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ABSTRACT

Financial Markets, Banks' Cost of Funding, and Firms' Decisions: Lessons from Two Crises*

We test whether financial fluctuations affect firms' decisions, through their impact on banks' cost of funding. We exploit two shocks to Italian bank CDS spreads and equity valuations: the 2007-2009 financial crisis and the 2010-2012 sovereign debt crisis. Using newly available data linking over 3,000, mostly privately-held, non-financial firms to their bank(s), we find that increases in Italian banks' CDS spreads and decreases in their equity valuations lead younger and smaller firms to cut investment, employment, and borrowing. We conclude that financial market fluctuations affect even private firms' real decisions by affecting the costs of funds of their banks.

JEL Classification: D92, G21, J23

Keywords: financial market shocks, banks, credit-default swaps, volatility, investment, employment, lending

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Introduction

Do financial market fluctuations affect the real economy? This question is central to our understanding of how market economies work and has become even more important in light of the recent financial and sovereign debt crises. We address this research question by investigating whether market-driven fluctuations of banks' cost of funding affected firms' decisions during the two crises. We measure banks' cost of funding with their CDS spread and Tobin's Q and we focus on the investment and employment decisions, and borrowing of client firms.[1] The CDS spread captures the banks' cost of debt over and above the risk-free rate and Tobin's Q reflects the cost of equity capital.[2] Both measures, although not necessarily to the same degree, are likely to affect the credit conditions faced by client firms. In summary, we study a new form of the bank-lending channel through which financial market fluctuations affected the real economy during the two crises.

Our empirical analysis focuses on the recent Italian experience during the 2007–2009 financial crisis and, perhaps even more importantly, the 2010–2012 sovereign debt crisis. Both crises arise outside the Italian non-financial corporate sector and generate heterogeneous time variation in banks' cost of funding, depending upon their exposure to U.S. banks and Italian sovereign debt. We rely on this differential response to estimate the effect of changes in banks' cost of funding on clients firms' real decisions. The Italian case is particularly interesting because Italian firms are predominantly small and privately held, rely heavily on bank debt, and are largely unable to cushion shocks to the cost and availability of bank lending by resorting to capital markets.

Figures 1–3 characterize the recent Italian experience at the aggregate level. Figures 1 and 2 plot the behavior of aggregate financial valuations for Italian banks during the 2006–2011 period. As it is apparent from the figures, banks' cost-of-funding conditions worsened following the Lehman

[1] Note that the amount of bank borrowing on the part of the firms in our sample is, in fact, the result of the interaction between demand and supply decisions—more discussion of this issue in Section 3.6.

[2] An important additional source of medium-term funding, the ECB's Long Term Re-financing Operations, or LTRO, was introduced only in December 2011, at the very end of our sample.

crisis and, especially, following the sovereign debt crisis, as reflected by higher CDS spreads, higher volatility of CDS spreads and stock prices, and lower stock valuations. Furthermore, the evolution of banks' valuations has not been uniform, as can be seen from the widening of the one-standard deviation bands: different banks have fared differently, particularly at the times of the financial and sovereign debt crises. Indeed, it is the time variation of the cross-sectional heterogeneity in firms' and banks' behavior that enables us to identify the effects of interest. Figure 3 plots the behavior of aggregate investment, employment, and bank loan growth, and documents their deterioration in times of crisis. In summary, the aggregate evidence in Figures 1–3 raises the question of whether there is a *causal* nexus linking banks' cost of funding to the real economy, through the effects banks exert on the decisions of client firms.

There are several main features of our analysis that are worth emphasizing. First, we use a newly available data set covering a representative sample of over 3,000 Italian firms. This data set includes a large number of privately held micro and small firms and provides information on the identity of the bank(s) each firm has a relationship with. Second, we allow for the effects of banks' financial market valuations on firms' decisions to depend on the likelihood of the firm being financially constrained, as measured by age and size. Third, we quantify banks' financial market conditions with several indicators—level and volatility of banks' CDS spreads, Tobin's Q, and stock market volatility—and we evaluate their relative importance for firms' decisions. Fourth, we develop a novel instrumenting strategy in which we use the *pre-crisis* individual banks' exposure to dollar-denominated assets or sovereign bonds, interacted with *lagged* CDS spreads on contracts on U.S. banks and Italy, as instruments for contemporaneous banks' financial valuations (more on this below). Fifth, although our main focus is on investment, we show that our basic results hold also for firms' employment and borrowing decisions. Finally, we investigate whether other bank-related variables, in addition to our measures of the cost of funding, impact firms' decisions.

We do so by including in the investment equation controls for bank balance-sheet variables (Tier 1 capital ratio, liquidity, etc.) as well as expectations of banks' fundamentals based on analyst earnings forecasts. Indeed, all previous literature on the real effects of the financial crisis through the bank-lending channel has focused on *balance-sheet* variables as indicators of bank health.

The estimation requires instrumenting banks' financial valuations because of their potential endogeneity due to omitted variables and reverse-causality effects: banks' financial market conditions could be correlated with omitted variables in the investment, employment, and borrowing equations, and could be themselves affected by the choices of client firms.[3] Therefore, we control for a rich menu of variables capturing firms' demand and balance-sheet conditions, and we go beyond the standard use of internal instruments in a dynamic-panel context (Arellano and Bond, 1991; Blundell and Bond, 1998). As mentioned above, we use as instruments for banks' valuations the banks' pre-crisis exposure to dollar-denominated assets, interacted with the *lagged* CDS spread for U.S. banks, and the exposure to sovereign bonds, interacted with the *lagged* CDS spread for Italian Treasury bonds. Our identifying assumption is that these instruments are orthogonal to the *idiosyncratic shocks* to firms' decisions. The use of *pre-crisis* exposures deals with possible feedback from firms' decisions to bank portfolio choices. Furthermore, even though the financial and sovereign debt crises originated outside the Italian non-financial corporate sector, the use of lagged, as opposed to contemporaneous, CDS spreads represents an extra degree of caution in instrument selection.

The main results of the empirical analysis are easily summarized: an increase in a bank's CDS spread, CDS volatility, and stock price volatility, and a decline in Tobin's Q, all affect the investment activity of client firms. These effects are negative (positive) for younger and smaller (older and larger) firms. These effects are statistically and economically significant. For example,

[3] A detailed discussion of our econometric strategy is contained in Section 1.

after controlling for common year- and firm-specific effects, a one-standard deviation increase in a bank's CDS spread *decreases* the investment activity of a client firm at the *10th percentile* of the age distribution—a five-year old firm—by 0.5 standard deviations, while it *increases* investment for a firm at the *90th percentile*—a 38-year old firm—by 0.2 standard deviations. We also document significant negative effects of changes in the CDS spread on employment and borrowing of younger and smaller firms. Therefore, there is evidence of a bank-lending channel in the transmission of adverse financial shocks, characterized by a (relative) flight-to-quality away from the riskier and more opaque borrowers.

These results are robust to the inclusion of a large menu of variables capturing: i) a firm's creditworthiness; ii) banks' balance-sheet conditions and profitability; and iii) analyst bank earnings forecasts. Among the cost-of-funding measures used in our empirical work, banks' CDS spreads impact firms' decisions more than banks' Tobin's Qs, reflecting the fact that debt, rather than equity, is likely to be the marginal source of funding for the banks in our sample. Moreover, both CDS levels and (orthogonalized) CDS volatility measures seem to matter. Finally, adverse financial shocks also have a negative impact on the employment and borrowing of young and small firms.

While our econometric analysis is performed at the firm level, we also investigate the *aggregate* implications of our results. Specifically, we compute two *counter-factual* benchmarks: the hypothetical investment and employment of each firm in the sample, had the CDS spread of the bank(s) it borrows from stayed at the previous year's level. Furthermore, we compute indicators of allocative efficiency for both investment and net employment changes, based on the marginal-revenue product of actual investment (net employment change) relative to the counter-factual benchmark. In most years, changes in banks' CDS spreads relative to the previous year's level lead to net reductions in aggregate investment activity, and the effect is largest and substantial in 2011, when banks' valuations were severely affected by the sovereign debt crisis. Across all years, actual investment is allocated less efficiently than counter-factual investment, with sizable efficiency losses in 2008 and 2011. As to employment decisions, changes in banks' CDS spreads lead to net reductions in aggregate employment in all years, with largest effects occurring in 2008 and 2011. In all years, the allocation of net employment changes is less efficient than the counter-factual, with the largest efficiency loss in 2011.

