Financial Inclusion and Financial Stability: *Can Broader Use of Deposits Boost Resilience of Bank Funding?*[*]

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Abstract

In addition to idiosyncratic shocks, depositors can be hit by systemic shocks. Because depositors are heterogeneous, their response to systemic shocks can differ. Growth of bank deposits could thus be more resilient, and correlated withdrawals of deposits mitigated, if bank deposits are more diversified—that is, held by more persons. In this paper, the authors examine how the use of bank deposits before the global crisis affected the growth of bank deposits around the world during the crisis period, while controlling for relevant covariates. Measuring the use of bank deposits by the 2011 Global Findex, they find that a broader use of deposits can increase the resilience of bank deposit funding in times of financial and economic downturn.

Keywords: Use of Deposits, Global Findex, Deposit Growth and Withdrawals, Banking Sector Resilience, Global Financial Crisis.

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1. Introduction

From 2006 to 2009, the average real growth of global bank deposits declined by over 12 percentage points per year.[1] Upper-middle-income countries experienced the greatest declines of 15 percentage points on average. Deposit growth in individual countries such as Azerbaijan, Iceland, and Montenegro turned from 58 percent, 57 percent, and 94 percent in 2007 to systemic withdrawals of -2 percent, -1 percent, and -8 percent in 2009. Worsening macroeconomic fundamentals, rampant insolvency problems, and emerging crises could have explained much of the aggregate declines in deposit growth across countries. But could a more diversified deposit funding of the banking sector have mitigated the systemic declines in deposit growth? In other words, could a broader use of bank deposits among the population have made the systemic declines in times of the global crisis less severe, controlling for other important factors?

This paper investigates whether a *broader use* of deposits had a positive effect on the *growth* of bank deposits across countries during the global crisis. We analyze whether the use of bank deposits by a larger share of a country's population can help explain differences in the reduction in deposit growth over 2007–10 across our sample of 95 countries. We measure the use of deposits according to Demirguc-Kunt and Klapper (2012). We also examine the interaction between banking crises and the use of bank deposits to determine whether the possible stabilizing effect of a broader use of deposits could have been stronger in crisis-affected countries.

In the regression analysis, we condition on relevant control variables, including gross national income (GNI) per capita, growth in aggregate output, the population size, inflation,

[1] Global Financial Development Statistics of the World Bank; see also figure 1.

occurrence of a banking crisis, existence of explicit deposit insurance, a banking sector stability indicator, the banking sector liquidity position, banking sector concentration, the ratio of deposits to gross domestic product (GDP), the ratio of loans to deposits, and capital account openness, as well as the rate of deposit growth and change in the exchange rate. We address the problem of potential endogeneity by timing the control variables before 2007. Because the adopted measure of financial inclusion in deposits of Demirguc-Kunt and Klapper (2012) is from 2010, we instrument the measure by relevant variables from the Financial Access Survey of the International Monetary Fund (IMF) and by education and aging variables from the World Development Indicators (WDI) of the World Bank. As for the relevance of the latter, the general level of education and the share of young population in total population are assumed to positively affect financial literacy and financial inclusion, including the use of bank deposits. We estimate the regression by the general method of moments (GMM) using robust standard errors. We also check the robustness of our results with an alternative measure of our dependent variable.

We find that a broader use of bank deposits can significantly mitigate the drop in the growth of bank deposits (or deposit withdrawals) in times of financial and economic downturn. However, we reject the hypothesis that the mitigation effect could be particularly strong for crisis countries. This rejection is based on the estimated insignificant coefficient on the interactive term between the deposit use and the banking crisis dummy. Per capita income, population size, inflation, deposit insurance, aggregate resilience of the banking sector (*z*-score), and the openness of capital accounts—in addition to the use of deposits—are the most significant explanatory variables in our regressions, which show a satisfactory fit to the data. Our instrumental variables are validated by the exogeneity test, first-stage regression statistics, and

the test of overidentification restrictions. The results hold even when an alternative specification of the dependent variable—the standard deviation of deposit growth—is used.

Our paper tries to fill the existing gap in the empirical literature linking financial inclusion in deposits with financial (banking sector) stability and resilience. Although the literature postulates that an inclusive financial sector with a more diversified and stable retail deposit base could increase systemic stability, empirical research confirming existence of such a relationship, especially at the level of the entire financial system, is largely absent in the literature (GPFI 2012; Cull, Demirguc-Kunt, and Lyman 2012; Prasad 2010). Only Sarma and Pais (2011) show that greater financial inclusion is significantly correlated with the better health of the banking system, gauged by lower nonperforming assets.

Low-income savers tend to maintain steady financial behavior through the business cycle. Hence, during crises, deposits from low-income clients typically act as a continued source of funds even when other sources of bank financing dry up or become difficult to roll over (Hannig and Jansen 2010).[2] Indeed, the global crisis showed that stable retail sources of funding, in contrast with reliance on borrowed funds, can greatly enhance the soundness and resilience of financial institutions and reduce the volatility of earnings (Khan 2011; Hannig and Jansen 2010). Small customers thus provide big opportunities to mobilize stable deposits. Banking systems that focus on generating retail deposits can therefore achieve a more diversified and stable funding base that is less sensitive to changes in market interest rates and a bank's financial condition.

[2] According to the 2001 Survey of Consumer Finance in the United States, less than 40 percent of low-income households (the bottom decile of wealth distribution) own any safe assets such as checking or savings accounts. But those households that do, put all their assets in safe assets compared to the median households that allocate less than 5 percent of assets to safe assets (Campbell 2006).

In times of financial stress, all depositors can get anxious, withdraw their deposits, or even participate in a run on banks (Diamond and Dybvig 1983; Shin 2009). By the law of large numbers and given the heterogeneous preferences of depositors, correlated deposit withdrawals could be mitigated if bank deposits were more diversified. Indeed, researchers have found, controlling for size, that banks with more interconnected or larger depositors are more likely to experience a run (Iyer and Puri 2012; Huang and Ratnovski 2011). In contrast, retail banks with a higher share of core deposits tend to have a consistently lower exposure to systemic risk (De Jonghe 2010). Furthermore, in times of stress, insured retail depositors have proven to be a bank's most reliable funding source and, therefore, play an integral role in mitigating liquidity risk (OCC 2012). In addition, greater financial inclusion in savings can also enhance financial stability indirectly by providing individuals, households, and small firms with financial risk-managing tools. Greater use of deposits as a self-insurance tool can then enhance the resilience and stability of the real economy and thus the financial system that serves it (GPFI 2012; Cull, Demirguc-Kunt, and Lyman 2012; Khan 2011).

