Loan loss provisions in banks – a shock transmission channel from shareholders to subsidiaries?

Abstract

In this paper, we investigate loan loss provisions (LLP) in banks as a previously unexplored channel of transmitting shocks between shareholder companies and subsidiary banks. To date, the shock transmission literature concentrated on subsidiary bank loan supply as the main channel of negative shocks, originating from the shareholder level. Using a Central European sample of over 200 banks between 2003-2014, we find that both macroeconomic- and internal shocks on the shareholder company level are connected to changes of loan loss provisions in subsidiary banks. Moreover, these shocks also affect income smoothing processes at the daughter companies. In particular, positive developments in shareholder company macroeconomic environment and financial standing are linked to a boost of LLP and a less intense income smoothing process in subsidiary banks. Pressure on shareholder economies creates incentives for subsidiaries to decrease reserves and intensify income smoothing. In opposition to this, acute drops in shareholder profitability are positively related to subsidiary loan loss provisions, possibly because of the willingness to avoid future capital outflows in case of credit risk increases.

Introduction

The continuous growth of bank holding companies and other corporates in recent years has led to an increasing level of interconnections in the banking system worldwide. This has especially affected developing country banks, which are largely owned by foreign corporations, both financial- and non-financial. The evidence from large literature on the effect of foreign ownership on domestic banking sectors is inconclusive. Some authors underline the positive aspects, connected with increased competition and efficiency, as well as lower lending margins and better access to credit. In addition, the protection and capital injections from foreign shareholders are found to protect subsidiary banks in times of crises. Other studies underline negative effects of foreign banks for the local sme sector, which frequently experiences worse credit conditions. Lower margins are found to stem from a different, less risky client base rather than cheaper loan products offered by foreign banks. In parallel, a large body of literature studies international transmission of financial shocks. They provide evidence for links between shareholders and subsidiary banks that are visible in changes of loan supply. In particular, subsidiary banks are shown to decrease lending when parent companies or their economies are negatively affected (de Haas and van Lelyveld 2014).

The aim of our paper is to verify if credit risk reserves may also be a channel for the transmission of shocks from shareholders and their home countries to subsidiary banks. Knowing that shareholders have the power and willingness to shape the volume of loans granted by subsidiaries, it is highly possible that they affect credit risk reserves as well. This is particularly plausible, taken that any additions to loan loss reserves in the form of annual loan loss provisions (LLP) pass through the income statement and directly influence the level of net income. In consequence, we aim to assess changes in the economic environment and performance of main shareholders is translated to a pressure on subsidiary LLP. As LLP are shown to be used by banks to smooth income throughout better and worse profitability, shocks from shareholders are likely to affect the income smoothing process as well.

In order to study links between subsidiary banks and shareholders, we use a sample of Central European banks between 2003-2014, which includes the whole business cycle. Central European banks constitute a perfect sample for our analysis, as they are largely owned by foreign holding companies (financial and non-financial) and the shareholder country sample is very diversified, which allows for different macroeconomic and shareholder shocks to occur in different periods.

Literature review

Our paper draws from three important areas in the literature that concern loan loss provisions and income smoothing, role of primary shareholders in bank activities and shock transmission literature.

Loan loss provisions (LLP) are frequently considered in the literature as one of crucial credit risk indicators, with an assumption of reflecting the underlying credit portfolio quality of a given bank. In this respect, loan loss provisions are studied in the context of their timing and found to be created with a delay (Laeven and Majnoni 2003, Foos et al. 2010). In a recent paper, de Haan and van Oordt (2018) provide evidence for a lagged reaction of loan loss provisions in relation to internal target ratios of reserves. As a result, using LLP as a risk indicator is biased, as frequently they reflect past rather than contemporary changes in asset quality. In many cases, LLP are used as a risk indicator in place of non-performing loans (NPL), due to insufficient data availability on NPL.

In addition to the analyses of timing of loan loss provisions, many papers study their role in shaping bank financial results. This area is linked to a broad field of earnings management literature in the non-financial institutions context (De Fond 2010, Dechov et al. 2012, Bouwman 2014). Within banking, numerous studies show that banks engage in managing the level of loan loss provisions. This process is referred to as income smoothing, which implies adjusting loan loss provisions not only to the underlying credit risk, but also to pre-provisioning income (Bikker and Metzemakers 2005, Fonseca and González 2008, Pérez et al. 2008, Bouvatier et al. 2014, Olszak et al. 2014). The effect of income smoothing is a reduction in fluctuations of net income, and hence a more stable dividend- and retained earnings stream throughout multiple periods. Many authors indicate that income smoothing has two primary parts, the discretionary and non-discretionary element. The non-discretionary aspect is directly linked to a particular bank's credit risk level (Bikker and Metzemakers 2005, Pérez et al. 2008). If the bank expects that future credit losses will be high, it creates additional reserves for future losses in periods of high earnings. The discretionary part of income smoothing may reflect elements not directly linked to a bank's credit risk level, such as managerial private benefits (Bushman and Williams 2012). Hence, loan loss provisions created by a bank may be suboptimal, in relation to its credit risk level. One of the few empirical works linking income smoothing to shareholders is Bouvatier et al. (2014), where the authors consider the role of concentrated shareholders in shaping income smoothing in Western European banks. They find that concentrated ownership enhances smoothing behaviour, while the type of shareholder does not play a large role.