The present paper is related to and extends the recent literature on the effects of shocks to banks' health on bank lending and firms' real decisions during the recent financial crisis. Ivashina and Scharfstein (2010), for example, document that U.S. banks reduced credit to their clients more during the crisis if they had a less stable deposit base (see also Cornett, McNutt, Strahan, and Tehranian, 2011), or if they were more exposed to credit-lines drawdowns because of co-syndicated loans with Lehman Brothers. Chodorow-Reich (2013) presents evidence that firms with pre-crisis relationships with less healthy lenders faced worse credit conditions and reduced employment more.[4] Puri, Rocholl, and Steffen (2011), on the other hand, show that more loan applications were rejected by German banks, if these banks were affected by the U.S. financial crisis through their holdings in Landesbanken with substantial subprime exposure.[5] Jiménez, Ongena, Peydró, and Saurina (2012a) and Jiménez, Ongena, Peydró, and Saurina (2012b) use Spanish data to show that banks' capitalization and liquidity matter for the probability of obtaining a loan in time of crisis and for the transmission of monetary policy. Bentolila, Jansen, Jiménez, and Ruano (2013) also use Spanish data to show that firms attached to weak banks suffered an additional fall in employment

[4]See also Montoriol-Garriga and Wang (2011), who document the deterioration of access to credit for small firms during the Great Recession. A critical view of the importance of lending shock in the aftermath of the post-Lehman crisis in the U.S. is provided by Khale and Stulz (2012), who find that bank-dependent publicly traded firms, or firms with high initial leverage, do not experience a greater fall in net debt issuance or in investment early on during the crisis. Indeed, Adrian, Colla, and Shin (2012) and Becker and Ivashina (2011) find evidence that, for U.S. firms, the fall in bank credit is compensated by bond issuance. Focusing on *firms'* balance-sheet conditions, Duchin, Ozbas, and Sensoy (2010) and Almeida, Campello, Laranjeira, and Weisbenner (2012) present evidence that U.S. firms with low cash reserves and high short term debt (the former) or with long term debt maturing in late 2007 (the latter) reduce their investment more in the aftermath of the financial crisis.

[5]Also see Beltratti and Stulz (2012) for a *cross-country* study of the factors affecting bank performance in the aftermath of the financial crisis.

between 3 and 6 percentage points. For Italy, Albertazzi and Marchetti (2010) and Bonaccorsi and Sette (2012) document that the supply of loans drops more after the Lehman default for less well-capitalized or liquid banks, and for banks more reliant on non-bank sources of funding. Bofondi, Carpinelli, and Sette (2012), on the other hand, show that during the sovereign crisis the supply of credit of foreign banks drops less than that of Italian banks.[6]

The papers mentioned above, in their emphasis on banks' balance-sheet variables, build on the earlier contributions on the importance of the lending channel of monetary policy by Kashyap, Stein, and Wilcox (1993), and Kashyap and Stein (2000). They also build on Peek and Rosengren (1997, 2000), who studied the international transmission of bank-credit supply shocks following the stock market and real estate crash in Japan.[7]

While our study is based on firm- and bank-level data, Gilchrist and Zakrajšek (2012) analyze similar issues at the aggregate level. They show that U.S. aggregate corporate bond spreads, adjusted for the probability of default, have great predictive power for future aggregate economic activity. Moreover, they find that aggregate corporate bond spreads are closely correlated with the CDS spreads of broker-dealers, supporting the notion that changes in financial intermediaries' market valuations impact credit supply conditions and, hence, real activity.

Our paper differs from and extends the existing literature by being the first to study the effect of individual banks' market-based cost-of-funding measures—both level and volatility—on the real decisions of the firms they lend to, and to do so for both the post-Lehman and sovereign debt crises. The information on firm-bank relationships allows us to exploit the time variation of the *cross-sectional heterogeneity* of banks' cost of funding to identify the real effects of financial volatility on individual firms. This paper uncovers and documents an important channel through

[6]Presbitero, Udell, and Zazzaro (2012) find that the effect of the credit crunch is greater in provinces with more distantly headquartered banks. See also D'Aurizio, Oliviero, and Romano (2012) who find that lending to family firms falls less than lending to non-family firms following the 2008 crisis.

[7]More recently, Adrian, Moench, and Shin (2010) relate financial intermediaries' balance-sheet conditions to future stock and bond returns and economic activity in the U.S.

which financial market shocks can affect the real economy. Indeed, even in countries where the fraction of firms with publicly traded financial instruments is small, financial market fluctuations are likely to have a powerful impact on firms' real decisions through their effect on banks' cost of funding.

Furthermore, our results suggest that banks' cost of funding matters for firms' investment, over and above banks' balance-sheet conditions and earnings forecasts. Previous papers provide evidence that stock market fluctuations have an effect on firms' investment, even if one controls for fundamentals (see Morck, Shleifer, Vishny, Shapiro, and Poterba, 1990, and Blanchard, Rhee, and Summers, 2000, among others). The crucial difference between that earlier literature and our contribution is that we focus on banks', not on firms' financial valuations. In addition, we show that banks' CDS spreads impact firms' investment decisions more than banks' equity valuations. Finally, our paper presents evidence that both the level and volatility of bank CDS spreads affect firms' decisions. The focus on the role of volatility for firms' real decisions is also shared by a different literature that uses firms' stock return volatility as a proxy for uncertainty.[8] Again, we differ from those contributions because we place the volatility of banks', not firms', financial valuations at the center of our analysis.

The structure of the paper is as follows. Section 1 discusses the empirical methodology we use, with an emphasis on how we deal with possible endogeneity issues. Section 2 describes the data and, in particular, the novel survey data set containing firm-bank information. Section 3 discusses the empirical results. Section 5 concludes the paper.

[8]See, for instance, Bloom, Bond, and Van Reenen (2007) in the context of a model with irreversibility. See also the early paper by Leahy and Whited (1996), and Stein and Stone (2012), where the effects of stock volatility are analyzed by using the implied volatility from equity options.

1 Empirical methodology

This section describes the empirical strategy we use in identifying the effect of banks' cost of funding on client firms' decisions. We first discuss the financial variables that we employ and why they contain information on the credit conditions faced by client firms. We then illustrate the econometric issues we face and present the model specification and instrumental variable strategy employed in addressing them.

1.1 Banks' financial valuations and credit supply conditions

There are several reasons why banks' financial valuation are measures of their cost of funding and, hence, are likely to affect the credit-supply conditions faced by client firms.[9] First, CDS spreads are tightly correlated with the rates at which banks borrow in the bond markets—indeed, in a frictionless economy, arbitrage activity ensures that bond credit spreads are *the same* as CDS spreads.[10] Importantly, Italian banks rely heavily on bond issuance as a source of funding. Indeed, in 2009, Italian banks displayed a bond-to-deposit ratio of 40%, the highest among European banks (Grasso, Linciano, Pierantoni, and Siciliano, 2010). Banks' cost of debt is likely to be passed on to their customers, possibly more than in a one-to-one fashion.[11] Second, equity valuations reflect the expected rates of return required by stockholders and, hence, the cost of issuing equity capital. This cost should be factored in when the bank makes investment—i.e., lending—decisions. Third,

[9] Banks' cost of funding may also reflect credit demand conditions. The next section discusses how to address this issue.

[10] Obviously, arbitrage activity may be subject to frictions, especially at times of high volatility, and the differential between CDS spreads and bond credit spreads—the CDS "basis"—may deviate significantly from zero. Indeed Fontana (2009) and Bai and Collin-Dufresne (2010) document negative CDS basis during the financial crisis. In our setting, the presence of a non-zero CDS basis does not invalidate the CDS spread as a measure of the cost of funding, as long as the basis has only constant bank-specific and common time-varying components, as these components are picked up by the firm and time fixed effects that we control for in the empirical analysis.

[11] Note that CDS spreads reflect a *risk-adjusted* probability of default, which incorporates the objective probability of default, as well as compensation for risk. While we do not take a stand as to the drivers of CDS spread variation in our analysis, we do show that the effects of banks' CDS spreads on firm investment are robust to the inclusion of variables capturing banks' fundamentals.

changes in banks' financial valuations are likely to be driven by investors' risk aversion.[12] These changes in investors' risk aversion may affect bank managers' own risk aversion. Fourth, in addition to the level of banks' valuations, the *volatility* of valuations is also likely to impact bank managers' risk aversion, willingness to lend, and the credit conditions offered to client firms. Moreover, the volatility of banks' valuations is likely to translate into volatility of the credit conditions offered to client firms, which may also affect investment.

In summary, there are good reasons why we would expect banks' financial valuations to capture their cost of funding and, hence, to affect the credit-supply conditions faced by client firms. To be more precise, denote with c_{it} the financial factors affecting investment decisions by firm i at time t (the firm-specific discount factor or cost of capital for short), inclusive of all financial frictions in accessing external funds. We assume that c_{it} can be written as:

$$c_{it} = \gamma_{1i}^{\top}\text{FINVAR}_{it} + \gamma_{2i}^{\top}x_{it}^{b} + \gamma_{3i}^{\top}x_{it}^{1,f} + \mu_t + \omega_i + \varepsilon_{it}, \tag{1}$$

where FINVAR_{it} denotes the vector of market-based measures of banks' cost of funding.

In our empirical analysis, we run "horse races" between CDS spreads and equity valuations, and between the level and volatility of valuations. Note, though, that if bond markets are the more common marginal source of funds for the bank, it is likely that the CDS spreads are more informative than stock market valuations in determining banks' cost of funding. The firm's credit conditions are also likely to be related to other indicators of bank health obtained from bank balance sheets or from analysts' expectations of banks' profitability. We will explore their role as well, and compare it to that of banks' market-based measures of their cost of funding. The vector of these additional bank-level factors is denoted by x_{it}^{b}. All bank-level variables may have a different effect on the

[12]See Cochrane (2011) for a discussion of the role of expected discount rates v. expected cash flows as drivers of financial valuations.

overall credit conditions faced by the firm, depending upon the degree of bank dependence. Young (small) firms, for instance, are likely to be more informationally opaque, short of collateralizable assets and, therefore, less likely to be able to substitute bank funds with market funds. As a result, adverse changes in the health of the bank a firm borrows from are likely to have a larger negative effect on its cost of capital. This is why we allow γ_{1i} and γ_{2i} to vary by firm (or firm type) in equation (1).