Our paper has important implications for exploiting synergies in financial policy. The G-20 has argued for global commitment both to advancing financial inclusion (the Maya Declaration and the Alliance for Financial Inclusion) and to enhancing financial stability at the global and country levels (the Financial Stability Board). However, striving to improve financial inclusion and stability at the same time could present a policy trade-off. There are prudential limits for advancing financial inclusion in credit, because not everyone is creditworthy or can handle credit responsibly—as we have learned most recently from the global financial crisis. But prudential limits may not exist for advancing financial inclusion in deposits. Hence, in contrast to policy trade-offs, policies generating synergies across financial inclusion and financial stability

could also be found and exploited. Our results suggest that advancing financial inclusion in deposits could be one such synergic policy that could advance financial inclusion and financial sector stability in sync.

2. Stylized Facts

In this section, we preview some stylized facts about the main variables of interest, that is, growth in bank deposits around the 2008 global financial crisis, as well as the use of and access to bank deposits before the crisis. The preview motivates some choices that we make for our regression analysis and further illustrates the extent of heterogeneity in the growth of bank deposits and financial inclusion in deposits across country income groups.

Consider the global growth in bank deposits first. Figure 1 shows that the median growth in bank deposits across countries dropped significantly from 2007 to 2009 by about nine percentage points and then recovered slightly in 2010. The drop in deposit growth was much more apparent among the countries with high growth in deposits prior to the 2008 crisis (13 percentage points; the third quartile) than in countries with lower precrisis growth (nine percentage points; the first quartile). In addition, some countries, such as Azerbaijan, Botswana, Iceland, Moldova, and Montenegro transitioned from the 75th percentile of countries with the fastest-growing deposits to the 25th percentile of countries with the slowest-growing (dropping) deposits. They generally experienced deposit withdrawals in 2009 and thus much larger declines in deposit growth than other countries (60, 31, 59, 45, and 102 percentage points, respectively).

[Figure 1 about here]

The timing of the peak and trough of deposit growth around the 2008 financial crisis varies notably across countries. While the global average suggests that the peak of global deposit growth was in 2007 and the trough in 2009, there is a significant heterogeneity across countries in peaks and troughs. Figure 2 shows that although 67 countries experienced the peak of deposit growth in 2007, 55 countries experienced the peak in 2006, and 43 experienced it in 2008. Similarly, 2009 was the year of the lowest deposit growth for 83 countries, but 52 others experienced the lowest growth only in 2010. These observations lead us to conclude that we need to allow for country-specific timing in calculating the drop in deposit growth in a given country around the 2008 global crisis. This variable will be our first main variable of interest and also our dependent variable in the regression analysis later in the paper.

[Figure 2 about here]

An interesting stylized fact to consider at this point is the maximum drop in deposit growth across countries that *did* experience and those that *did not* experience a banking crisis around 2008. Figure 3 shows the calculated drops in deposit growth for different country groups: High-income OECD countries (HIC-OECD), middle-income countries (MIC), and low-income countries (LIC).[3] Across all countries (the "ALL" bars in figure 3), there is no apparent difference in the maximum drop in deposit growth across crisis and noncrisis countries. The picture, however, becomes much more heterogeneous when countries are grouped by income.

[Figure 3 about here]

[3] We follow the World Bank classification of country income groups. See the Data Description section for details.

First, no low-income countries (LICs) experienced banking crises during 2006–10. Second, there is a large difference in the maximum drop in deposit growth between crisis and noncrisis countries in the group of middle-income countries (MIC): noncrisis countries experienced, on average, a 19-percentage-point drop in deposit growth, while crisis countries experienced a 53-percentage-point drop. Third, there is no significant difference in the maximum drop in deposit growth between crisis and noncrisis countries in the group of high-income countries (HIC). Interestingly, the data show a higher maximum drop for *noncrisi*s HICs than in *crisis* HICs, by about five percentage points. Our conjecture is that people in richer countries could diversify their savings portfolios much more than those in lower income countries, allocating their savings to investment in securities as well. When the 2008 crisis hit, the uncertainty about future returns and general risk aversion mounted. Hence, people in HICs, especially those living through a crisis, might have liquidated their investment in securities and used bank deposits as a safe haven propped by public deposit insurance. Overall, the maximum drop in deposit growth was the strongest in crisis-affected MICs and was very heterogeneous across all three income groups.

Next, consider financial inclusion in deposits before the 2008 crisis. Figure 4 (left panel) plots the median access to deposits using the Honohan (2008) index for all countries and their income groups. Similarly, figure 4 (right panel) plots the use-of-deposits measure of Demirguc-Kunt and Klapper (2012). The measures show a similar pattern, with generally low access to or use of deposits worldwide (the "ALL" column). Although people in HICs enjoy relatively high access to bank deposits, people in MICs and LICs face much greater challenges in accessing or using bank deposits (see also Allen et al. 2012).

In sum, countries within the MIC group show the greatest variation in both the maximum drop in deposit growth and the precrisis access to deposits. We can thus expect that most of the interaction between the access to deposits before the global financial crisis and the changing deposit growth in the immediate aftermath of the crisis could happen within the subsample of MICs. We will formally examine this link next, using a regression model, which controls for other factors that could significantly influence the effect of financial inclusion in deposits on the drop in deposit growth during the global financial crisis.

3. Regression Model

To formally analyze the link between financial inclusion in formal deposits prior to 2007 and the growth in deposits during 2007-10, we use a regression model of the following form:

$$y_i = \alpha(DKK_i) + \beta X_i + \varepsilon_i, \quad (1)$$

where y_i is the maximum drop in bank deposit growth between 2006 and 2010; DKK_i is the measure of financial inclusion in the use of formal deposits of Demirguc-Kunt and Klapper (2012)—that is, the share of people (15 years and older) that saved with formal financial institutions in 2010 (*DKK*); X_i is a vector of control variables; ε_i is a disturbance; and the subscript *i* stands for countries.