The second strand of literature addresses the role of primary shareholders in bank activities. Extensive literature exists on corporate governance in banks, including both the level of management and shareholder structure. A broad and very detailed literature is provided by De Haan and Vlahu (2016) and Cull, Peria and Verrier (2017). Two frequently studied concepts are bank profitability and bank risk, linked with various forms of shareholder structure.

There is a large body of literature analysing differences in bank profitability that are driven by shareholder structure. Banks with stakes owned by governments are proven to be less efficient in Western Europe (Iannotta, Nocera and Sironi 2007). On the other hand, Karas, Schoors and Weill (2010) find that state owned banks in Russia are not less efficient than private domestic banks and are inferior only to foreign banks. In recent studies, new elements beyond simple shareholder type have been introduced. Performance of foreign versus domestic banks is shown to depend on host and home country characteristics, including regulations, competition, macroeconomic situation or economic risks (Chen and Liao 2011, Claessens and van Horen 2012). Foreign banks in Central Europe are less affected by domestic conditions, but react to the financial standing of shareholder banks and economic situation in their home countries (Havrylchyk and Jurzyk 2011). In the same region, depositors react to rumours and public aid announcements regarding bank majority shareholders (Hasan et al. 2013).

The type of shareholder is shown to be linked with different cyclicality of bank lending. State banks are beneficial to the economy, as during turbulent times they may behave anticyclically and sustain their credit granting, in opposition to private banks (Brei and Schclarek 2015). Bertay et al. (2015) show that state banks are less procyclical in lending than private banks, while foreign banks' loans are the most procyclical. The same results are reported for Russian banks by Fungacova, Herrala and Weill (2013), who show that foreign banks are procyclical and state banks anticyclical in credit supply. Cull and Peria (2013) demonstrate that in Eastern Europe foreign banks were more procyclical than private banks, demonstrating high pre-crisis growth and diminishing credit supply during the crisis, while government owned banks were not countercyclical and behaved in line with domestic private banks.

As far as the relation between shareholder structure and bank risk is concerned, evidence is mixed and there is no shareholder type or stake size that consistently shows to be related with lower risk taking. State banks are not unequivocally linked to bank risk levels. Some authors show that state banks have higher risk (Iannotta, Nocera and Sironi 2007; Demirguc-Kunt and Detragiache 2002). On a country level, public ownership has no effect on the banking system stability and banking crisis probability (Demirguc-Kunt and Detragiache 2002). Iannotta, Nocera and Sironi (2013) provide evidence for lower default risk of government owned

institutions, but this is caused by state support. State banks' risk on a standalone basis is more elevated, especially in election years. The financial crisis is shown to affect the shareholder – bank risk relation. Saghdi-Zedek and Tarazi (2015) demonstrate that before the financial crisis, shareholders with excess control rights boosted risk of Western European banks. However, during the crisis the relation reversed or disappeared, depending on the risk proxy. After the crisis, the positive effect between control rights and risk was re-established. Barry et al. (2011) find that banks held by other banks (foreign and/or domestic) have a lower level of LLP (in relation to loans) and lower Zscores. The result is not seen for listed banks. For European pre-crisis banks, Garcia-Kuhnert, Marchica and Mura (2015) provide very weak evidence for the relation between shareholder type and bank risk. At the same time, after controlling for the investment profile of the primary shareholder, the authors prove that banks with foreign shareholders take less risk than domestically owned counterparts.

Taking into account the size of the primary shareholder stake, Beltratti and Stulz (2012) demonstrate that large banks with stronger controlling shareholder ownership take more risks. Erkens et al. (2012) and Gropp and Kohler (2010) find that banks with higher institutional ownership took more risk before the financial crisis. Contrary to this, Iannotta, Nocera and Sironi (2007) show that higher ownership concentration is linked to lower risk. The relation between insider control and bank risk taking may be U-shaped, although Forssbaeck (2011) demonstrates that the negative effect predominates.

The third strand of literature deals with the transmission of shocks throughout bank holding companies. The primary direction in these studies is exploring changes of loan supply in holding- and subsidiary banks. A deterioration in the financial standing of shareholders or macroeconomic downturns in home markets may be transmitted to countries where subsidiary banks are based or where multinational bank holding companies are extending loans through branch offices. Such a shock transmission may strongly affect local credit market conditions and thus macroeconomic developments. Peek and Rosengreen (1997) study the performance of Japanese bank subsidiaries located abroad, after a crisis in Japan in the early 1990s. They identify the transmission of the Japanese crisis by showing a decrease of total loans in Japanese banks' US subsidiaries, which resulted from a decline in the shareholder capital ratio. De Haas and Van Lelyveld (2006) illustrate that loan supply of domestic banks is more affected by local crises than that of foreign banks. They also demonstrate that deteriorating health of shareholders has a negative effect on subsidiary loan supply. Schnabl (2012) provides evidence for the liquidity shock transmission to Peruvian banks, which had to curb lending at foreign-owned bank subsidiaries. Popov and Udell (2012) analyse credit access of firms as a function of a

bank's financial situation and financial standing of its foreign shareholder bank. Credit supply to domestic sme's is adversely affected by negative shocks at parent banks that serve these firms. Cetorelli and Goldberg (2011) examine the transmission of adverse liquidity shocks on main developed country banking systems to emerging markets across Europe, Asia, and Latin America, isolating lending supply from lending demand shocks. Havrylchyk and Jurzyk (2011) underline a possibility of a dual relationship between adverse events at shareholder level and their subsidiary banks. Greenfield banks have a complementary relationship with their shareholders, indicating that assistance to subsidiaries is granted when no adverse developments are experienced. Takeover banks witness a growth in loan supply when negative shocks appear at shareholder level, so a substitution effect dominates.