Firms' credit conditions may also depend directly upon observable time-varying firm characteristics, including firms' balance-sheet conditions, x_{it}^{f}, a common time-specific effect, μ_t, unobservable firm-specific and time-invariant characteristics, ω_i, and an idiosyncratic error component, ε_{it}. Since it is possible that some of the firm's balance sheet conditions included in $x_{it}^{1,f}$ may have a different effect depending upon firm type, we index γ_3 by i. The error term has the standard error-component structure: ω_i, and ε_{it} are mean zero and uncorrelated with each other; moreover, ε_{it} is uncorrelated over time or cross sectionally. Finally, in some specifications, the time effect, μ_t, is permitted to vary by firm type or bank type.

1.2 Model specification and instrumenting strategy

There are three main interrelated issues that we must address in assessing the effect of banks' financial valuations on firms' decisions. The first issue is the need to control for credit-demand factors, which, in turn, affect firms' expected returns from investing. Not controlling properly for demand conditions gives rise to an omitted-variable bias in evaluating the effect of market-induced credit supply shocks on firms' decisions.[13]

The second related issue has to do with the problem of reverse causality, whereby banks' financial valuations do not cause investment, but are the result themselves of factors affecting

[13] Obviously, the firm-level controls for demand effects are likely to be econometrically endogenous and need to be instrumented; more on this issue below.

firms' investment activity, which, in turn affect banks' bottom line and valuations. Positive shocks to investment are associated with a healthier firm's balance sheet and result in improved banks' profitability (reflected in their valuations), because, for instance, of a reduction in the amount of non-performing loans. It is true that most of our firms are small, so that idiosyncratic shocks to their investment prospects have a negligible effect on a bank's bottom line, but this effect may be substantial if firms borrowing from the same bank are hit by correlated shocks and these shocks are not controlled for. All these issues would render banks' valuations econometrically endogenous in the estimating equations and must be appropriately addressed in model specification, by using extensive controls for firms' investment opportunities and balance-sheet strength, and through an appropriate instrumenting strategy.

A final issue is one of selection, in which a firm with better investment prospects at a given time chooses to borrow from banks with a more favorable market valuation. If permanently better firms have associations with permanently better banks, this problem is easily addressed by controlling for the time-invariant component of the error term. Indeed, firm-bank relationships in Italy are rather stable and most firms have long-term associations with a single bank.[14]

We discuss our econometric approach in the context of a simple specification of the investment equation. Assume that the investment rate $\frac{I_{it}}{K_{i,t-1}}$ depends upon covariates capturing firm

[14]It is possible, however, that some firms with improved (unobservable) prospects may be able to more easily diversify the portfolio of their bank relationships, which may be reflected in the average valuations of the multiple banks a firm has a relationship with. This issue is interrelated with the fact that we observe the bank-firm relationship only at the end of the sample and is discussed below in Section 2.3.

profitability, x_{it}^{2f}, and credit conditions, c_{it}:[15]

$$\frac{I_{it}}{K_{i,t-1}} = \beta_1^\top x_{it}^{2,f} + \beta_2 c_{it} + \tilde{\lambda}_t + \tilde{\eta}_i + \widetilde{u}_{it}. \tag{2}$$

As in equation (1), the time effects are allowed to vary by firm or bank type in some specification.Substitute (1) into (2) and assume that the effect of bank-level variables on firms' credit conditions differs by age (or size). We obtain our estimating equation:

$$\frac{I_{it}}{K_{i,t-1}} = \alpha_{1i}^\top \text{FINVAR}_{it} + \alpha_{2i}^\top x_{it}^b + \alpha_{3i}^\top x_{it}^f + \eta_i + \lambda_t + u_{it}, \tag{3}$$

where $\alpha_{1i} = \alpha_{10} + \alpha_{11}\ln(1+\text{age}_{it})$, $\alpha_{2i} = \alpha_{20} + \alpha_{21}\ln(1+\text{age}_{it})$, and $\alpha_{3i} = \alpha_{30} + \alpha_{31}\ln(1+\text{age}_{it})$.

We allow the effect of FINVAR_{it} to differ according to the age of the firm to account for the fact that market-generated changes in bank credit conditions are likely to have a different impact depending on firm type. As an alternative to age, we also use firm size, measured by beginning-of-period total assets in the interaction terms. In addition, investment may depend upon the other bank-level variables, x_{it}^b, capturing the effect of other bank characteristics on the firm cost of capital, c_{it} (balance-sheet variables, measures of profitability, and expected earnings). Their coefficients can also vary by firm age or size. Investment is also a function of the union (denoted by x_{it}^f) of all the firm-level variables $x_{it}^{1,f}$ and $x_{it}^{2,f}$ that affect either the firm's cost of capital or its expected profitability. All specifications include in x_{it}^f the output-to-capital ratio and the cash-flow-to-capital ratio, in addition to age or size.[16] We also check the robustness of our results to the

[15] One way to rationalize our investment equation is to think of a firm facing quadratic adjustment costs. In that case, the investment rate can be written as a function of the expected discounted sum of the marginal revenue products of capital. To a first-order approximation, the latter term can be expressed as the sum of the present value of the expected marginal revenue products (with a fixed common discount rate) and the present value of the firm- and time-specific discount factors summarizing all the possible financial frictions faced by the firm. Assuming that expectations about marginal revenue products and the discount factors are formed on the basis of the variables contained in x_{it}^{2f} and c_{it} respectively, yields equation (2) (see Gilchrist and Himmelberg, 1998).

[16] With a Cobb-Douglas production function and log-linear demand, the marginal revenue product of capital for an imperfectly competitive firm is proportional to the capital-output ratio (Gilchrist and Himmelberg, 1998). Cash flow

inclusion of other variables, such as the firm's Altman Z-score (Altman, 1968). In principle, the effect of the firm's balance-sheet variables may also vary by firm type.

Most of the literature has focused on the role of a firm's balance-sheet variables in determining the firm's discount factor. Some other contributions, old and recent, have focused, instead, on banks' balance-sheet conditions. Our novel contribution is to emphasize the effect of banks' financial valuations on firm investment through their effect on the (unobservable) firm's discount factor. However, financial valuations not only measure banks' cost of funding and, hence, credit supply conditions, but they may also capture credit demand factors. Therefore, it is important to control for common factors that may have affected firms' investment opportunities during the turbulent years of our sample. The year effect, $\lambda_t(=\tilde{\lambda}_t + \beta_2\mu_t)$, is assumed common to all firms in our basic specification, but is allowed to vary by firm industry, region or size, or bank size in our robustness exercises to account for shocks to profit opportunities (or the cost of capital) that are specific to particular groups of firms. Finally, in our estimating equation, the firm-specific, time-invariant component of the error term, $\eta_i(=\tilde{\eta}_i + \beta_2\omega_i)$, and the idiosyncratic component, $u_{it}(=\widetilde{u}_{it} + \beta_2\varepsilon_{it})$, are assumed to satisfy the standard assumptions $E(\eta_i) = E(u_{it}) = 0$, $E(\eta_i u_{it}) = 0$, and $E(u_{js}u_{it}) = 0$ for $j \neq i$ or $s \neq t$.

In estimation, we use the Two-step System GMM (Blundell and Bond, 1998, building on Arellano and Bond, 1991, and Arellano and Bover, 1995) as implemented in Stata by Roodman (2009). In the calculation of the standard errors we use the Windmeijer (2005) finite-sample correction. The basic idea of the system estimator is to combine the orthogonality conditions for the differenced and the level model. The differenced equation uses appropriately lagged levels of the variables as instruments, while the level equation is instrumented with lagged first differences of the included variables. More specifically, we use values of the output-to-capital ratio and cash-

is likely to contain information both about a firm's demand and cost of capital, but we do not attempt to identify its separate effects here.

flow-to-capital ratio (or other included firm-level variables or bank-fundamental variables) lagged twice or more for the differenced model.[17] For the level equations, we use their difference lagged once, which is legitimate given the appropriate assumptions about initial conditions discussed in Blundell and Bond, 1998, and Blundell, Bond, and Windmeijer (1993).[18]

Given the rich set of controls included in the investment equation, one could argue that the variables in FINVAR_{it} are likely to be orthogonal to the idiosyncratic component of the error. Yet, in our main analysis, we instrument FINVAR_{it} and we go beyond the conventional option of using its value lagged twice or more as instrument in the difference equation. Our choice of instruments emphasizes the crucial role of the two main shocks that have buffeted financial markets in the recent past: the post-Lehman financial crisis and the sovereign debt crisis. More specifically, we use as instruments the exposure to dollar-denominated assets in the pre-crisis period (2006) interacted with the CDS spread for U.S. banks—lagged two and three periods—and the 2006 exposure to sovereign bonds interacted with the value of the CDS spread for Italian Treasury bonds–also lagged lagged two and three periods.