The vector of control variables, X_i, includes a constant; the population size (*popsize*); GNI per capita (*gnipc*); the consumer price index for inflation (*inflation*); a dummy variable taking the value of 1 if the country experienced a banking crisis during 2007-10 and 0 otherwise (*bc*); an interaction term between banking crisis and the use of bank deposits (*DKK*bc);* GDP growth corresponding to the time period over which the maximum drop in deposits happened

(*gdpgr*); a dummy variable taking the value of 1 if the country had explicit public deposit insurance and 0 otherwise (*depins*); the aggregate *z*-score for the banking sector as a measure of financial stability (*z-score*); the ratio of liquid assets to deposits and short-term funding as a measure of the banking sector's liquidity position (*liquidity*); the share of the three largest banks' assets in total banking sector assets as a measure of banking sector concentration (*concen*); deposits-to-GDP (*depgdp*) ratio; loan-to-deposit ratio [4] (*loantodeposit*); and capital account openness (*kaopen*). We discuss the expected effects of the control variables next, before explaining how the issue of possible endogeneity of some variables is handled, as well as the estimation method employed.

We expect that countries with larger populations could be less prone to herd behavior because it simply takes more people to converge on the same idea and the timing of deposit withdrawals. Richer countries (with higher GNI per capita) will have more savings per person so that deposit withdrawals by the same number of people will be relatively higher in richer countries. Countries that experienced a banking crisis around 2008 could have experienced larger deposit withdrawals because of possible contagion-like effects and self-fulfilling runs on banks. The slowdown in deposit growth could have been particularly strong in countries that had experienced a slowdown in GDP growth or an increase in inflation over the same period. If a country has explicit deposit insurance it is less likely, all else being equal, to experience panic withdrawals of deposits, especially those that are smaller and fully insured.

Banking sectors with higher *z*-scores are perceived by depositors as more stable and could experience relatively smaller deposit withdrawals. Similarly, banking sectors with a stronger liquidity position have a greater capacity to meet deposit withdrawals of a given size

[4] The loan-to-deposit ratio approximates the share of wholesale funding (IMF 2013).

and could thus be more credible and less prone to deposit withdrawals. Highly concentrated banking systems could be more prone to deposit withdrawals because of possibly greater interconnectedness and thus greater fears of depositors about possible transmission of problems from one bank to another and subsequently to the whole system. Banking systems with higher deposits per GDP are susceptible, other conditions remaining the same, to greater deposit withdrawals simply because they have greater risk exposure in this regard.

Depositors may consider banks with higher loan-to-deposit ratios better monitored and safer than banks with very low loan-to-deposit ratios because of the covenants and the resulting external monitoring that credit financing of banks entails. Note that the financing position of banks with high loan-to-deposit ratios can still be more vulnerable overall, as informed creditors are typically the first to run. However, here we analyze the resilience (stickiness) of bank deposit funding, not the entire financing of the bank. Finally, countries with greater capital account openness are more diversified, more integrated in global finance and are thus better protected against domestic shocks; but they are also more exposed to foreign shocks, including negative spillovers of crises in the region or capital-sending countries.

We handle the possible endogeneity of explanatory variables by dating most of them prior to the crisis. Since our measure of the use of formal deposits of Demirguc-Kunt and Klapper (2012) is dated 2010, we must find suitable (valid and relevant) instruments for the variables to address the potential endogeneity problem. Once suitable instruments are found, we estimate the regression model by GMM using robust standard errors.

Because the 2010 Demirguc-Kunt and Klapper variable measures financial inclusion in the use of deposits, we use two types of instrumenting variables: (1) one type measuring the

extent of access to finance (the supply of finance); and (2) another type measuring the general level of education that is assumed to improve financial literacy and the demand for finance. We have considered the entire range of financial access variables in the IMF's Financial Access Survey (FAS) database. However, because of the varying country coverage of individual series and their relevance, we use only two variables: automatic teller machines (ATMs) per 1,000 square kilometers and ATMs per 100,000 adults. For measuring the level of education, we have considered several World Development Indicators and use the percentage of population age 25 and older with completed secondary schooling in 2005 and young population (0–14 years) as a percentage of working-age population (15–64 years)—the so-called age dependency ratio. All the instruments are dated before 2007 and assumed weakly exogenous and thus valid. We follow Stock, Wright, and Yogo (2002) and Stock and Yogo (2005) in checking that our instruments are relevant and that our GMM regression does not suffer from the weak instrument problem. A later section with additional statistics and robustness tests performs statistical tests of instrument exogeneity, first-stage regression diagnostics, and the test of overidentifying restrictions.

4. Data Description

This paper examines the relationship between financial inclusion in (the use of) bank deposits and the stability of bank deposits during the 2008 global financial crisis. We thus focus on analyzing the dynamics of bank deposit growth between 2007 and 2010, which covers both precrisis years and postcrisis years. We calculate the year-on-year growth rate of bank deposits for 173 countries using data on outstanding deposits of commercial banks from the IMF's FAS database. We choose this indicator over other measures of total deposits to ensure maximum

cross-sectional coverage (number of countries covered) and best consistency across countries. We observe a variation in the year-on-year rate of deposit growth, as many countries experienced more than one peak or more than one trough during the period that we examine. To capture the potential impact of the 2008 crisis, we define the maximum drop in deposit growth in the following manner: first, we find the minimum growth in deposits that a country experienced between 2007 and 2010 and mark the year when it occurred; then we find the maximum growth in deposits the country had experienced before that year. The difference between the maximum growth and the minimum growth then constitutes the maximum drop in the growth of deposits—our dependent variable across countries.

We also check the legitimacy of this dependent variable for measuring the stability of bank deposits by using the standard deviation of deposit growth over 2006–10 as an alternative dependent variable. However, the maximum drop in deposit growth is our preferred dependent variable because it better reflects the abrupt declines in deposit growth rather than considering the boosts and busts equally. Detailed descriptions of variables, data sources, and data availability are provided in table A1.

As the measure of financial inclusion in the use of formal deposits, we use the indicator "percentage of adult population who saved at a formal financial institution in the past year" from the Global Financial Inclusion Database (Demirguc-Kunt and Klapper 2012). Earlier attempts at measuring access to bank deposits include Beck, Demirguc-Kunt, and Martinez Peria (2007) and Honohan (2008). We do not use these measures because they are either available for much fewer countries or are composite measures that only indirectly measure financial inclusion in deposits and because they are highly correlated with the ratio of deposits to GDP, which we use as a control and could encounter a severe multicollinearity problem.