The most recent wave of shock transmission literature has emerged after the financial crisis of 2007-2009. De Haas et al. (2014) study loan growth at Central European banks in the context of their ownership structure and the Vienna Initiative. The Vienna Initiative was a common action of EBRD, EIB and the World Bank group, aimed at avoiding negative spillover effects that could be suffered by Central European banks as a result of the financial crisis repercussions experienced by strategic shareholders of these banks. The authors find that there was a credit crunch during the financial crisis, but foreign banks that participated in the Vienna Initiative were stable lenders. This provides evidence for possible institutional interventions that may curb international shock transmission. De Haas and van Lelyveld (2014) provide a wide body of evidence on interactions between parent banks and their subsidiaries during the financial crisis of 2008-2009. Contrary to earlier evidence on a stabilising effect of multinational banks on local subsidiaries during local crises, they find that during the 2008-2009 foreign bank subsidiaries cut back on lending three times more than domestic banks. They provide important evidence for a framework of a multinational banking group, in which capital and liquidity flows to markets where there is a financial shock. This however also implies that capital and liquidity may flow from subsidiaries to parents, when parents experience a problem. Our paper adopts the perspective of subsidiary banks, where the level of reserves for credit risk may be affected by financial shocks experienced by shareholder companies or in their economic environments.

Data and methodology

The analysis of the effect of shareholder-related shocks on credit risk policy is performed on a sample of c.150 banks from 11 Central European countries, for the period 2003-2014.[1] The raw sample consisted of 315 banks active in the region in this period. From this initial sample, we deleted all banks for which we could not find shareholder details. Subsequently, we deleted all banks that had domestic shareholders, which included state banks and banks with local capital ownership. Last but not least, some observations had to be deleted due to missing data on non-performing loans, which is an important control variable for the level of our dependent variable (LLP).

All bank financial data is taken from the Bankscope database. All shareholder structure details and shareholder financial data has been hand-input, using bank- and shareholder annual reports and management reports, as well as bank- and shareholder websites. Macroeconomic data is from the World Bank. Within the final sample, over 90% of observations stem from commercial banks, with a small share of cooperative, savings and real estate and mortgage banks.

We analyse credit risk policy as a channel of transmission of impulses from shareholders to subsidiary banks in two main areas. Firstly, we verify if the macroeconomic environment of the shareholder may affect the credit risk policy of the subsidiary, in the sense of both the nominal level of loan loss provisions and the income smoothing process. Secondly, we study the link between the financial situation of the shareholder as such and loan loss provisions and income smoothing.

A possible existence of a link between macroeconomic environment of the shareholder and subsidiary credit risk policy is suggested by numerous results from the literature on shock transmission between shareholders and subsidiaries. When macroeconomic conditions deteriorate in the shareholder environment, loan supply in subsidiary banks is diminished. This popular result has two potential implications for our analysis. On one hand, this implies that shareholders are cutting back on their activities and limiting their risk exposures outside home markets. Hence, they could press for higher loan loss provisions in subsidiaries, notwithstanding their credit risk levels, in order to hedge any unexpected NPL losses that would require additional capital from the shareholder level. In such a case, the relation between negative shocks and LLPs would be positive. In addition, a shareholder-incited credit rationing on the subsidiary level also affects LLPs. As Foos et al. (2010) suggest, aggressive loan growth is frequently connected with lower credit quality, hence a more selective approach is likely to

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[1] The sample includes: Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Lithuania, Latvia, Poland, Romania, Slovenia, Slovakia.

decrease the level of non-performing loans and hence loan loss provisions necessary to cover them. On the other hand, pressure coming from shareholder home markets could incite them to minimize LLPs in subsidiaries, in order to press for higher operating profitability on a consolidated level and higher dividend transfers. This suggests a positive link between shareholder macroeconomic shock and LLPs. The main equation reflecting links between credit risk policy and shareholder macroeconomic environment takes the following form:

$$
\begin{aligned}
LLP_{i,t} = \alpha &+ \beta_1 Income_{i,t} + \beta_2 Shareholder\ Macro_{i,t,t-1} + \beta_3 Shareholder\ Macro_{i,t,t-1} \\
&* Income_{i,t} + +\beta_4 Bank\ control\ variables_{i,t} \\
&+ \beta_5 Macroeconomic\ control\ variables_{j,t} + v_i + \varepsilon_{i,t}
\end{aligned}
$$

$$(1)$$

Subscript *i* denotes a bank, *j* the country and *t* the year. Equation (1) is a static model for panel data with fixed effects (v_i) that represent unobserved individual bank characteristics, such as bank corporate culture. $\varepsilon_{i,t}$ are random errors. The dependent variable *LLP* are loan loss provisions scaled by total assets. Income smoothing through loan loss provisions is accounted for by *Income*, which is the level of pre-provisioning income (related to total assets). *Shareholder Macro* is the main independent variable, reflecting changes in shareholder macroeconomic environment. We use several variables to proxy such changes. First, we use GDP growth to proxy for general changes in the shareholder economy. *Shareholder GDP Up* (*Shareholder GDP Down*) is a binary variable reflecting an increase or decrease in the current year's GDP growth in the shareholder home country of at least 0.2 pp. Second, we use stock exchange variables to reflect investor sentiment and market valuation of firms on the shareholder capital markets. *Shareholder SE Up* (*Shareholder GDP Down*) are binary variables comparing annual stock exchange market returns to the standard deviation of market returns for a given market for the whole period. As the shareholder country sample is strongly diversified, market returns levels and changes vary strongly, hence we control for 'country-specific' market returns level. As an example, *Shareholder SE Up* equals one when the market returns in the shareholder home stock exchange in a given year are higher than the standard deviation of market returns for the whole period. In order to account for changing trends on capital markets, that more closely reflect a 'shock', we introduce *Shareholder SE Shock positive* and *Shareholder SE Shock Negative.* They are binary variables equal one in the year when stock market returns change from negative to positive (*Shock Positive*) or from positive to negative (*Shock Negative*). All of the subsequent *Shareholder Macro* variables are also interacted with

