. *IE/A* equals the ratio of interest expenses to average assets. *OE/A* equals the ratio of wages and other overhead expenses to average assets. *ROE* equals the ratio of net income after tax to net worth. *MVE/BVE* equals the ratio of market equity value to book equity value. *YR0610* is a constant term. *Creditor* equals the creditor rights index from La Porta et al. (1998). *Largest_Shldr* equals the voting shares owned by the largest shareholder. *EcFreedom* is from the Heritage Foundation. *RuleLaw* is from the World Bank World Governance Indicators. *Corruption* is from Transparency International's Survey of Political Corruption. *DepIns_Reg, Activities_reg, Entry_Reg*, and *Capital_Reg* are indices of bank regulations from the World Bank, Bank Regulation and Supervision Data Sets. Breakdowns of the indices are provided in Appendix B. *Risk_Free* rate is the government short term T-bill rate, from Datastream. *Corp_Bond* rate is the Corporate bond yield, middle rate, from Datastream. *Deposit_Rate* is bank deposit rates, from Economist Intelligence Unit, sourced from Datastream. *Market_Rate* is the annual total stock market index return from Datastream. *GDP* is nominal GDP, from Datastream. Concentration ratio, *CR*, equals the ratio of the sum total assets of the 4 largest bank institutions (defined as commercial banks, saving banks, cooperatives and real estate banks) in the country to the sum of total assets for the 20 largest banking institutions in the country, from Bankscope. *Assets(-1)* equal gross total assets in billions of dollars, lagged one year. P-values are reported below coefficient estimates in parentheses. Bottom row of both panels reports the net effect of a 1 standard deviation increase in D(*DepIns_Reg*), from the five coefficient estimates that include deposit insurance, with other coefficients evaluated at their mean, scaled by the standard deviation of the dependent variable. Coefficients and test statistics significant at the 5 or 1 percent levels are in bold type. Test statistics significant at 10, 5 or 1 percent are marked with *, **, and *** respectively.

Table 6: Comparison of standardized regression coefficients

	Risk Measures		Revenue and Cost Measures			Value Measures	
	A/K	***NPL***	***IR/A***	***IE/A***	***OE/A***	***ROE***	***MVE/BVE***
Panel A. Stable period 1999-2006							
Sub-sample							
No. of banks	54	54	54	54	54	54	54
No. of observations	97	97	97	97	97	97	97
St. Regression Coefficient for 5 *DepIns* variables	**0.295**	**0.833**	**-0.039**	**0.192**	**-0.511**	-0.202	**-0.110**
All public banks							
No. of banks	78	58	75	72	77	78	76
No. of observations	147	109	140	133	145	147	142
St. Regression Coefficient for 5 *DepIns* variables	**0.027**	**0.566**	**0.004**	**0.150**	**-0.124**	**0.119**	**-0.054**
Panel B. Crisis period 2010							
Sub-sample							
No. of banks	58	58	58	58	58	58	58
No. of observations	58	58	58	58	58	58	58
St. Regression Coefficient for 5 *DepIns* variables	**1.186**	**-0.425**	**1.441**	**1.061**	**-0.097**	**0.593**	**0.830**
All public banks							
No. of banks	68	60	66	65	67	68	67
No. of observations	68	60	66	65	67	68	67
St. Regression Coefficient for 5 *DepIns* variables	**1.007**	**-0.412**	**1.047**	**1.041**	**0.043**	**0.476**	**0.571**

Notes: Table provides sample size and standardized regression coefficients for specifications in Table 4. First three rows for each panel directly repeat numbers from Table 4. The last three rows for each panel provide comparable numbers for Table 4 specifications fit over all publicly listed banks for which data are available, give our initial Bankscope screens for banks, headquartered in 16 countries identified by Demirguc-Kunt and Levine (2001) as financially and economically developed, with total assets greater than US $10 billion, and financial statements in Bankscope and stock market data in Datastream available for at least two contiguous years for which we have Deposit Insurance data: 1999, 2002, 2006 and 2010.

Table 7: Estimated effect on the banking sector's 2010 market value if all sample countries moved to the median level of deposit insurance

Country	Change in 2010 Deposit Insurance Index to equal median value of 6	FTSE 2010 Bank Index market value US$B	Est. Change in bank market value US$B
Countries where Deposit Insurance index would rise and market value fall			
Canada	1	274	-30.7
Finland	1	3	-0.3
Norway	1	17	-1.9
Switzerland	1	119	-13.3
UK	2	344	-77.1
US	2	810	-181.5
- Total		1567	-304.8
Countries with no change in Deposit Insurance Index			
Australia	0	278	0
Belgium	0	8	0
France	0	123	0
Germany	0	55	0
Italy	0	85	0
Spain	0	148	0
Countries where Deposit Insurance Index would fall and market value rise			
Austria	-2	17	3.7
Netherlands	-2	1	0.3
Portugal	-1	5	0.5
- Total		22	4.5

Notes: Sample equals financially and economically developed countries as identified in Demirguc-Kunt and Levine (2001). We exclude Sweden because its Deposit Insurance regulations are not included in the World Bank 2010 Survey, New Zealand due to lack of data, and Japan due to a banking crisis during our sample period. The Deposit Insurance index is from the World Bank, Bank Regulation and Supervision 2010 Data Set. A breakdown of the index is in Appendix A. December 2010 FTSE bank index market values are from Datastream. Estimated effect is -0.112 per unit increase in Deposit Insurance, from coefficient estimates in Table 4, *MVE/BVE* regressions.