There has been continued effort in constructing a comprehensive composite index for financial inclusion: Sarma and Pais (2011) constructed an index of financial inclusion through a multidimensional approach, incorporating three dimensions—accessibility (number of bank accounts per 1,000 population), availability (bank branches and ATMs per 100,000 population), and use (volume of credit plus deposit relative to GDP); Amidzic, Massara, and Mialou (2014) used factor analysis to identify key dimensions (availability and use) of financial inclusion and the weight for each dimension, focusing on a proxy very similar to that of Sarma and Pais (2011). A substantial challenge in constructing a comprehensive composite index for financial inclusion is finding a relevant and comprehensive proxy for the dimension of use. Honohan (2008) covers 159 countries but is often criticized for using extrapolated data for the dimension of use. A popular indicator for use is "depositors with commercial banks per 1,000 adults" from the International Monetary Fund's Financial Access Survey, but only 68 out of 190 countries have available data for 2007. Detailed descriptions of variables, data sources, and data availability are again listed in table A1.

We use indicators of growth in aggregate output, income per capita, inflation, and population to control for the economic growth during the global crisis period, for the difference in economic development, for the change in prices, and for the difference in the country size. The nominal GDP (henceforth, GDP), GNI per capita, inflation, and total population data were obtained from the World Bank's World Development Indicators (WDI) database, and the variables other than for inflation were log transformed. To control for the impact of GDP growth on deposit growth, we calculate the GDP growth over the period during which the deposit growth declined most in each country.

We included indicators for deposit insurance, bank stability, bank liquidity, banking concentration, the deposits-to-GDP ratio, the loan-to-deposit ratio, and capital account openness to capture the cross-sectional variation in financial sector structure, openness, development, and stability. Deposit insurance is a dummy variable indicating the existence of an explicit deposit insurance scheme as documented in Demirguc-Kunt, Karacaovali, and Laeven (2005). We use the banking system's *z*-score as the indicator for financial stability and the ratio of liquid assets to deposits and short-term funding as the indicator for bank liquidity. The data on both indicators were obtained from the World Bank's Global Financial Development Database (GFDD). Capital account openness is measured by the Chinn-Ito financial openness index (Chinn and Ito 2006). Banking concentration is approximated by the total assets of a country's three largest banks as the share of assets of all commercial banks in the country. The data for bank concentration, the loan-to-deposit ratio, and the deposits-to-GDP ratio were obtained from the World Bank's Financial Data database (FinStats). Summary statistics of all variables are provided in table A2, and pairwise correlations of variables are shown in table A3.

Given concerns that small island countries could have macroeconomic and institutional characteristics that are very different from those of other countries of the same income group, we removed such countries from our sample.[5] Our sample is further reduced to 95 countries for regression estimation due to data availability on banking sector indicators.

[5] The actual impact of excluding small island countries from the sample on the sample size used in the regression analysis is negligible since many of such countries do not have banking sector data available.

5. Estimation Results

This section discusses: (i) results of the first-stage (auxiliary) regression for the endogenous variable of interest (*DKK*), which measures financial inclusion in the use of bank deposits, and (ii) the results of the main regression that estimates the conditional (marginal) effect of *DKK* on the maximum decline in the growth (drop) in deposits during 2007–10.

5.1. First-Stage (Auxiliary) Regression

This subsection discusses the estimation results reported in table 1. All four considered instruments perform well individually, explaining between 12.6 percent and 33 percent of variation in our endogenous variable of interest (*DKK*): see the respective adjusted R-squared. However, when considered jointly, the young population (0–14 years) as a percentage of working-age population (15–64 years) (*pctyoung2006*) loses its significance and relevance as an additional instrument for *DKK*: see column (5). The parsimonious version of the auxiliary regression based on maximizing adjusted R-squared includes the number of bank accounts per 1,000 population (*atm1*), bank branches and ATMs per 100,000 population (*atm2*), and the percentage of population aged 25 and older with completed secondary schooling in 2005 (*yrschool2005*): see column (6). The loss of significance for *pctyoung2006* is due to the variable's high correlation with *yrschool2005* and *atm2* of 0.78 and 0.63 in absolute value. We thus use *atm1*, *atm2*, and *yrschool2005* as the instruments for *DKK* in the main regression.

[Table 1 about here]

5.2. Main Regression

This section discusses the baseline estimation results presented in table 2. When considered alone (column (1)), our financial inclusion variable (*DKK*) is significant at the 1 percent level in explaining variation in the maximum deposit growth across countries during 2007–10. It bears the expected negative sign, indicating the ability to support the resilience of growth in bank deposits.

[Table 2 about here]

When we condition on our set of control variables, *DKK* retains its significance at the 5 percent level, and its negative marginal effect increases to about -0.61 (column (2)). In addition to the set of control variables, we test the hypothesis that the possible mitigating (negative) effect of financial inclusion could be especially strong in crisis countries that experienced the largest systemic shocks. We find the latter hypothesis rejected by the data at common significance levels, consistent with earlier indications from figure 2.

There is a possibility that the drops in the rates of deposit growth are simply greater in countries that have experienced stronger growth in deposits. We test this hypothesis in column (3) and reject it at the common significance level. Note that the data sample shrinks for this test because of lower data availability. Furthermore, changes in the exchange rate (local currency units per U.S. dollar) could play a significant role in explaining deposit growth rates expressed in a local currency when a large share of the deposits is denominated in foreign currency. We test this hypothesis (see column (4)), again on a smaller sample due to data availability, and reject it. Also when considered jointly in one regression, deposit growth and exchange rate changes appear insignificant (column (5)). Note, however, that the data sample used for the estimation

reported in column (5) indicates that the mitigating effects of financial inclusion could be significantly stronger in some crisis countries. The data sample is skewed toward the upper MICs and HICs that experienced banking crises around 2008 more often than lower MICs and LICs.

Column (6) shows the parsimonious version of our estimated regression model using adjusted R-squared as the information criterion to maximize. *DKK* enters this parsimonious regression with a negative sign of -0.51, which is significant at the 5 percent level. The estimation results thus suggest that greater financial inclusion in the use of bank deposits can enhance banking sector stability by mitigating the vulnerability of bank deposit financing. Specifically, the estimated coefficient on the *DKK* variable indicates that a 10 percent increase in the share of people that have actively used bank deposits can mitigate the deposit growth declines (or deposit withdrawal rates) by about five percentage points. Recall that, on average, the maximum drop in deposit growth averaged 20 percent across countries and, in MICs that experienced a banking crisis around 2008, the drop averaged around 50 percent (figure 3). Also, note that the explanatory power of the regressions is satisfactory, with an adjusted R-squared of about 0.27. The conditioning set of variables thus appears to adequately test the relevance of using bank deposits for explaining declines in deposit growth during 2007–10.