the *Income* variable. The resulting coefficient aims to show if the macroeconomic situation in shareholder markets affects the process of income smoothing at subsidiary banks, apart from the nominal level of provisions as such. Bank Control variables are standard for the literature and include the level of non-performing loans (NPL), loan loss reserves (LLR), loans to assets, equity and natural logarithm of total assets (size). Importantly, we also control for loan growth, which has been shown to be a transmission channel of shareholder shocks. Macroeconomic control variables consist of GDP growth and Inflation (in the subsidiary country). We include bank fixed effects and year fixed effects in all estimations.

Next, we account for the situation of the banking sector in the shareholder country. This is important for a few reasons. First, it may happen that despite a sound macroeconomic environment, the banking sector is in trouble and shareholders are more prone to get engaged in their subsidiaries' activities, regardless of the fact whether shareholders themselves are banks or non-bank institutions. Second, although usually macroeconomic downturns are paired with banking sector problems, timing may be different. Hence, the deterioration in the banking sector may happen after the macroeconomic downturn and the shareholder reaction may also materialise with a time lag. Thirdly, banking sector problems have particular effects on shareholders which are banks. Such shareholders do not necessarily have to experience the full extent of their home banking sector shortcomings, but their sensitivity to potential risk- and capital exposures is likely to strongly increase in such periods. In order to account for banking sector problems, we estimate the following equation:

$$
\begin{aligned}
LLP_{i,t} = \alpha &+ \beta_1 Income_{i,t} + \beta_2 Shareholder\ Banking\ Sector_{i,t,} \\
&+ \beta_3 Shareholder\ Banking\ Sector_{i,t} * Income_{i,t} \\
&+ +\beta_4 Bank\ control\ variables_{i,t} + \beta_5 Macroeconomic\ control\ variables_{j,t} + v_i \\
&+ \varepsilon_{i,t}
\end{aligned}
$$

(2)

The main variable of interest here is the *Shareholder Banking Sector* coefficient. It takes on several forms. First, we introduce *Shareholder BS ROA Increase* (*Shareholder BS ROA Decrease*), which equals one for years when the return on assets (ROA) of the banking sector in the shareholder country increased (decreased) by more than 0.2 pp. Second, we introduce *Shareholder BS Capital Increase* (*Shareholder BS Capital Decrease*), which equals to one for years when the level of banking sector capital to risk weighted assets increased (decreased) by more than 0.5 pp. Last but not least, we include a *Banking Sector Crisis* variable, which equals

one for years when shareholder banking sectors experienced a crisis.[2] The interaction between Shareholder Banking Sector and Income reflects the potential effect on the subsidiary income smoothing process. The remaining variables are the same as in Equation (1).

Last but not least, we study the direct link between shareholder financial standing and subsidiary credit risk policy. The reasoning in this case accounts for two possible scenarios. On one hand, shareholders that have higher profitability are more likely to be more conservative in subsidiary risk policies. Such behaviour could protect them from unexpected capital outflows, which would be forced if subsidiary risk materialised in high losses. On the other hand, shareholders with sound bottomlines may encourage shareholders to take higher risks to profit from local business opportunities, as in case of trouble funding would be possible. This may also be the line of reasoning within the subsidiary banks themselves, along the moral hazard hypothesis, with more aggressive risk taking stemming from support forthcoming from shareholders. In this scenario, subsidiary banks would create less loan loss provisions, in order to build up sufficient capital to further enhance growth. the shareholder-subsidiary links are shown by the following equation:

$$
\begin{aligned}
LLP_{i,t} = \alpha &+ \beta_1 Income_{i,t} + \beta_2 Shareholder\ ROA_{i,t,t-1} + \beta_3 Shareholder\ ROA_{i,t,t-1} * Income_{i,t} \\
&+ +\beta_4 Bank\ control\ variables_{i,t} + \beta_5 Macroeconomic\ control\ variables_{j,t} + v_i \\
&+ \varepsilon_{i,t}
\end{aligned}
$$

(3)

The coefficient *Shareholder ROA* reflects profitability of the primary shareholder of CE banks, and takes on three forms. First, we introduce *Shareholder ROA Drop*, which equals to one in years when the ROA of the shareholder is smaller than in the previous year. Second, we include variables to account for different scope of ROA changes. *ROA _0.2pos (ROA _0.2neg)* are binary variables equal to one in years when shareholder ROA increased (decreased) by more than 0.2 pp. *ROA _0.5pos (ROA _0.5neg)* and *ROA _1pos (ROA _1neg)* account for medium- and large profitability shocks of 0.5pp and 1 pp respectively. All subsequent *Shareholder ROA* variables are interacted with *Income*, to verify the effect on subsidiary income smoothing. Remaining variables are the same as in Equation (1).