Appendix A: Construction of the regulatory indices

Source: World Bank, Bank Regulation and Supervision Data Sets (Original, 2003, 2007, and 2010).
http://econ.worldbank.org/WBSITE/EXTERNAL/EXTDEC/EXTRESEARCH/0,,contentMDK:20345037~pagePK:64214825~piPK:64214943~theSitePK:469382,00.html

Deposit Insurance Index: Higher values indicate more moral hazard.

1. Is there an explicit deposit insurance protection system? Yes =1
2. Is it funded by (check one) : the government, the banks, or both? Any Government = 1
3. Are premia collected regularly (ex ante)? Ex Post = 1
4. Do deposit insurance fees charged to banks vary based on some assessment of risk? No = 1
5. Is there a limit per person? No = 1
6. Is there formal coinsurance, that is, are depositors explicitly insured for less than 100% of their deposits? No = 1
7. Does the deposit insurance scheme also cover foreign currency deposits? Yes = 1
8. Are interbank deposits covered? Yes = 1
9. Does the deposit insurance authority by itself have the legal power to cancel or revoke deposit insurance for any participating bank? No = 1
10. Can the deposit insurance agency/fund take legal action for violations against laws, regulations, and bylaws (of the deposit insurance agency) against bank directors or other bank officials? No = 1
11. Who manages the insurance fund? Any Public = 1

Entry Restrictions Index: Higher values indicate fewer restrictions.

1. Is information on source of funds for capital required? No = 1
2. Can borrowed funds be used? Yes = 1
3. Legal submissions required for banking license: (For each one below, No =1)
    a. Draft by-laws
    b. Intended organization chart
    c. First 3-year financial projections
    d. Financial information on shareholders
    e. Background/experience of future directors
    f. Background/experience of future managers
    g. Sources of funds in capitalization of new bank
    h. Intended market differentiation of new bank

Activity Restrictions Index: Higher values indicate more activities permitted.

Permitted activities in 4 areas (securities, insurance, real estate, owning voting shares in nonfinancial firms) are classified as: prohibited (= 0 points), restricted (= 1 point), permitted (= 2 points), unrestricted (= 3 points).

Capital Restrictions Index: Higher values indicate more permissive/less restrictive requirements.

1. Does the ratio vary with a bank's credit risk?
2. Does the ratio vary with market risk?
3. Before minimum capital adequacy is determined, which items are deducted from capital
    a. Market value of loan losses
    b. Unrealized securities losses
    c. Unrealized foreign exchange losses

Each "no" answer gets 1 point; "under certain circumstance" gets ½ a point.

World Bank regulatory indices

		DepIns_reg	*Entry_reg*	*Capital_reg*	*Activities_reg*
Australia	1999	0	1	0	8
	2002	0	1	0	5
	2006	0	3	0	6
	2010	6	0	0	7
Austria	1999	5	0	0	11
	2002	5	0	0	9
	2006	7	0	2	9
	2010	8	1	1	10
Belgium	1999	3	0	0	7
	2002	2	1	1.5	7
	2006	5	0	5	9
	2010	6	1	2	8
Canada	1999	5	0	5	9
	2002	5	0	5	9
	2006	4	0	5	8
	2010	5	1	2	8
Finland	1999	4	7	2	9
	2002	3	4	2	8
	2006	5	2	2	7
	2010	5	1	0	8
France	1999	2	3	1	10
	2002	2	3	4	10
	2006	3	2	0	7
	2010	6	0	0	5

Germany	1999	4	5	3.5	11
	2002	4	2	3.5	9
	2006	6	1	2	9
	2010	6	0	0	9
Italy	1999	5	0	3	6
	2002	5	0	3	6
	2006	6	0	4	4
	2010	6	1	2	6
Netherlands	1999	7	0	3	10
	2002	6	0	3	10
	2006	8	1	3	10
	2010	8	0	0	9
Norway	1999				
	2002	5	0	3	9
	2006	7	2	0	5
	2010	5	3	0	8
Portugal	1999	5	2	2	7
	2002	5	2	1	6
	2006	5	2	0	4
	2010	7	2	1	8
Spain	1999	6	0	1	9
	2002	6	0	0	10
	2006	6	1	0	9
	2010	6	0	0	10
Sweden	1999	5	1	5	7
	2002	6	1	5	8
	2006	7	4	4	6
	2010				
Switzerland	1999	7	1	2	11
	2002	6	0	2	9
	2006	7	0	0	8
	2010	5	0	0	12
UK	1999	6	1	0	11
	2002	6	1	1	11
	2006	5	1	0	12
	2010	4	1	1	11
US	1999	6	2	2	4
	2002	7	1	3	5
	2006	6	0	2	5
	2010	4	1	2	6

Notes: Norway (Sweden) was not included in 1999 (2010) survey, so it does not have an index for that year. The 1999 survey only included 4 questions for Deposit Insurance. For the other questions, we use the 2002 survey values, so that changes from 1999 to 2002 only reflect changes in the 4 questions for which we have answers. If the survey has "not available" for the answer, we put in the value for the prior survey, if available.