The use of pre-crisis exposure to dollar-denominated bonds and sovereign bonds (mostly Italian for Italian banks) virtually eliminates the problem of anticipatory behavior of banks in determining their asset portfolio. Moreover, the use of lagged values of the CDS spread for U.S. banks and for Italian government bonds is motivated by an extra degree of caution in the (unlikely) case our common or group-specific time effects have not controlled fully for aggregate shocks to the economy that affect firms' investment opportunities, which may be correlated with contemporaneous values of the CDS's (particularly the one for Italian government bonds).[19] In other words,

[17]The error term in the difference equation is Δu_{it}, so that variables dated $t-2$ are legitimate instruments, if u_{it} is serially uncorrelated—we provide, therefore, the results of the serial correlation test proposed by Arellano and Bond, 1991.

[18]More precisely, we assume that all the firm- or bank-level variables follow mean-stationary processes. This means that the deviation of the initial observation for each variable from its steady state value is uncorrelated with η_i.

[19]Chodorow-Reich (2013) uses an instrumenting strategy similar to the one used here. In estimating the effect of credit supply shocks on employment, he instruments the chosen measure of bank health (lending during the crisis by

our identification strategy requires that the level of the CDS spread for U.S. banks or for Italian sovereign debt in 2008 and 2009 (interacted with the 2006 bank-portfolio allocations) is not correlated with the idiosyncratic component of the shock in the investment equation of the firm between 2010 and 2011.[20] We regard this as highly plausible. The combination of extensive controls for a firm's investment opportunities and our instrumenting strategy leaves us confident that what we are capturing is the effect of fluctuations in banks' financial valuations on investment through a bank-lending channel.

2 Data

The final estimation sample is the result of matches and transformations of several data sets containing information on firm-bank relationships, firm balance-sheet data, bank balance-sheet data and exposures, banks' cost-of-funding measures, and analyst bank-earnings forecasts.[21] In the following, we describe the different data sources employed.

2.1 The MET dataset

The main source of data is the Monitoraggio Economia e Territorio (MET) dataset on Italian firms, a three-wave survey performed in the years: 2008, 2009, and 2011. The sample size is about 25,000 observations per wave, including both corporations and partnerships, belonging to the manufacturing (about 60%) and service (about 40%) sectors. The sampling design is studied to have representativeness at size, region, and industry levels, while at the same time allowing for an oversampling of some characteristics of interest.[22] Differently from other Italian datasets, the

a firms' pre-crisis syndicate to all of its *other* borrowers) with the pre-crisis exposure to Lehman brothers and to toxic mortgage-backed securities, and with components of bank balance sheets not related to the corporate loan portfolio.

[20] We also add the interactions between the 2006 exposures and the change (lagged once) in the average value of the U.S. banks and Italian government debt CDS spreads to the instruments for the level equation.

[21] The Appendix contains detailed definitions of all the variables used in the analysis.

[22] The large size of the sample is compatible with an oversampling of more innovative firms in the manufacturing sector, and of companies in certain geographical regions. The sampling scheme is performed with Bayesian methods

sample contains information on firms of all size classes, even very small firms with less than 10 employees.[23]

In addition to polling firms on a very rich set of firm characteristics and behaviors, the 2011 survey asks each firm to specify the financial institutions it has a relationship with. This is the crucial piece of information that makes our analysis possible.

2.2 Other sources

Several different data sets are matched to the firm-bank identifier. Firm balance sheets, available only for corporations, are from CRIBIS D&B. Bank balance-sheet variables are from the Bankscope Bureau van Dijk dataset, while data on the exposures to the U.S. economy and to sovereign debt are hand-collected from banks' annual reports. Analyst earning forecasts are from the I/B/E/S (Thomson Reuters) database.

A relevant part of the dataset refers to banks' cost-of-funding measures. Individual bank CDS spreads, stock prices, and Tobin's Qs are from Bloomberg. CDS spreads for U.S. banks and Italian Treasury bonds are from Datastream.

All the financial variables used in the estimations are the result of aggregations from higher frequency data. CDS spreads and Tobin's Qs are computed as the average of daily observations over the fiscal year. Equity volatilities and CDS volatilities are, respectively, the standard deviations of daily continuously compounded equity returns and daily changes of CDS spreads over the same period. Expected earnings are computed as the discounted sum of analyst earnings forecasts for years $t-1$, t, and $t+1$.[24]

exploiting the observed frequencies of previous waves.

[23] Note that our data set covers a very different sample of firms from those covered by the Centrale dei Rischi (CdR) data set, not openly available to researchers. In 1993, for example, the median number of employees for the firms covered by the CdR data set was 277 (Auria, Foglia, and Reedtz, 1999), while it is 12–14 in our data set.

[24] From monthly forecasted earnings at different horizons we compute their averages over the first three months of the year and we aggregate them assuming $\rho = 0.967$ as a discount rate. As a robustness check, we also try different values of ρ and we include a perpetuity in the expectation from $t+2$ forward—see (Vuolteenaho, 2002)—with very similar results.

The panel structure of the sample is obtained by assuming stability over time of the firm-bank relationship. From the observed relationships in 2011, we project the firm-bank connections backwards to 2006. In the case of local banks belonging to a banking group, we attribute to the local bank the cost-of-capital measure of the group, in order to match as many cases as possible. Depending on the specification, the final sample contains 10 (for CDS and CDS volatility) to 21 (for Tobin's Q and stock price volatility) banking groups covering 90% to 97% of the overall firm-bank relationships in the survey. Finally, for firms that borrow from multiple institutions, bank variables are computed as the equally-weighted averages across the related financial institutions.

Overall, the dataset includes roughly 15,000 to 19,000 observations, for a total number of 3,000 to 3,400 firms for the years between 2006 and 2011. The main loss of observations is due to the absence of balance-sheet data for partnerships. We further impose a minimum of three observations in the time series in order to implement our GMM estimation. Finally, all quantitative variables are expressed in units of standard deviation and winsorized at the 1% level in order to reduce the influence of outliers.

2.3 Summary statistics and the nature of banking relationships

Tables 1–2 present summary statistics for our panel data set. The patterns in Table 1 are consistent with the graphs in figures 1–2: the financial and sovereign debt crises lead to a marked increase in the level and volatility of bank CDS spreads and in the volatility of bank equity prices. The two crises also brought about a reduction in banks' stock market valuations.

Table 2 highlights the reduction in the investment rate between the 2006–2008 and 2009–2011 periods. Also marked is the reduction in the growth rate of bank debt. These patterns are consistent with the graphs in Figure 3.

Table 3 documents the number of banking relationships by firm age and firm size. It is evident the prevalence of single bank relationships, ranging between 80.5% (76.7%) and 87.5% (86.4%) across age (size) quartiles.[25] Also evident, though, is how older (larger) firms tend to have more banking partners.

One issue that this evidence above raises is the possibility of "switchers" among the firms in our sample, i.e., firms that change banking partners over the sample. If a firm switches bank over the sample, this introduces measurement error in the bank financial variables: we attribute to the firm the financial variables of a different bank than the one the firm was actually doing business with. We respond to this potential criticism in *three* ways. First, Auria, Foglia, and Reedtz (1999) document the tendency of Italian firms to *add*, rather than switch, banking partners. Hence, the possibility of mis-measuring the bank-firm relation arises mainly for firms that, in 2011, had multiple banking relations, which are a small fraction of the sample. Second, we estimated our basic specification of the investment function for the subsamples of firms with a single banking relationship in 2011, firms that, based on the evidence of Auria, Foglia, and Reedtz (1999), are unlikely to have changed bank over the sample. Our basic results are unchanged for this sample of firms (see discussion in Section 3.1 below). Third, since our instruments only include *lagged* values of the variables of interest, the measurement error generated by mis-measurement of the firm-bank relations gives rise to an asymptotic bias only if it leads to persistent regression residuals, potentially correlated with the lagged instruments. Our diagnostics indicate no persistence in the idiosyncratic component of the error term in the level equation and, thus, indicate as unlikely the correlation between residuals and lagged instruments.

[25] Similar percentages of single and multiple banking relationships are documented for the small firms (less than 20 employees) covered by the CdR database; Mistrulli and Vacca (2011).

3 Empirical results

In this section, we discuss the empirical results of the analysis. We first provide results for investment decisions. We then turn to employment and borrowing.

3.1 Investment

Table 4 highlights the main results of the paper. An increase in a bank's CDS spread reduces the investment rate of client firms, but this effect is attenuated as the age or size of the firm increases. The same effect occurs as the volatility of the CDS spread and the volatility of the stock price increases. The bank's Tobin's Q, on the other hand, has effects of the opposite sign. We also extract the first principal component (PC) of the four financial market indicators, which loads positively on the CDS spread, the volatility of the CDS spread, and the stock volatility, and loads negatively on Tobin's Q. The first PC affects negatively the investment rate, with an effect that is attenuated by age and size.

Figures 4–5 plot the impact of the four financial variables on the investment rate as a function of a firm's age. For the CDS spread, the effect is negative (positive) and significant (at the 5% level) for firms with age of 10–15 years or less (35–40 years or more). A one-standard deviation increase in a bank's CDS spread *decreases* the investment activity of a client firm at the *10th percentile* of the age distribution—a five-year old firm—by 0.5 standard deviations, while it *increases* investment by 0.2 standard deviations for firms at the *90th percentile*—a 38-year old firm. We see similar patterns for the volatility of the CDS spread and of the stock price. The pattern is reversed for Tobin's Q. These results support the presence of a *relative* flight-to-quality effect towards older (larger) firms. We use the word "relative" because the year dummies absorb the negative effect of an increase in the banks' CDS spread common to all firms.