The most important conditioning variables that consistently appear significant in explaining the declines in the growth of deposits during 2007–10 are the level of economic development (*gnipc*), population size (*popsize*), inflation rate (*inflation*), existence of deposit insurance (*dep_ins*), the aggregate resilience of the banking system (*z-score*), and capital account openness (*kaopen*). In effect, more developed countries suffered greater confidence shock and withdrawals of deposits during 2007–10 than less developed countries, which could contrast with the experience from previous banking crises. In the past 30 years, banking crises occurred more

often in emerging markets, whereas the recent global crisis predominantly hit advanced economies (Laeven and Valencia 2012).[6] A bigger population (*popsize*) was associated with relatively lower declines in deposit growth in our estimation**.** In contrast, deposit growth declined more sharply in countries with lower macroeconomic stability and higher inflation (*inflation*). The existence of an explicit deposit insurance (*dep_ins*) could have boosted trust in the banking systems and helped mitigate declines in deposit growth and deposit withdrawals. A higher *z*-score, the measure of banking sector resilience, significantly reduced the drop in deposit growth during 2007–10. Finally, greater capital account openness—and thus greater capital mobility—helped sustain greater deposit growth. Overall, the coefficients on all significant control variables bear the expected sign.

Recall that figure 3 indicates a possibly greater effect of financial inclusion in deposits on the stability of deposit growth in MICs than in LICs and HICs. We use this indication as a motivation for including and exploring the effect of an interactive term between *DKK* and income level in our baseline regression. We consider two different interactions of *DKK* with the GNI per capita (*gnipc*) and with an income group. For the latter, we consider five groupings of LICs, lower MICs, upper MICs, non-OECD HICs, and OECD HICs. However, neither of the two interactive terms appears significant at common levels.[7]

[6] The greater propensity of higher income countries to experience crises and busts in deposit growth could also explain why we have found the crisis dummy (*bc*) insignificant and income per capita significant in our regressions.
[7] Results available from the authors upon request.

6. Robustness Test

In this section, we test the relevance of our instruments for *DKK* in the context of our baseline parsimonious model reported in column (5) of table 2. We do so by running several diagnostics of the first-stage regression for the parsimonious model in column (5). The results are reported in table 3. The partial R-squared of the first-stage regression of the *DKK* is greater than 0.1, suggesting satisfactory relevance of the employed set of instruments for *DKK*. This satisfactory relevance is more formally confirmed by a robust *F*-test that rejects the hypothesis that the coefficients of the *am1*, *am2*, and *yrschool2005* are jointly equal to zero in the first-stage regression.

[Table 3 about here]

Table 3 also reports Hansen's *J*-test of overidentifying restrictions. The test does not reject the null hypothesis that the overidentifying restrictions are valid at common levels of significance. Although we have made an economic assumption that the employed instruments are weakly exogenous, we test this assumption using a statistical test of endogeneity. The test does not reject the null hypothesis that the instrumental variables are exogenous both jointly and individually at common levels of significance.

Next, we check the legitimacy of the dependent variable *drop in deposit growth* for measuring the stability of bank deposits by using *standard deviation of deposit growth* as an alternative dependent variable. Recall that we preferred the maximum *drop in deposit growth* as a more appropriate measure for analyzing the stability of bank deposits, since it distinguishes positive movements of deposit growth from negative movements of deposit growth during the

2007–10 period in which Emerging Markets and Developing Economies (EMDEs**)** in particular have experienced very heterogeneous developments in deposit growth.

We reestimate the main regressions using the standard deviation of deposit growth (volatility) as our dependent variable. All results from previous analysis hold (table A4), and we find the two indicators for the stability of banking system deposits highly correlated at 0.98.

7. Conclusion

This paper examined the effect of financial inclusion in bank deposits on the stability of deposit growth during the 2008 global financial crisis using a cross-sectional regression model for 95 countries. It found that a broader use of bank deposits among a country's population can enhance the resilience of deposit funding of the banking sector in times of financial stress. Specifically, the estimated coefficient on the variables measuring the use of deposits indicates that a 10 percent increase in the share of people that actively use bank deposits can mitigate any drop in deposit growth (or a deposit withdrawal rate) by about five percentage points. The enhanced resilience of bank funding can then support the overall financial stability of the banking sector and the entire financial system.

Our findings have important policy implications. Policy makers face trade-offs when deciding whether to focus on reforms that promote financial inclusion (such as greater use of credit) or reforms that improve financial stability (such as stricter prudential regulation). However, synergies between promoting financial inclusion and financial stability can also exist as shown in this paper. We recommend that policy makers focus first on taking advantage of such synergies in their framework for financial sector policy. This framework, typically

formulated in a national financial sector strategy, sets the development goals in finance, in view of systemic risk associated with achieving these goals and the risk preference of the country's government (Maimbo and Melecky 2015). We argue that enabling more people to actively use bank deposits could help both the people's pursuit of opportunities and the stability of the financial system as a whole. With proper regulation and oversight in place, initiatives such as Kenya's M-PESA and M-KESHO projects (Demombynes and Thegeya 2012) or South Africa's Mzansi accounts (Bankable Frontier Associates 2009) could serve as good examples of promoting a broader use of bank deposit accounts and enhancing the reliability of bank deposit funding at the same time.