In our analysis, we use consolidated data for both the main sample (subsidiary banks) and the shareholders. This choice is not obvious, as many holding companies consolidate their

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subsidiaries. On one hand, shareholder profitability is shaped by revenues (and loan loss provisions) of subsidiaries. Hence it could be advisable to use unconsolidated financial data for the holding company level. On the other hand, many of primary shareholders of CE banks are large Western banks, which possess many subsidiaries. The overall group result is shaped by the parent bank, but also by 'sister' companies from many countries. In consequence, incentives from the holding level are likely to be a function of total group profitability rather than that of the primary bank/company only. It is plausible that when the primary company suffers losses, but they are compensated by revenues from other subsidiaries, the pressure on one specific daughter bank will be smaller than when blows to profitability are suffered throughout the whole group. As a result, we decide to use consolidated data, even though we realise it has some limitations.

Results

Shareholder operating environment

Results of estimating Equation (1) are shown in Table 3. The usual outcome regarding income smoothing is confirmed, with a positive link between *Income* and *LLP*. The income smoothing observed is of a discretionary character, as we control for the level of credit risk (through non-performing loans) and pre-existing level of reserves (through loan loss reserves). The results show that credit risk policy in subsidiary banks is affected by the primary shareholder's macroeconomic environment. First, higher GDP growth in shareholder country is linked with higher loan loss reserves in subsidiary banks (*Specification 1*). This implies that when operating in a better economic environment, shareholders encourage their subsidiaries to create higher reserves, notwithstanding their credit risk level. This is paired with a lower income smoothing level at the subsidiary level. In other words, subsidiaries with shareholders witnessing an economic revival will be making higher reserves and will make these reserves less dependent on their own revenue streams. In contrast, shareholders that see an economic downturn, urge their subsidiaries to limit the reserves that they make, possibly in an effort to increase their bottomline and hence dividend streams to the holding company (*Specification 2*).

When the stock exchange performance in shareholder country is accounted for, the primary shareholder reaction is visible only in the negative part of the distribution. When market returns in the shareholder stock exchange are high in relation to an average level for the whole period, no reaction is observed in subsidiary credit policy. However, when the stock exchange returns are low, provisions at subsidiaries are reduced and their income smoothing minimized. The

reaction is in line with low GDP growth, confirming that unfavourable conditions on the home markets make shareholders more prone to press for lower reserves in subsidiary banks. Hence we find evidence for a transmission of negative shock from the shareholder country stock exchange to subsidiary credit risk reserves, visible in reducing reserve levels.

Last but not least, we account for a significant change of trend on shareholder stock markets, when previous positive market returns turn negative and vice-versa. In both scenarios, no significant changes in the level of loan loss provisions at the subsidiary bank are observed. The only change occurs in the income smoothing process, which is intensified when negative stock exchange shocks are taking place in shareholder countries.

Next, we consider whether the situation in the shareholder banking sector may affect loan loss provisioning policy at subsidiary banks. Results of estimating Equation (2) are shown in Table 4. First, we analyse changes in bank profitability (ROA) on shareholder markets (Specifications 1 and 2). The results clearly show a transmission of shareholder sentiment onto subsidiary loan loss provisions. When banking sector ROA in shareholder countries significantly increases, higher reserves are made on the subsidiary level, coupled with a less intense income smoothing process. Along the same lines, when profitability is hit, loan loss provisions shrink at daughter companies, while the income smoothing process is more visible. This may be exacerbated by the effects of the financial crisis. In general, in the period of the financial crisis, Central European banks did not suffer so acutely as their Western European and US peers. Hence, when shareholder ROA was diminishing during the crisis, subsidiary banks were still enjoying relatively sound profitability, which allowed them to make higher reserves without a loss to the final ROA.

As a next step, we consider changes of equity levels in shareholder banking sectors (*Specifications 3 and 4*). The results confirm previous findings. In particular, when equity levels in banking sectors of shareholder countries significantly increase (we consider changes of minimum 0.5 pp.), subsidiaries boost their loan loss provisions, while decreasing their income smoothing. In periods when problems surface in capitalization of banking sectors in shareholder countries (Specification 4), no direct effect is seen on the nominal level of loan loss provisions, but income smoothing significantly grows and the effect is of a similar magnitude (but opposite sign) to the one observed for the equity level increase.

Last but not least, we introduce a crisis variable, to verify if crisis experiences on the shareholder markets are transferred to subsidiary banks. A binary variable equals one for years when there was a crisis in the shareholder country banking sector. The results are similar to shocks observed on stock exchanges, in that subsidiary banks create much higher loan loss

provisions. The effect is not connected to any changes in income smoothing, which may indicate that it took place in years when subsidiary banks were experiencing relatively good profitability and were creating reserve buffers anyway.

Shareholder financial situation

In the final stage, we analyse the relation between the financial situation of a bank's primary shareholder and the level of loan loss provisions, as well as income smoothing, at the subsidiary bank (Table 6). First, we include any change in the level of shareholder profitability, by accounting for a drop in ROA in the current year (*Specification 1*). The relation is positive but not statistically significant. Next, we include a small change in shareholder ROA of at least 0.2 pp, both in the positive and negative direction, and we interact these binary variables with subsidiary bank pre-provisioning income (*Specifications 2 and 3*). Again, no significance between either of the variables is visible. Following this, we introduce a moderate change of ROA of minimum 0.5 pp. (*Specifications 4 and 5*). Results indicate that a moderate profitability shock at the shareholder level is related to a change in LLP at the subsidiary bank. Positive shocks in shareholder companies incite subsidiary banks to create higher provisions, which is in line with the results received for positive macroeconomic shocks. Shareholder-specific shocks are linked to a much larger LLP increase however. On the other hand, moderate negative changes at shareholder profitability level are not linked to changes in subsidiary credit reserve policy.