In all specifications there is no evidence of misspecification of the model. The Arellano-Bond test for serial correlation for the residuals in the difference equation does not reject the hypothesis of no second-order correlation, making variables lagged twice or more legitimate instruments. The Hansen test of over-identifying restrictions is also not suggestive of model mis-specification.

There are no simple first-stage regression statistics available for the difference and system GMM estimator to assess the "strength" of the instruments. However, it is informative for the difference GMM estimator to calculate the F statistics on our key instruments in an pooled OLS regression of the change in banks' CDS spreads on our instruments in levels (plus values of the firm cash-flow-to-capital and sales-to-capital ratio, lagged two and three periods, and year dummies). Similarly, for the system GMM estimator, we have also regressed the level of banks' CDS spreads on the once-lagged lagged change of our instruments (plus once-lagged changes of the firm cash-flow-to-capital and sales-to-capital ratio and year dummies). We find that our key instruments are strongly significant in predicting both changes and levels of banks' CDS spreads—the p-values of the corresponding F-statistics are essentially zero.[26]

We implement several checks to verify the robustness of our results, focus on the case where the banks' cost of funding is measured by the CDS spread (see Table 5). First, we implement our analysis on the subsample of firms with a *single* banking relationship in 2011. As explained earlier, this addresses the concern that changes in the firm-bank relationship may introduce measurement error in the cost-of-funding variables. Second, we consider three alternative instrumenting strategies for the CDS spread: i) we assume that it is exogenous; ii) we instrument it with its own lagged values (internal instruments); iii) we instrument it with the 2006 dollar-denominated exposure to other financial intermediaries and to sovereign risk, interacted with the *contemporaneous* CDS spread on U.S. banks and Italian Treasuries, respectively. Third, we address the concern that banks' financial valuations may reflect, in part, firms' creditworthiness by introducing as an additional regressor the

[26]Lagged firm-specific variables—cash-flow and sales-to-capital ratios—have little or no explanatory power, providing no evidence that individual firms' observables impact banks' financial valuations.

Altman Z-score as well as the first principal component of several firm-level financial ratios (see the Appendinx for details).[27] Fourth, we control for industry-specific (12 industries), region-specific (20 regions), firm-age specific (young and old), firm-size specific (large and small), and bank-size specific (large and small) time fixed effects. This approach allows us to deal, for instance, with demand shocks that are industry or region specific, or that vary by firm or bank size, and increases the likelihood that our instruments are uncorrelated with the idiosyncratic component of the error term in the investment equation. Finally, we implement the GMM estimator on the differenced specification alone. The results of all these robustness checks are qualitatively and quantitatively similar to those of reported in Table 4, thus confirming our main conclusions.

We have also experimented with allowing the effect of banks' financial variables to depend upon the cash flow of the firm, but the coefficient of this interaction term was not significant.[28] Finally, we have interacted firms' cash flow with firms' age and size, but there is no statistical support for a differential sensitivity to cash flow.

3.2 Controlling for banks' fundamentals

Having established our main results, we now test their robustness when we control for banks' fundamentals. It is possible that the effects that we document, while taking place through the impact of banks' cost of funding on firms' discount factors, are driven by the banks' fundamentals: balance-sheet variables, profitability measures, and analyst earnings forecasts. Our analysis below shows that the effects of banks' financial valuations on firms' investment decisions take place over and above the effects of banks' fundamentals.

In Table 6, we control for the banks' dollar-denominated exposure to other financial inter-

[27] In computing the Z-score we use the coefficients employed by Altman, Danovi, and Falini (2012) in their analysis of Italian firms.

[28] We have also introduced the lagged stock of liquid assets relative to total assets (or capital) and its interaction with the banks' CDS spread as additional regressors. Neither the direct effect nor the interaction term enter significantly.

mediaries and the exposure to sovereign risk. In addition, we also control for the liquidity of bank assets, the Tier 1 capital ratio, the stability of the sources of funding, and the amount of loan losses. The additional controls are largely insignificant, whereas the main effects do not change.

In Table 7, we control for bank profitability.[29] Specifically, we control for capital gains on dollar-denominated claims on other financial intermediaries and on holdings of sovereign bonds. In addition, we also control for the bank's ROE. Again, the additional controls are mainly insignificant, whereas the size and significance of the coefficient of banks' cost-of-funding measures remain uneffected. We attribute this result to the forward-looking nature of market valuations and the fact that they contain information not only on cash flow fundamentals, but also on expected future discount rates.

In Table 8, we control for the banks' earning forecasts formulated by sell-side analysts. Specifically, we aggregate the earnings forecasts formulated during the first three months of the year pertaining to the previous year, the current year, and the next year. The earnings forecasts are then standardized by the bank's assets at the end of the previous year to construct an ROA measure. The analysis in Table 8 shows how an increase in a bank's expected earnings leads client firms to invest significantly more, but that this effect is attenuated by age and size. At the same time, the effects of the banks' cost-of-funding measures do not change. Therefore, banks' cost of funding appears to matter over and above banks' balance-sheet conditions and expectations of fundamentals. This suggests that fluctuations in investors discount factors affecting the pricing of risk of financial intermediaries can have real consequences.

This result bears a resemblance with the evidence in Morck, Shleifer, Vishny, Shapiro, and Poterba (1990), and Blanchard, Rhee, and Summers (2000), who document that stock market fluctuations have an effect on firms' investment even after one controls for fundamentals.[30] Our

[29]See also Cummins, Hassett, and Oliner (2006) for the use of analysts' forecasts of *firms*' earnings in investment equations. We focus instead on analyst forecasts of *banks'* earnings.

[30]The crucial difference, however, is that these papers focuse on firms' market valuations, whereas we focus on

result is also related to the aggregate evidence in Gilchrist and Zakrajšek (2012), who partition an index of credit spreads into a component reflecting information on firms default risk and a residual component—the excess bond premium—and show that the latter has greater predictive power for aggregate economic activity.

3.3 CDSs v. equity prices

One of our novel contribution is to test which of banks' cost-of-funding measures is empirically more important for firm's investment decisions. Table 9 compares the effects of the CDSs to those of equity valuations, when both these variables are included in the equation. We first consider the level of the CDS spread and of the equity valuation. While the effect of the CDS is strongly significant, the effect of Tobin's Q is insignificant. We obtain the same results when we include both the CDS and the equity volatility, or both the first PC of the CDS level and volatility and the first PC of Tobin's Q and equity volatility. This is consistent with debt being the marginal source of funding for the banks in our sample.

3.4 Levels v. volatility

Table 10 explores whether both the level and the volatility of CDS spreads matter. In this analysis, given the high correlation between the level and volatility of CDS spreads, we use as regressors the level of the CDS spread and the residual of a regression of the volatility of the CDS spread on the level. We find that both the level and the volatility of CDS spreads matter. This result complements the results of papers showing that equity volatility matters for investment decisions, over and above the level of equity valuations. Leahy and Whited (1996), Bloom, Bond, and Van Reenen (2007), and Stein and Stone (2012) find a negative effect of firm stock volatility on firm investment. Our focus, instead, is on the volatility of banks' and not of firms' valuations.

banks' cost of funding and its effect on credit conditions.

3.5 Employment

Do bank valuations affect other firms' real decisions such as those regarding employment? The model in Table 11 uses the change in the log of the number of employees as the dependent variable. The covariates are the same as in the basic investment specification of Table 4, with the addition of (the log of) the lagged number of employees. Again, worse banks' financial market conditions impact negatively young and small firms, although the effect is insignificant for equity volatility. For a new firm (zero years of age), a one-standard-deviation increase in the CDS spread leads to a reduction of the growth rate in employment of 0.3 standard deviations.

As in the case of the investment function, we implement several robustness checks: we modify our choice of instruments; we control for industry-specific, region-specific, firm-age specific, firm-size specific, and bank-size specific time fixed effects; and we control for measures of the firm's creditworthiness. Again, our main results hold.

Figures 6–7 plot the effects of the different bank financial variables on employment growth. The effects are qualitatively analogous to those documented for the investment function.

3.6 Bank debt

The effect of fluctuations in banks' cost of funding is likely to be transmitted to firms' real decision through the impact they have on the cost and access to bank debt. We do not have information about the interest rate charged to firms or other aspects of debt contracts, such as collateral requirements. However, we have balance-sheet information on the stock of bank debt, which reflects the interaction between the credit *supply* decisions on the part of the bank and the credit *demand* decisions on the part of the firm.

Table 12 models the growth rate of firms' bank debt. In addition to the effects of banks' cost-of-funding measures in levels and interacted with age and size, we also control for the lagged (log of) bank debt, sales growth, the ratio of tangible assets to total assets, sales and cash flow over total assets, and the logs of age and size. As in the case of investment and employment, worse banks' financial market conditions lead small and young firms to slow down the growth rate of their bank debt. For a new firm, a one-standard-deviation increase in the CDS spread leads to a reduction of the growth rate of bank debt of 0.1 standard deviations.[31]

Figures 8–9 plot the effects of the different bank financial variables on the growth of bank debt. The effects are qualitatively analogous to those documented for the investment and employment functions.