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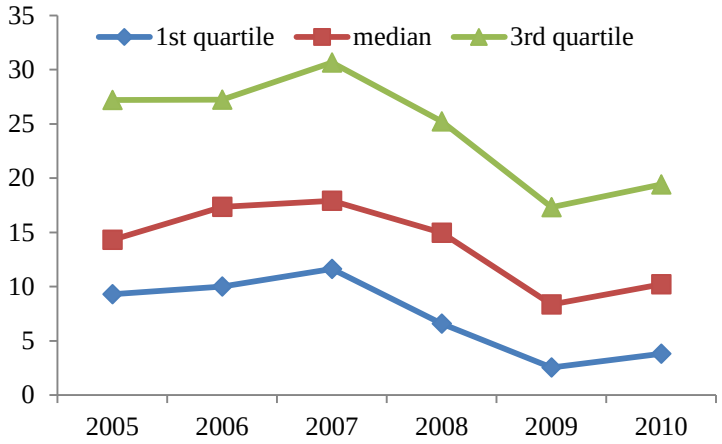
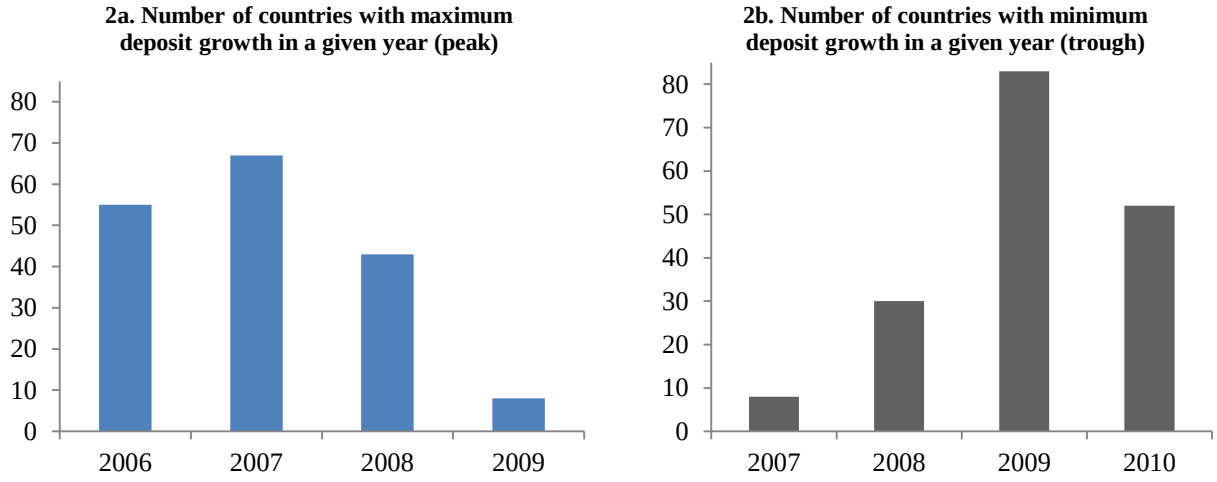
Figures and Tables in the Main Text

Figure 1 Global Growth of Bank Deposits, 2005–10



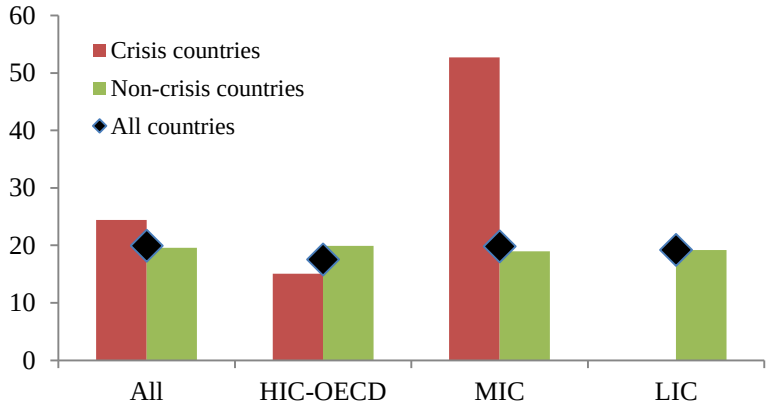
Source: FAS database.
Note: This figure displays the year-on-year percentage growth rate of outstanding deposits of commercial banks in national currency calculated for 173 countries.

Figure 2 Histogram of the Timing of the Peak (left panel) and Trough (right panel) in Deposit Growth in Individual Countries, 2006–10



Source: FAS database.

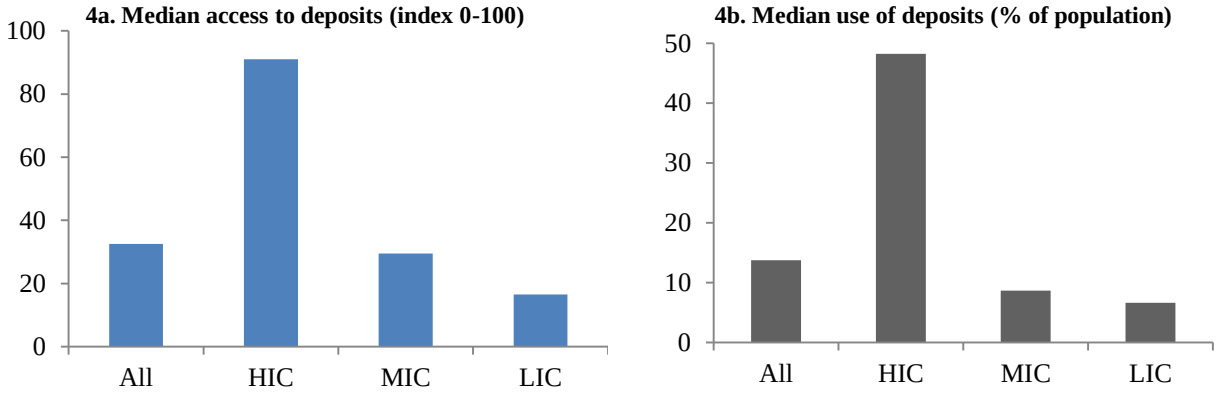
Figure 3 The Drop in Deposit Growth in Crisis and Noncrisis Countries, 2006-10



Source: FAS database; Laeven and Valencia 2012.

Note: The chart shows the median of the maximum drop in deposits growth, in percent. None of the LICs in authors' sample experienced banking crises between 2006 and 2010. HIC = high-income countries; OECD = Organisation for Economic C0-operation and Development; MIC = middle-income countries; LIC = low-income countries.

Figure 4 Access to Bank Deposits, 2005 (left panel), and the Use of Bank Deposits 2011 (right panel)



Source: Honohan 2008; Demirguc-Kunt and Klapper 2012.
Note: HIC = high-income countries; MIC = middle-income countries; LIC = low-income countries.