Last but not least, we account for large profitability shocks at the level of minimum 1 pp change for ROA (*Specifications 6 and 7*). A significant positive profitability shock is linked with a much higher LLP level and much lower income smoothing at subsidiary banks. A positive profitability shock results in decreased income smoothing behavior of subsidiary banks, and the scope of this decrease is again more sizeable than in case of GDP- or stock-exchange related shocks. When we account for a decrease in shareholder ROA that is higher than 1pp, we observe that it is also positively linked with subsidiary LLP and negatively linked with income smoothing. This may reflect the fact that when facing a large shock, whether positive or negative, shareholders encourage daughter companies to boost their reserve levels. In the case of sudden amelioration, this may stem from a relaxed approach of shareholders, which expect their own results to improve and do not need the additional dividends from their subsidiaries. In case of a negative shock, the fear of strongly depleted reserves at daughter companies and resulting possible capital demands, shareholders encourage a more prudent credit reserve policy in daughter companies.

Conclusion

Using a sample of c.150 Central European banks, we examine transmission of shocks from shareholder company level to subsidiaries. We find that changes in the economic environment or the financial standing of shareholders are linked to changes in the level of loan loss provisions of subsidiary banks, while controlling for the quality of their loan portfolio (NPL) and reserves created in previous periods (LLR). Our results indicate that positive shocks in macroeconomic environment are linked with higher loan loss provisions, in line with the saving for a rainy day hypothesis. Negative shocks in shareholder country GDP growth and stock exchange returns are negatively related to reserves, in line with a hypothesis of channeling funds from subsidiaries to assist shareholders. Changes in shareholder profitability also affect subsidiary loan loss provisions and income smoothing, but it depends on the scale of the profitability shocks. Small profitability changes have no effects. Medium profitability increases are shown to boost subsidiary reserves and decrease the intensity of income smoothing. Large profitability shocks, both positive and negative, are linked with a hike in loan loss provisions and a decrease in income smoothing. In these cases, loan loss provisions become anticyclical towards bank internal profitability, which is against the usual trend confirmed for both developed- and developing country banks.

The above results are important in two aspects. First, they confirm that the financial situation of primary shareholders not only has an effect on subsidiary loan supply, as indicated in the literature. It also strongly affects loan loss reserve policy in daughter companies, although not in the expected direction. Existing empirical results indicate that parent companies are prone to use subsidiaries to manage liquidity, especially when the former are negatively hit. This would indicate that moderate or larger drops in shareholder revenues would be linked with increases in LLP of subsidiary banks. We do not find such a statistically significant relation, even if the coefficient itself is negative. However, we do find that shareholders use periods of high profitability to accumulate reserves at subsidiary banks. The significance and size of this link is higher for larger positive changes of revenues. This implies that holding companies may perform smoothing income on the mother company level rather than at subsidiaries only.

The second aspect relates to income smoothing at subsidiary level. The statistically significant and economically large positive link between the shareholder ROA and pre-provisioning interaction term and LLP implies that the process of using loan loss provisions to change income fluctuations in subsidiaries is modified by shareholders. The extent of this modification is so large that in fact it wipes out the smoothing behavior. In other words, when shareholders

experience a strong positive shock in profitability, subsidiaries start making provisions in an anticyclical pattern, diminishing them when income increases. In light of the broad empirical evidence for income smoothing in various banks, both in developed and developing countries, this provides important new evidence for income smoothing incentives. To date, external factors affecting income smoothing were limited to macroeconomic environment or internal bank factors. Our results indicate that income smoothing may also be shareholder-related. Changes at shareholder level not only shape the nominal level of loan loss reserves but also their link with pre-provisioning income and hence also internal bank profitability cycles.

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Table 1. Descriptive statistics of main variables

Variable	Obs	Mean	Std.dev.	Min	Max
Bank variables					
LLP	890	1.13	1.5	-1.71	8.45
Income	890	1.95	1.9	-8.66	12.04
Non-performing loans	890	10.8	11.16	0.12	65.97
Loan growth	890	14.69	33.63	-45.81	319.09
LLR	890	5.56	5	0.09	25.76
Loans/assets	890	63.53	14.81	8.86	95.28
Equity	890	10.54	4.43	1.6	46.34
Size	890	14.79	1.44	10.66	17.49
Macroeconomic environment subsidiaries					
GDP growth	890	2.03	4.55	-17.70	10.99
Inflation	890	3.15	2.66	-1.87	14.24
Economic environment shareholders					
GDP growth	890	0.81	3.24	-14.81	11.09
Market returns	887	2.58	22.84	-86.73	92.69
Sector ROA	888	0.22	1.21	-8.52	7.56
Sector equity	887	14.37	2.77	7.34	22.50

Notes: *LLP* are Loan Loss Provisions over total assets, *Income* is the pre-provisioning income over total assets, *Non-performing loans* are irregular loans over total assets, *Loan growth* is the annual growth in total loans, *LLR* are loan loss reserves on the asset side over total loans, *Loans/assets* are total loans over total assets, *Equity* is the total capital over total assets, *Size* is the natural logarithm of total assets, *GDP growth* is the annual GDP growth, *Inflation* is the annual growth in price level, *Market returns* is the average annual market returns in a country's stock exchange, *Sector ROA* is the average level of ROA in the country's banking sector, *Sector equity* is the average value of capital to risk weighted assets in the country's banking sector.