4 Implied aggregate effects and allocative efficiency

It is important to assess the quantitative effect of changes in banks' cost of funding on aggregate capital accumulation at different points in time during the sample. We thus perform a *ceteris paribus* exercise, whereby we compute the difference between the actual investment and the counter-factual investment had the bank cost of funding stayed at the previous year's level, while all the other covariates (year dummies included) are at their actual values.[32] In fact, our exercise is likely to underestimate the impact of changes in banks' financial valuations as we ignore their effect on firms' cash flows and sales.[33] Specifically, using equation (3), we can compute

$$I_{it} - \hat{I}_{it} = K_{it-1}\left[\frac{I_{it}}{K_{i,t-1}} - \widehat{\left(\frac{I_{it}}{K_{i,t-1}}\right)}\right] = K_{it-1}\alpha_{it}^{\top}(\mathrm{FINVAR}_{it} - \mathrm{FINVAR}_{it-1}). \tag{4}$$

which measures the difference between the firm's actual investment and its counter-factual invest-

[31] We performed the same robustness checks as in the case of the employment function and our main results are largely unchanged.

[32] Our exercise is similar in spirit to Chodorow-Reich (2013), who computes a counter-factual measure of firm-level employment based on the assumption that the health of the firm's syndicate, as measured by its lending to other firms, was the same as that of the healthiest syndicate.

[33] Moreover, we are keeping constant the common component of banks' valuations, which is captured by the year dummies. If this common component is least partly independent of other common macro factors, then we further underestimate the effect of worsening banks' financial conditions.

ment had FINVAR_{it} stayed at the previous year's level.

We can then aggregate the difference between actual and counter-factual investment across firms for which $I_{it} - \hat{I}_{it}$ is negative and relate it to the aggregate average capital stock over years t and $t-1$, to obtain:

$$\text{NEG}_t = \frac{\sum_{i, I_{it} - \hat{I}_{it} < 0} w_i |I_{i,t} - \hat{I}_{it}|}{\sum_{i=1}^{N_t} w_i (K_{it} + K_{it-1})/2}, \tag{5}$$

where w_i is the firm-specific sampling weight employed to reproduce the population aggregates (calibrated in the post-stratification stage of the survey procedure). Similarly, we can aggregate the difference between actual and hypothetical investment across firms for which $I_{it} - \hat{I}_{it}$ is positive, to obtain:

$$\text{POS}_t = \frac{\sum_{i, I_{it} - \hat{I}_{it} \geq 0} w_i (I_{i,t} - \hat{I}_{it})}{\sum_{i=1}^{N_t} w_i (K_{it} + K_{it-1})/2}. \tag{6}$$

The net effect of changes in FINVAR_{it} on the aggregate rate of capital accumulation at time t is $\text{NET}_t = \text{POS}_t - \text{NEG}_t$. In addition, it is interesting to measure the total reallocation of investment due to changes in FINVAR_{it}.[34] The total amount of investment reallocation is measured as $\text{SUM}_t = \text{POS}_t + \text{NEG}_t$, whereas the amount of investment reallocation in excess of the minimum amount needed to accommodate the net investment change is $\text{EXC}_t = \text{SUM}_t - |\text{NET}_t|$.

Finally, we are interested to measure how the reallocation of investment has impacted the efficiency resource allocation. To do so, we compare the aggregate marginal value product of capital generated by actual investment, relative to that generated by counter-factual investment. We use

[34] See Herrera, Kolar, and Minetti (2013) for an analysis of credit reallocation across firms in U.S. states following deregulation of the credit markets. Their and our calculations are in the spirit of Davis and Haltinwanger (1992).

the sales-to-capital ratio as the indicator firms' marinal-value product and compute the index:[35]

$$\text{EFF}_t = \frac{\sum_{i=1}^{N_t} (S_{i,t}/K_{i,t-1}) w_i I_{i,t}}{\sum_{i=1}^{N_t} (S_{i,t}/K_{i,t-1}) w_i \hat{I}_{i,t}}. \tag{7}$$

The index is less than one one if in year t actual investment was allocated less efficiently than counter-factual investment.

We can perform a similar analysis for the net change in employment. Let $\widehat{\Delta E_{it}}$ denote the counter-factual change in the number of employees. We have

$$\text{NEG}_t = \frac{\sum_{i,\Delta E_{it}-\widehat{\Delta E_{it}}<0} w_i |\Delta E_{it} - \widehat{\Delta E_{it}}|}{\sum_{i=1}^{N_t} w_i (E_{it} + E_{it-1})/2} \tag{8}$$

$$\text{POS}_t = \frac{\sum_{i,\Delta E_{it}-\widehat{\Delta E_{it}}>0} w_i |\Delta E_{it} - \widehat{\Delta E_{it}}|}{\sum_{i=1}^{N_t} w_i (E_{it} + E_{it-1})/2} \tag{9}$$

and

$$\text{EFF}_t = \frac{\sum_{i=1}^{N_t} (S_{i,t}/E_{i,t}) w_i \widehat{\Delta E_{i,t}}}{\sum_{i=1}^{N_t} (S_{i,t}/E_{i,t}) w_i \Delta E_{i,t}}. \tag{10}$$

Note that in the index above the counter-factual quantity appears at the numerator, rather than at the denominator as in equation (7). The index is defined in this way because, in all years, both numerator and denominator are negative—they are both positive in the case of investment. As a result, as in the case of investment, the index is less than one one if in year t the actual net change in employment was allocated less efficiently than the counter-factual employment change.

Results of the analysis for investment choices are presented in Table 13, where we focus on the CDS spread as the cost-of-funding measure. With the only exception of 2009, the net effect of the change in banks' cost of funding on aggregate investment (NET_t) is negative, and sizable

[35]This is strictly speaking correct if firms share a common log-linear demand function and a Cobb-Douglas production function. See Galindo, Schiantarelli, and Weiss (2007).

in 2011: -0.68%. In 2011 we also have the largest investment reallocation, 5.56% (SUM_t) and the largest excess investment reallocation, 4.88% (EXC_t). These numbers are substantial, given that in 2011 the aggregate investment rate ($\sum_{i=1}^{N_t} w_{it} I_{it} / [\sum_{i=1}^{N_t} w_i (K_{it} + K_{it-1})/2]$) was only 0.33%. Turning now to the efficiency index (EFF_t), it is always less than one, as low as 0.90 and 0.91 in 2008 and 2011, respectively, indicating a 10% and 9% loss of allocative efficiency relative to the previous year. Hence, the 2011 sovereign debt crisis, through its effect on banks' cost of funding, lead to a significant reduction in the aggregate investment rate. In addition, both crises brought about a substantial reduction in the efficiency of capital allocation.

Results for the net change in employment are reported in Table 14. In the case of employment, the vast majority of the differentials relative to the counter-factual employment change are negative. Hence, the aggregate positive differential, POS_t, is essentially zero in all years, and the aggregate net differential, NET_t, is always negative and equal to $-\text{NEG}_t$. Moreover, $\text{SUM}_t = \text{NET}_t$, and $\text{EXC}_t = 0$. The aggregate net employment differential is substantial in 2008 and 2011, at -1.76% and -1.92%, respectively. As to the efficiency index, it is always less than one, reaching a minimum value of 0.89 in 2011, and the second lowest, 0.97, in 2008.

5 Conclusions

This is the first paper to empirically investigate the link between banks' market-based measures of cost of funding and the decisions of client firms. Our analysis focuses on the Italian experience during the financial and sovereign debt crises. These two crises generate heterogeneous variation over time in banks' financial valuations, depending upon their U.S. or sovereign debt exposure, and this variation is crucial for our identification strategy. The Italian experience is especially interesting, as Italian firms are heavily dependent on bank lending. Furthermore, we take advantage of a unique data set, covering a large number of small, privately held firms, with information on firm-bank relationships.

We find robust evidence that higher banks' cost of funding leads young and small client firms to invest less, hire fewer workers, and reduce the growth of bank borrowing. We conclude that financial volatility has real consequences, even for *privately held* firms, and that a key transmission channel is the banking system.

Interestingly, the effects that we document go over and beyond the effects of banks' balance-sheet variables and analyst earnings expectations. Among the financial variables used in our empirical work, CDS spreads are more informative than Tobin's Q for firm's decisions, indicating that the cost of debt matters more than the cost of equity. Finally, both the level of CDS spreads and their (orthogonalized) volatility seem to matter.

While our econometric analysis is performed at the firm level, we also derive aggregate implications. We find that, through their impact on banks' cost of funding, the 2008 and, especially, the 2011 crisis, lead to sizable reductions in the level and the allocative efficiency of capital accumulation and employment growth.