Table 1 Estimation Results, First-Stage (Auxiliary) Regression

Variables	(1) DKK	(2) DKK	(3) DKK	(4) DKK	(5) DKK	(6) DKK
atm1	0.0200***				0.0156***	0.0152***
	(0.000264)				(1.90e-09)	(7.62e-11)
atm2		0.219***			0.159***	0.153***
		(1.54e-09)			(0.000279)	(0.000400)
yrschool2005			2.772***		1.535*	1.285
			(5.21e-06)		(0.0996)	(0.110)
pctyoung2006				-0.280***	0.0516	
				(5.85e-05)	(0.599)	
Constant	17.22***	10.13***	-2.245	31.30***	-2.529	2.068
	(0)	(1.09e-08)	(0.530)	(3.05e-10)	(0.807)	(0.649)
Observations	79	79	81	89	71	71
R-squared	0.137	0.343	0.248	0.162	0.458	0.457
Adjusted R-squared	0.126	0.334	0.239	0.152	0.425	0.432

Note: Robust *p*-values in parentheses; *** p<0.01, ** p<0.05, * p<0.

Table 2 Main Regression Results

Variables	(1) drop1	(2) drop1	(3) drop1	(4) drop1	(5) drop1	(6) drop1
DKK	-0.282***	-0.608**	-0.440	-0.540*	-0.630**	-0.512**
	(2.08e-05)	(0.0482)	(0.104)	(0.0647)	(0.0336)	(0.0422)
bc		5.599	15.26	22.44	69.84***	
		(0.588)	(0.314)	(0.133)	(0.00349)	
DKK*bc		-0.0917	-0.150	-0.316	-4.661***	
		(0.733)	(0.690)	(0.245)	(0.00204)	
gnipc		8.890**	9.111**	8.140**	8.647**	8.657***
		(0.0150)	(0.0130)	(0.0157)	(0.0123)	(0.00556)
popsize		-2.245*	-3.458**	-3.307**	-3.195*	-2.813**
		(0.0713)	(0.0256)	(0.0304)	(0.0866)	(0.0327)
inflation		0.903**	0.866*	0.703	0.590	0.879**
		(0.0446)	(0.0952)	(0.167)	(0.271)	(0.0382)
dep_ins		-7.696*	-8.491*	-6.898	-7.894*	-9.918**
		(0.0736)	(0.0529)	(0.105)	(0.0733)	(0.0410)
zscore		-0.653***	-0.853***	-0.876***	-0.909***	-0.546***
		(0.000844)	(0.00241)	(0.000229)	(0.00137)	(0.000653)
liquidity		-0.0357	-0.195	-0.193	-0.250*	
		(0.732)	(0.173)	(0.132)	(0.0925)	
concen		0.164	0.179	0.249	0.265	
		(0.277)	(0.297)	(0.137)	(0.144)	
kaopen		-3.172*	-3.509*	-2.409	-2.194	-3.546**
		(0.0716)	(0.0688)	(0.176)	(0.237)	(0.0458)
loantodeposit		-0.0703	-0.155*	-0.146*	-0.176**	
		(0.285)	(0.0660)	(0.0701)	(0.0445)	
depgdp		0.0358	-0.00920	0.0549	0.0219	
		(0.626)	(0.928)	(0.447)	(0.846)	
deposit_growth			-2.534		-5.912	
			(0.702)		(0.406)	
exchange_rate_growth				-7.896	8.070	
				(0.716)	(0.768)	
Constant	27.64***	4.237	39.51	37.38	40.94	19.00
	(0)	(0.913)	(0.338)	(0.342)	(0.342)	(0.554)
Observations	71	71	52	59	50	71
R-squared	0.070	0.360	0.406	0.431	0.443	0.338
Adjusted R-squared	0.0562	0.214	0.181	0.250	0.197	0.265

Note: Robust pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1. DKK instrumented by *atm1*, *atm2*, *yrschool2005* in the GMM estimation (see also table 1). GMM = general method of moments.

Table 3 Additional Diagnostics

First-stage regression summary statistics					
Variable	R-sq.	Adjusted R-sq.	Partial R-sq.	Robust F(3,61)	Prob > F
DKK	0.5520	0.4859	0.1109	9.80008	0.0000
Test of overidentifying restriction					
Hansen's J chi2(2) = .890099 (p = 0.6408)					
Test of endogeneity (orthogonality conditions)					
joint	GMM C statistic chi2(1) = .556204 (p = 0.4558)				
am1	GMM C statistic chi2(1) = .07394 (p = 0.7857)				
am2	GMM C statistic chi2(1) = .00296 (p = 0.9566)				
yrschool2005	GMM C statistic chi2(1) = 1.0456 (p = 0.3065)				

Note: Additional statistics and diagnostic tests of the parsimonious baseline model in column (5) of table 2.

Appendix

Table A1 Description of Variables

Variable name	Description	Source	Countries Available
drop	Maximum yoy deposit growth minus minimum yoy deposit growth 2006-2010, provided that the maximum growth occurred before the minimum growth.	Authors' calculation using Commercial Banks - Outstanding Deposits data from IMF FAS	173
DK-K	Percent of adult population saving at a financial institution in 2011.	Demirguc-Kunt and Klapper 2012	148
gnipc	Log transformed GNI per capita in 2008.	World Development Indicator 2013	192
popsize	Log transformed total population in 2008.	World Development Indicator 2013	214
inflation	Inflation in 2008 as measured by the consumer price index.	World Development Indicator 2013	178
bc	Systemic banking crisis experience 2006-2010 (0, 1 dummy variable).	Laeven & Valencia 2012	162
depins	Explicit deposit insurance schemes as of 2003 (0, 1 dummy variable).	Demirguc-Kunt, Karacaovali, and Laeven 2005	178
gdpgr	GDP growth over the period matching deposit growth drop.	Author calculation using GDP data from WDI 2013	167
zscore	Z-score of a country's banking system in 2008.	Global Financial Development Database 2012	178
liquidity	Liquid assets to deposits and short-term funding in 2008.	Global Financial Development Database 2012	168
concen	Three-bank-concentration ratio of a country's banking system in 2008.	FinStats 2013	145
kaopen	The 2008 Chinn-Ito index measuring a country's degree of capital account openness	Chinn and Ito 2006, index updated in 2013	177
loantodeposit	Private credit by deposit money banks as a share of domestic demand, time and saving deposits in deposit money banks in 2008.	FinStats 2013	167
depgdp	Domestic demand, time and savings deposits in deposit money banks to GDP in 2008.	FinStats 2013	174
atm1	The number of bank accounts per 1000 population	IMF Financial Access Statistics	84
atm2	Bank branches and ATMs per 100,000 population	IMF Financial Access Statistics	84
yrschool2005	The percentage of population age 25+ with completed secondary schooling in 2005	World Development Indicator 2013	86
ypctyoung2006	Young population (0-14) as a percentage of working age population (15-64)	World Development Indicator 2013	95