Table 2. Final sample – country and observation split of subsidiary banks and shareholders

Subsidiary banks

Country Name	Freq.
Bulgaria	91
Croatia	95
Czech Republic	98
Estonia	35
Hungary	60
Latvia	60
Lithuania	59
Poland	137
Romania	99
Slovakia	96
Slovenia	57
Total	**887**

Shareholders

Country Name	Freq.	Country Name	Freq.
Austria	224	Portugal	12
France	74	Estonia	11
Sweden	61	Ireland	9
Netherlands	57	Norway	9
Italy	54	Latvia	8
Germany	51	Cyprus	7
Greece	46	Finland	6
Luxembourg	44	Lithuania	5
Belgium	43	Turkey	5
Hungary	36	Slovenia	4
United States	29	Czech Republic	3
Russian Federation	19	Malta	3
Denmark	16	Iceland	2
United Kingdom	16	Japan	2
Spain	15	Slovak Republic	1
Ukraine	15		
Total			**887**

Notes: Frequencies are given for all periods.

Table 3. Changes in shareholder country GDP and stock exchange returns versus subsidiary bank loan loss provisions and income smoothing

	-1	-2	-3	-4	-5	-6	-7
Income	0.2373***	0.1535***	0.2293***	0.1896***	0.1703***	0.2109***	0.1829***
Non-performing loans	0.0478***	0.0479***	0.0483***	0.0480***	0.0491***	0.0420***	0.0433***
Loan growth	-0.0046***	-0.0046***	-0.0048***	-0.0047***	-0.0048***	-0.0048***	-0.0045***
LLR	-0.0397***	-0.0398***	-0.0411***	-0.0406***	-0.0408***	-0.0307**	-0.0315**
Loans/assets	0.0091	0.0094	0.0101*	0.0102*	0.0104*	0.0087	0.0078
Equity	-0.0872***	-0.0863***	-0.0889***	-0.0880***	-0.0819***	-0.0880***	-0.0864***
Size	-0.2084	-0.2045	-0.2308	-0.2297	-0.194	-0.2029	-0.1996
GDP growth	-0.1020***	-0.1006***	-0.0961***	-0.0984***	-0.0962***	-0.0956***	-0.0940***
Inflation	-0.0323	-0.0328	-0.0389*	-0.0379*	-0.0364*	-0.0367*	-0.0367*
Sh_GDP Up	0.3706***						
IS Sh_GDP Up	-0.0882**						
Sh_GDP Down		-0.3118**					
IS Sh_GDP Down		0.0777**					
sh_GDP_low			0.1695				
IS_sh_GDP_low			-0.0565				
Sh_SE Up				-0.0063			
IS Sh_SE Up				0.0247			
Sh_SE Down					-0.4352**		
IS Sh_SE Down					0.1021**		
Sh_SE Shock_Pos						0.1992	
IS Sh_SE Shock_Pos						-0.0446	
Sh_SE Shock_Neg							0.201
IS Sh_SE Shock_Neg							0.0954**
Year fixed effects	yes	yes	yes	yes	yes	yes	yes
No. of obs.	890	890	890	887	887	885	885
No. of banks	150	150	150	150	150	150	150
R-Squared	0.2042	0.2014	0.1964	0.1917	0.1988	0.1675	0.1766

Notes: *LLP* are Loan Loss Provisions over total assets, *Income* is the pre-provisioning income over total assets, *Non-performing loans* are irregular loans over total assets, *Loan growth* is the annual growth in total loans, *LLR* are loan loss reserves on the asset side over total loans, *Loans/assets* are total loans over total assets, *Equity* is the total capital over total assets, *Size* is the natural logarithm of total assets, *GDP growth* is the annual GDP growth, *Sh GDP Up (Down)* is a binary variable equal 1 when the increase (decrease) in a shareholder country GDP equals min. 0.2pp., *IS GDP UP (Down)* is the interaction variable of *Sh GDP UP (Down)* * *Income*; *Sh GDP Low* is a binary variable equal one for years when GDP growth in the shareholder's country is lower than mean GDP growth for this country for the period 2003-3014; *Sh SE Up (Down)* is a binary variable equal one when average annual market returns in a given year are higher (lower) than the standard deviation of SE returns for the whole period, *IS Sh SE Up* (*Down*) is the interaction term with *Income*; *Sh SE Shock Pos (Neg)* is a binary variable equal one in a year when previously negative market returns turn positive (or vice-versa); *IS SH SE Shock Pos (Neg)* is the interaction term with *Income*.