Appendix: Variable definitions

Firm-level variables

- I_{it}: firm gross investment—the change in gross capital over the year. Gross capital is defined as the sum of net capital (tangible fixed assets) and the accumulated depreciation on tangible assets.
- K_{it}: end-of-year firm net capital (tangible fixed assets).
- Sales_{it}: firm total sales over the year.
- $\mathrm{Cash\ flow}_{it}$: firm cash flow over the year. Cash flow is defined as operating income before depreciation net of taxes payable, interest payments, non-operating income, and extraordinary items.
- age_{it}: end-of-year firm age.
- assets_{it}: end-of-year firm total assets.
- $\mathrm{Altman\ score}_{it}$: is the Altman score as computed in Altman, Hartzell, and Peck (1995). $Z''_{it} = 6.56X_{1,it} + 3.26X_{2,it} + 6.72X_{3,it} + 1.05X_{4,it}$ where $X_{1,it}$ to $X_{4,it}$ are (in order): working capital to total assets, retained earnings to total assets, EBIT to total assets, and book value of equity to total liabilities.
- PC of bal. sheet charact. is the principal component of the following balance-sheet ratios: sales to total assets, cash flow to total assets, floating capital to total assets, liquid assets to total assets, ROA, ROE, working capital to sales, equity and long term debt to fixed assets, long term debt to total debt, total debt to total assets, liquidity to short term debt, labor costs to value added, value added to sales. The principal component explains the 35% of the total variance.
- $\mathrm{Employees}_{it}$: end-of-year firm employees.
- $\mathrm{Bank\ Debt}_{it}$: end-of-year firm stock of bank debt.
- $\mathrm{Total\ assets}_{it}$: end-of-year firm total assets.
- $\mathrm{Sales\ growth}_{it}$: rate of growth of firm sales between years $t-1$ and t.
- $\mathrm{Tangible\ assets}_{it}$: end-of-year firm tangible assets.

Bank-level variables

- CDS_{it}: average of daily bank CDS spreads over the year.
- CDS vol_{it}: standard deviation of daily changes in the bank CDS spread over the year.
- Tobin's Q_{it}: average bank Tobin's Q over the year. Tobin's Q is defined as the ratio between the market value of the bank and the replacement cost of its assets: equity-market capitalization, plus liabilities, preferred equity, and minority interest, over total assets.
- Equity vol_{it}: standard deviation of daily continuously-compounded returns on bank stock prices over the year.
- PC_{it}: first principal component extracted from CDS_{it}, CDS vol_{it}, Tobin's Q_{it}, and Equity vol_{it}. The factor loadings are 0.54, 0.56, -0.36, and 0.51, respectively. The overall explained variance is 75.5%.
- $\text{Sovereign debt held}_{it}$: end-of-year amount of Euro-denominated sovereign bonds held by the bank.
- $\text{\$ Assets}_{it}$: end-of-year amount of \$-denominated assets held by the bank.
- CDS(Italy)_{it}: average of daily CDS spreads on Italian Treasury bonds over the year.
- $\text{CDS(US Banks)}_{it}$: average of daily CDS spreads for the U.S. banking sector over the year.
- $\text{Liquid assets}_{it}$: end-of-year bank liquid assets, defined as the sum of cash and equivalents, deposits with banks, loans to banks, deposits with central banks and government authorities, and other securities.
- $\text{Short-term funding}_{it}$: end-of-year bank short-term funding, defined as the sum of deposits and other short-term borrowing (loans with maturity less than one year).
- $\text{Tier 1 capital ratio}_{it}$: end-of-year bank Tier 1 capital ratio, defined as the ratio between Tier 1 regulatory capital and risk-weighted assets. Regulatory Tier 1 capital, is the sum of common equity—including equity injections from the government—and retained earnings.
- Deposits_{it}: end-of-year total bank deposits—the sum of customer deposits (current, savings, and term), bank deposits, and other deposits (those deposits that do not belong to the previous categories).
- $\text{Total funding}_{it}$: end-of-year total bank funding, defined as the sum of short- and long-term funding.

- Charge-offs$_{it}$: end-of-year total bank charge-offs, defined as those non-performing loans the bank recognizes to be no longer collectable.

- ROE$_{it}$: bank return on equity over the year, defined as the ratio between net income and total equity.

- Earnings forecasts$_{it-1:t+1}$ discounted sum of analyst earnings forecasts for years $t-1$, t and $t+1$. Based on analyst forecasts on earnings per share (EPS) at different horizons, we compute the total earnings forecasts multiplying EPS by the bank number of shares at time t (the same time of the forecast). We then aggregate expected earnings at different horizons by employing $\rho = 0.967$ as a discount rate.

- PC (CDS, CDS vol)$_{it}$: first principal component of CDS spread and CDS-spread volatility. The factor loading are 0.71 and 0.70, respectively. The overall explained variance is 98%.

- PC (Tobin's Q, Equity vol)$_{it}$: first principal component of Tobin's Q and Equity vol. The factor loadings are -0.71 and 0.70, respectively. The overall explained variance is 70%.

- CDS vol. residual$_{it}$: residual of a pooled OLS regression of CDS vol$_{it}$ on CDS$_{it}$, with $\hat{\beta}_{\text{CDS}} = 0.88$ and $R^2 = 0.92$.

- Equity vol residual$_{it}$: residual of a pooled OLS regression of Equity vol$_{it}$ on Tobin's Q$_{it}$ with $\hat{\beta}_{\text{Tobin's Q}} = -.39$ and $R^2 = 0.16$.

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Table 1: Summary Statistics: Banks

Banks: median values	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
CDS spread	0.12%	0.18%	0.81%	1.02%	1.37%	2.83%
CDS volatility	0.00%	0.02%	0.06%	0.05%	0.08%	0.15%
Tobin's Q	103%	100%	97.1%	97.1%	95.9%	95.7%
Equity volatility	1.26%	1.37%	3.75%	3.21%	2.67%	4.15%
$ assets/total assets	6.32%	3.81%	2.84%	2.91%	2.96%	1.37%
Sovereign debt held/total assets	1.85%	1.85%	2.68%	4.91%	7.09%	4.81%
Liquid assets/short-term funding	6.97%	5.89%	4.41%	8.17%	8.67%	6.40%
Tier–1 K ratio	6.93%	6.76%	6.68%	7.72%	8.90%	9.39%
Deposits/total funding	45.0%	46.9%	46.6%	47.0%	46.5%	43.2%
Charge-offs/total assets	1.75%	1.68%	1.94%	3.41%	4.06%	4.42%
Discounted earning forectast/total assets	0.76%	1.09%	0.91%	0.54%	0.39%	0.42%
ROE	11.7%	13.5%	6.67%	3.36%	5.12%	-15.2%

Notes: Summary statistics for the banks in the sample.

Table 2: Summary Statistics: Firms

Firms: median values	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
$\frac{Gross\,investment}{K}$	8.73%	7.86%	11.8%	3.53%	3.48%	3.12%
$\frac{Cash\,flow}{K}$	25.4%	26.9%	23.6%	15.8%	18.1%	17.5%
$\frac{Sales}{K}$	797%	805%	771%	573%	599%	599%
Sales growth	7.14%	5.88%	0.61%	-11.1%	3.29%	2.01%
Bank debt growth	2.63%	5.66%	0.92%	-6.92%	0.00%	-0.49%
$\frac{Bank\,debt}{Total\,assets}$	26.1%	24.8%	26.8%	26.1%	26.3%	26.9%
$\frac{Tangible\,assets}{Total\,assets}$	14.7%	14.4%	13.8%	18.0%	16.9%	17.3%
Total assets (1m euro)	1.15	1.21	1.30	1.29	1.37	1.43
# Employees	12	12	14	13	13	13
Age	14	15	16	17	18	19

Notes: Summary statistics for the firms in the sample.

Table 3: Banking Relationships

	Type of banking relationship		
	Single	**Double**	**Multiple**
Age - Q1	87.5%	10.7%	1.79%
Age - Q2	84.3%	12.5%	3.13%
Age - Q3	83.6%	12.4%	4.03%
Age - Q4	80.5%	15.1%	4.46%
Size - Q1	86.4%	11.4%	2.27%
Size - Q2	87.2%	11.0%	1.75%
Size - Q3	82.2%	13.4%	4.49%
Size - Q4	76.7%	17.0%	6.32%
Total	83.0%	13.3%	3.77%

Notes: Percentage of firms with one, two, or multiple banking relationships.

Table 4: Firms' Investment and Banks' Valuations.