Appendix B: List of 91 publicly traded banks with accounting data

Bank Name	Country	In either 3yr or 2010 subsample of firms with all data items
Australia and New Zealand Banking Group	AL	1
Bank of Queensland Limited	AL	1
Bendigo and Adelaide Bank Limited	AL	1
Commonwealth Bank of Australia	AL	1
Macquarie Group Ltd	AL	
National Australia Bank Limited	AL	1
St. George Bank Limited	AL	1
Westpac Banking Corporation	AL	1
Bank für Tirol und Vorarlberg AG-BTV (3 Banken Gruppe)	AU	
Erste Group Bank AG	AU	1
Oberbank AG	AU	1
Dexia	BL	1
Groupe Bruxelles Lambert	BL	
KBC Groep NV/ KBC Groupe SA-KBC Group	BL	1
Bank of Montreal-Banque de Montreal	CA	1
Bank of Nova Scotia (The) - SCOTIABANK	CA	1
Canadian Imperial Bank of Commerce CIBC	CA	1
Canadian Western Bank	CA	1
Laurentian Bank of Canada	CA	1
National Bank of Canada-Banque Nationale du Canada	CA	1
Royal Bank of Canada RBC	CA	1
Toronto Dominion Bank	CA	1
Merita Bank Plc	FI	
Pohjola Bank plc-Pohjola Pankki Oyj	FI	1
Sampo Plc	FI	
BNP Paribas	FR	1
Entenial	FR	
Le Crédit Lyonnais (LCL)	FR	
Natixis	FR	1
Société Générale	FR	1
Aareal Bank AG	GE	1
Baden-Wuerttembergische Bank AG	GE	
Commerzbank AG	GE	1
Deutsche Bank AG	GE	1
Dresdner Bank AG	GE	1
Landesbank Berlin Holding AG-LBB Holding AG	GE	1

Bank Name	Country	In either 3yr or 2010 subsample of firms with all data items
Banca Carige SpA	IT	1
Banca Monte dei Paschi di Siena SpA-Gruppo Monte dei Paschi di Siena	IT	1
Banco Desio - Banco di Desio e della Brianza SpA	IT	1
Banco di Sardegna SpA	IT	1
Exor Spa	IT	
Intesa Sanpaolo	IT	1
Rolo Banca 1473 SpA	IT	
UniCredit SpA	IT	1
Bank Mendes Gans NV	NL	
Fortis Bank (Nederland) N.V.	NL	
ING Groep NV	NL	1
SNS Reaal NV	NL	
Van Lanschot NV	NL	1
Fokus Bank ASA	NO	
Banco BPI SA	PO	1
Banco Comercial Português, SA-Millennium bcp	PO	1
Banco Espirito Santo SA	PO	1
BANIF SGPS SA	PO	1
Banco Bilbao Vizcaya Argentaria SA	SP	1
Banco de Sabadell SA	SP	1
Banco de Valencia SA	SP	1
Banco Pastor SA	SP	1
Banco Santander SA	SP	1
Bankinter SA	SP	1
Nordea Bank AB (publ)	SW	1
Skandinaviska Enskilda Banken AB	SW	1
Svenska Handelsbanken	SW	1
Credit Suisse Group AG	SZ	1
EFG International	SZ	1
GAM Holding AG	SZ	
Pargesa Holding SA	SZ	
UBS AG	SZ	1
Valiant Holding	SZ	
Vontobel Holding AG-Vontobel Group	SZ	1

Bank Name	Country	In either 3yr or 2010 subsample of firms with all data items
Barclays Plc	UK	1
Bradford & Bingley Plc	UK	
HSBC Holdings Plc	UK	1
Lloyds Banking Group Plc	UK	1
MBNA Europe Bank Ltd.	UK	
Merrill Lynch International Bank Limited (old)	UK	
National Westminster Bank Plc - NatWest	UK	
Paragon Group of Companies Plc	UK	
Royal Bank of Scotland Group Plc (The)	UK	1
Schroders Plc	UK	
Standard Chartered Plc	UK	1
Bank of America	US	
Bank One	US	1
BB&T	US	
Capital One	US	1
Citigroup	US	1
Fifth Third	US	
KeyBank	US	1
NYCommunity	US	1
Regions	US	1
US Bancorp	US	1