Table 4. Changes in banking sector ROA and equity in shareholder country versus subsidiary bank loan loss provisions and income smoothing

	-1	-2	-3	-4	-5
Income	0.2014***	0.1847***	0.2627***	0.1714***	0.1743***
Non-performing loans	0.0463***	0.0473***	0.0487***	0.0489***	0.0613***
Loan growth	-0.0050***	-0.0048***	-0.0050***	-0.0050***	0.0006
LLR	-0.0386***	-0.0392***	-0.0423***	-0.0412***	-0.1245***
Loans/assets	0.0117**	0.0115*	0.0094	0.0109*	-0.0183***
Equity	-0.0874***	-0.0849***	-0.0840***	-0.0830***	-0.0312
Size	-0.2432	-0.2298	-0.223	-0.2084	0.2643
GDP growth	-0.1050***	-0.1040***	-0.1001***	-0.1014***	-0.1050***
Inflation	-0.0414**	-0.0415**	-0.0364*	-0.0335	-0.0622***
Sh_BS_ROA_Up	0.054				
IS Sh_BS_ROA_Up	-0.0039				
Sh_ROA_BS_neg		-0.1175			
IS_sh_ROA_BS_neg		0.0701			
Sh_cap_RWA_BS_pos			0.2183*		
IS_Sh_cap_RWA_BS_pos			-0.1149***		
Sh_cap_RWA_BS_neg				-0.0991	
IS_ Sh_cap_RWA_BS_neg				0.1089**	
Sh_BS_crisis					-0.2791
IS_Sh_BS_crisis					-0.0386
Year fixed effects	yes	yes	yes	yes	yes
No. of obs.	887	887	883	883	586
No. of banks	150	150	150	150	134
R squared	0.2006	0.2026	0.2049	0.2028	0.3358

Notes: *LLP* are Loan Loss Provisions over total assets, *Income* is the pre-provisioning income over total assets, *Non-performing loans* are irregular loans over total assets, *Loan growth* is the annual growth in total loans, *LLR* are loan loss reserves on the asset side over total loans, *Loans/assets* are total loans over total assets, *Equity* is the total capital over total assets, *Size* is the natural logarithm of total assets, *GDP growth* is the annual GDP growth, *Sh BS ROA Up* is a binary variable equal 1 when banking sector ROA in shareholder country increases, *IS Sh BS ROA UP* is the interaction variable of *Sh BS ROA UP * Income*; *Sh ROA BS neg (pos)* is a binary variable equal one for years when ROA decreases (increases) by over 0.2 pp. in the shareholder's country banking sector; *IS Sh ROA BS neg (pos)* is the interaction term with *Income; Sh BS Crisis* is a binary variable equal one when a banking sector crisis was recorded in the shareholder country; *IS BS Crisis* is the interaction term with *Income*.

Table 5. Changes in shareholder entity profitability versus subsidiary bank loan loss provisions and income smoothing

	-1	-2	-3	-4	-5	-6	-7
Income	0.2097**	0.2264***	0.1543**	0.2270***	0.2060***	0.2196***	0.2640***
Non-performing loans	0.0803***	0.0792***	0.0796***	0.0786***	0.0806***	0.0784***	0.0783***
Loan growth	0.0016	0.0014	0.0012	0.0013	0.0015	0.0016	0.002
LLR	-0.0759***	-0.0774***	-0.0763***	-0.0793***	-0.0763***	-0.0780***	-0.0708***
Loans/assets	-0.0004	-0.0004	0.0005	-0.0016	-0.0004	-0.0014	-0.0015
Equity	-0.0814***	-0.0832***	-0.0850***	-0.0841***	-0.0821***	-0.0807***	-0.0720***
Size	-0.0531	-0.0546	-0.0507	-0.0719	-0.0517	-0.0503	-0.0995
GDP growth	-0.0985***	-0.0990***	-0.0970***	-0.0986***	-0.0982***	-0.0991***	-0.1029***
Inflation	-0.0625***	-0.0617***	-0.0629***	-0.0614***	-0.0620***	-0.0615***	-0.0643***
ROA_sh_drop	0.1005						
IS_ROA_sh_drop	-0.0051						
ROA_0.2_pos		0.2841					
IS_ROA_0.2_pos		-0.1216					
ROA_0.2_neg			-0.1127				
IS_ROA_0.2_neg			0.0867				
ROA_0.5_pos				0.5841***			
IS_ROA_0.5_pos				-0.2339**			
ROA_0.5_neg					0.0949		
IS_ROA_0.5_neg					0.0014		
ROA_1_pos						0.6750**	
IS_ROA_1_pos						-0.2522**	
ROA_1_neg							0.8312***
IS_ROA_1_neg							-0.3645***
Years fixed effects	yes	yes	yes	yes	yes	yes	yes
No of observations	568	568	568	568	568	568	568
No of banks	95	95	95	95	95	95	95
R squared	0.3315	0.3331	0.3327	0.3393	0.331	0.3388	0.3545

Notes: *LLP* are Loan Loss Provisions over total assets, *Income* is the pre-provisioning income over total assets, *Non-performing loans* are irregular loans over total assets, *Loan growth* is the annual growth in total loans, *LLR* are loan loss reserves on the asset side over total loans, *Loans/assets* are total loans over total assets, *Equity* is the total capital over total assets, *Size* is the natural logarithm of total assets, *GDP growth* is the annual GDP growth, *ROA Sh Drop* is a binary variable equal 1 shareholder company ROA increases, *IS ROA Sh Drop* is the interaction variable with *Income*; *ROA 0.2 pos (neg)* is a binary variable equal one for years when shareholder ROA increases (decreases) by over 0.2 pp.; *IS ROA 0.2 pos (neg)* is the interaction term with *Income; ROA 0.5 pos (neg) and ROA 1 pos (neg)* account for respective changes of shareholder ROA of 0.5 pp and 1 pp., along with relevant interaction terms with *Income.*