Table A2 Summary Statistics of Variables

Variable name	Observations	Mean	Standard deviation	Minimum	Maximum
drop	95	24.94	20.71	1.08	99.27
volatility	95	10.69	8.10	1.07	35.56
DKK	89	17.86	16.11	0.69	63.58
gnipc	95	8.29	1.46	5.25	10.99
popsize	95	16.52	1.51	13.53	21.00
inflation	95	10.26	6.89	2.37	44.39
bc	95	0.21	0.41	0	1
gdpgr	95	0.14	0.22	-0.33	1.11
depins	95	0.59	0.49	0	1
zscore	95	18.22	10.34	4.25	53.8
liquidity	95	38.49	19.27	11.49	119.06
concen	95	66.80	19.51	28.9	100
kaopen	95	0.78	1.61	-1.86	2.46
loantodeposit	95	95.49	39.26	23.82	197.41
depgdp	95	52.38	35.72	10.61	172.85
atm1	84	68.00	302.90	0	2753.96
atm2	84	37.99	44.67	0	211.65
yrschool2005	86	7.55	2.95	1.11	13.13
pctyoung2006	95	49.04	23.49	19.50	102.22

Table A3 Pairwise Correlation of Variables

	drop	DK-K	gnipc	popsize	inflation	bc	gdpgr	depins	zscore	liquidity	concen	kaopen	loantodeposit	depgdp
drop	1													
DK-K	-0.2783*	1												
gnipc	-0.0649	0.6491*	1											
popsize	-0.1887	0.1244	-0.0169	1										
inflation	0.1639	-0.4511*	-0.5867*	0.0289	1									
bc	0.0066	0.4924*	0.5717*	0.1561	-0.2158*	1								
gdpgr	0.1889	-0.2364*	-0.1553	-0.1269	0.2953*	-0.1173	1							
depins	-0.2249*	0.3033*	0.4812*	0.2867*	-0.3146*	0.3785*	-0.1462	1						
zscore	-0.2301*	0.0256	0.0782	0.0149	-0.0808	-0.1084	0.008	-0.0385	1					
liquidity	0.1444	0.1165	0.0635	-0.0356	-0.0785	0.0988	-0.2461*	-0.1536	-0.2352*	1				
concen	0.0718	0.1487	0.0317	-0.5052*	0.0032	-0.0292	-0.0585	-0.3228*	0.0801	0.3464*	1			
kaopen	-0.1969	0.4079*	0.4864*	-0.1841	-0.2672*	0.3143*	-0.1025	0.3555*	-0.0102	0.0619	0.103	1		
loantodeposit	-0.0094	0.2025	0.4462*	-0.0763	-0.0708	0.4930*	0.1081	0.3399*	-0.0077	-0.2616*	-0.1203	0.2906*	1	
depgdp	-0.3079*	0.7020*	0.6276*	0.2041*	-0.4665*	0.4625*	-0.1633	0.2770*	0.2363*	-0.0139	0.0499	0.3859*	0.1648	1

Note: * $p<0.05$.

Table A4 Reestimation of Baseline Model Using Alternative Dependent Variable

Variables	(1) volatility	(2) volatility	(3) volatility	(4) volatility	(5) volatility	(6) volatility
DKK	-0.122***	-0.252**	-0.184*	-0.214**	-0.247**	-0.226**
	(1.69e-06)	(0.0252)	(0.0512)	(0.0366)	(0.0176)	(0.0155)
bc		1.614	5.546	8.459	24.25***	
		(0.688)	(0.313)	(0.146)	(0.00820)	
*DKK*bc*		-0.0162	-0.0557	-0.0942	-1.602***	
		(0.878)	(0.685)	(0.371)	(0.00628)	
gnipc08		3.221**	3.217**	2.807**	3.101***	3.426***
		(0.0107)	(0.0119)	(0.0129)	(0.00988)	(0.00247)
popsize08		-0.933*	-1.366**	-1.354**	-1.293*	-1.110**
		(0.0537)	(0.0159)	(0.0193)	(0.0700)	(0.0312)
inflation		0.323**	0.253	0.242	0.152	0.316**
		(0.0429)	(0.174)	(0.184)	(0.428)	(0.0374)
dep_ins		-3.918**	-4.310***	-3.511**	-4.129***	-4.602**
		(0.0138)	(0.00595)	(0.0241)	(0.00791)	(0.0104)
zscore2008		-0.265***	-0.314***	-0.354***	-0.338***	-0.226***
		(0.000579)	(0.00420)	(9.66e-05)	(0.00181)	(0.000290)
liquidity2008		-0.00824	-0.0596	-0.0597	-0.0782	
		(0.839)	(0.250)	(0.193)	(0.137)	
concen		0.0619	0.0514	0.0916	0.0796	
		(0.253)	(0.368)	(0.118)	(0.186)	
kaopen2008		-1.210*	-1.184*	-0.948	-0.769	-1.248*
		(0.0558)	(0.0853)	(0.148)	(0.261)	(0.0549)
loantodeposit		-0.0162	-0.0462*	-0.0427	-0.0544*	
		(0.504)	(0.0963)	(0.131)	(0.0613)	
depgdp		0.0166	-0.00353	0.0219	0.00632	
		(0.546)	(0.927)	(0.417)	(0.881)	
deposit_rate_growth			-0.219		-1.371	
			(0.932)		(0.619)	
exchange_rate_growth				-0.911	3.095	
				(0.911)	(0.763)	
Constant	11.76***	5.398	19.54	19.04	20.38	9.274
	(0)	(0.702)	(0.149)	(0.154)	(0.166)	(0.441)
Observations	71	71	52	59	50	71
R-squared	0.085	0.385	0.440	0.468	0.467	0.365
Adjusted R-squared	0.0720	0.245	0.228	0.299	0.231	0.295

Note: Robust pval in parentheses; *** p<0.01, ** p<0.05, * p<0.1.