Dependent variable $\frac{I_t}{K_{t-1}}$

	(1)	(2)	(3)	(4)	(5)
FINVAR:	CDS	CDS vol	Tobin's Q	Equity vol	PC
FINVAR_t	-1.053***	-1.023***	2.021***	-0.901***	-1.380***
	(0.298)	(0.284)	(0.745)	(0.325)	(0.314)
$\text{FINVAR}_t \times \ln(1+\text{age}_t)$	0.297***	0.293***	-0.624***	0.268***	0.408***
	(0.0897)	(0.0838)	(0.222)	(0.0980)	(0.0953)
$\frac{\text{Sales}_t}{\text{K}_{t-1}}$	0.122***	0.128***	0.121***	0.135***	0.138***
	(0.0365)	(0.0381)	(0.0353)	(0.0418)	(0.0401)
$\frac{\text{Cash flow}_t}{\text{K}_{t-1}}$	0.132***	0.143***	0.126***	0.136***	0.141***
	(0.0279)	(0.0296)	(0.0312)	(0.0333)	(0.0291)
N	17085	16999	18349	17487	15590
Hansen p-value	0.736	0.718	0.420	0.442	0.868
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.901	0.901	0.760	0.699	0.695
FINVAR:	CDS	CDS vol	Tobin's Q	Equity vol	PC
FINVAR_t	-2.487***	-2.991***	0.950***	-2.137**	-2.523***
	(0.833)	(0.951)	(0.342)	(0.835)	(0.633)
$\text{FINVAR}_t \times \ln(\text{Total assets}_{t-1})$	0.256***	0.311***	-0.106***	0.226**	0.262***
	(0.0886)	(0.101)	(0.0367)	(0.0883)	(0.0675)
$\frac{\text{Sales}_t}{\text{K}_{t-1}}$	0.102***	0.127***	0.125***	0.0978***	0.107***
	(0.0389)	(0.0414)	(0.0409)	(0.0373)	(0.0394)
$\frac{\text{Cash flow}_t}{\text{K}_{t-1}}$	0.151***	0.160***	0.138***	0.142***	0.138***
	(0.0303)	(0.0334)	(0.0367)	(0.0329)	(0.0315)
N	17113	17027	18380	17519	15616
Hansen p-value	0.508	0.579	0.182	0.184	0.344
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.820	0.623	0.856	0.889	0.656

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript) (omitting the i subscript): $\ln(1+\text{age}_t)$ or $\ln(\text{assets}_{t-1})$. "CDS" is the average of daily bank CDS spreads over the year, "CDS vol" is the standard deviation of daily changes in the bank CDS spreads over the year, "Tobin's Q" is the average bank Tobin's Q over the year, "Equity vol" is the standard deviation of daily returns over the year, and "PC" is the first principal component of the previous four variables. Variables normalized by their standard deviation. Set of instruments: $\frac{\text{Sales}_t}{K_{t-1}}$, $\frac{\text{Cash flow}_t}{K_{t-1}}$, and exposure to Italian sovereign debt and U.S. banks (and their interactions), lagged two or three periods. Italian and U.S. exposures are defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\ \text{Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$. "Hansen" denotes the test of over-identifying restrictions; "AR(q)" denotes the Arellano and Bond (1991) test of q^{th} order serial correlation.

Table 5: Firms' Investment and Banks' Valuations: Robustness.

		CDS_t	$CDS_t \times \ln(1+age_t)$	Hansen p
Subsample	Single bank relationships	-1.265***	0.351***	0.550
		(0.352)	(0.105)	
Instruments for CDS_t	Exogenous	-1.443***	0.416***	0.206
		(0.425)	(0.122)	
	Internal	-0.946***	0.262***	0.368
		(0.337)	(0.097)	
	External (t)	-1.343***	0.394***	0.284
		(0.407)	(0.121)	
Additional controls	Altman score	-0.712***	0.196***	0.456
		(0.184)	(0.055)	
	PC of bal. sheet charact.	-0.658***	0.177**	0.182
		(0.250)	(0.741)	
Alternative year effects	Common	-1.053***	0.297***	0.736
		(0.298)	(0.089)	
	Industry	-0.978***	0.272***	0.636
		(0.333)	(0.099)	
	Region	-0.996***	0.279***	0.675
		(0.327)	(0.098)	
	Firm age	-1.258***	0.358***	0.479
		(0.411)	(0.121)	
	Firm size	-0.978***	0.274***	0.460
		(0.324)	(0.097)	
	Bank size	-1.011***	0.281***	0.499
		(0.311)	(0.091)	
Estimation	Difference GMM	-1.511***	0.440***	0.482
		(0.453)	(0.131)	

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript): $\frac{Sales_t}{K_{t-1}}$, $\frac{\text{Cash flow}_t}{K_{t-1}}$, $\ln(1+age_t)$, $\ln(assets_{t-1})$. Column 1, 2, and 3 report, respectively, the coefficients of CDS_t and $CDS_t \times \ln(1+age_t)$, and the Hansen p-value of each specification. The top panel report the baseline estimation on the subset of firms with single bank relationship. The second panel presents three different set of instruments for CDS_t: not instrumented (Exogenous), instrumented with lagged values (Internal instruments) or with contemporaneous exposures (External (t)) defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\ \text{Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. The third panel augments the baseline specification with two alternative measures of firms' creditworthiness: the Altman Z-score as in Altman, Hartzell, and Peck (1995) (Altman score) or the principal component of several measures of financial solidity typically used in the literature on credit scores (PC of bal. sheet charact.). The fourth panel presents alternative specifications of the year effects. Time fixed effects are common across all firms (Common), or vary by 12 industries (Industry), by 20 geographical regions (Region), by old and young firms (Firm age), by small and large firms (Firm size) or by small and large banks (Bank size). The threshold to identify small and large or young and old is the median of the respective distribution. Le last panel presents the baseline specification estimated with difference GMM (Difference GMM). "CDS" is the average of daily bank CDS spreads over the year. Variables are normalized by their standard deviation. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$.

Table 6: Firms' Investment and Banks' Valuations, Controlling for Banks' Balance-sheet Variables.

Dependent variable $\frac{I_t}{K_{t-1}}$

	(1)	(2)	(3)	(4)	(5)
FINVAR:	CDS	CDS vol	Tobin's Q	Equity vol	PC
FINVAR_t	-0.906***	-1.711***	2.612**	-1.131**	-1.645***
	(0.345)	(0.615)	(1.282)	(0.485)	(0.602)
$\text{FINVAR}_t \times \ln(1+\text{age}_t)$	0.263***	0.472***	-0.793**	0.339**	0.465**
	(0.0993)	(0.178)	(0.379)	(0.147)	(0.183)
$\frac{\$\text{ assets}_{t-1}}{\text{Total assets}_{t-1}}$	0.186	0.888	1.129	-0.175	0.120
	(0.583)	(0.642)	(0.836)	(0.716)	(0.759)
$\frac{\$\text{ assets}_{t-1}}{\text{Total assets}_{t-1}} \times \ln(1+\text{age}_t)$	-0.0486	-0.259	-0.360	0.0431	-0.0358
	(0.171)	(0.185)	(0.252)	(0.212)	(0.220)
$\frac{\text{Sovereign debt held}_{t-1}}{\text{Total assets}_{t-1}}$	-0.192	0.0786	-0.299	0.297	0.950
	(0.360)	(0.723)	(0.465)	(0.386)	(0.758)
$\frac{\text{Sovereign debt held}_{t-1}}{\text{Total assets}_{t-1}} \times \ln(1+\text{age}_t)$	0.0545	-0.0294	0.0817	-0.0891	-0.284
	(0.107)	(0.212)	(0.134)	(0.111)	(0.223)
$\frac{\text{Liquid assets}_{t-1}}{\text{Short-term funding}_{t-1}}$	0.141	0.0720	0.642	-0.370	-0.392
	(0.240)	(0.377)	(0.468)	(0.351)	(0.396)
$\frac{\text{Liquid assets}_{t-1}}{\text{Short-term funding}_{t-1}} \times \ln(1+\text{age}_t)$	-0.0417	-0.0187	-0.186	0.110	0.116
	(0.0702)	(0.110)	(0.137)	(0.102)	(0.115)
Tier–1 capital ratio_{t-1}	0.0421	0.0754	-0.0262	-0.0431	0.0675
	(0.0336)	(0.0529)	(0.0310)	(0.0325)	(0.0578)
Tier–1 capital $\text{ratio}_{t-1} \times \ln(1+\text{age}_t)$	-0.0143	-0.0192	0.00849	0.0135	-0.0113
	(0.0105)	(0.0133)	(0.00878)	(0.00881)	(0.0143)
$\frac{\text{Deposits}_{t-1}}{\text{Total funding}_{t-1}}$	-0.251	-0.0713	0.0754	0.376	-0.116
	(0.288)	(0.438)	(0.389)	(0.467)	(0.485)
$\frac{\text{Deposits}_{t-1}}{\text{Total funding}_{t-1}} \times \ln(1+\text{age}_t)$	0.0738	0.0361	-0.0199	-0.112	0.0464
	(0.0843)	(0.127)	(0.113)	(0.135)	(0.141)
$\frac{\text{Charge-offs}_{t-1}}{\text{Total assets}_{t-1}}$	0.512	-0.188	-0.295	-1.106*	-0.778
	(0.354)	(0.808)	(0.804)	(0.581)	(0.707)
$\frac{\text{Charge-offs}_{t-1}}{\text{Total assets}_{t-1}} \times \ln(1+\text{age}_t)$	-0.149	0.0764	0.0775	0.330**	0.242
	(0.104)	(0.239)	(0.233)	(0.166)	(0.209)
N	14947	14940	16207	15427	13809
Hansen p-value	0.252	0.462	0.151	0.374	0.436
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.848	0.300	0.549	0.913	0.570

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript): $\ln(1+\text{age}_t)$. "CDS" is the average of daily bank CDS spreads over the year, "CDS vol" is the standard deviation of daily changes in the bank CDS spreads over the year, "Tobin's Q" is the average bank Tobin's Q over the year, "Equity vol" is the standard deviation of daily returns over the year, and "PC" is the first principal component of the previous four variables. Variables normalized by their standard deviation. Set of instruments: $\frac{\text{Sales}_t}{K_{t-1}}$, $\frac{\text{Cash flow}_t}{K_{t-1}}$, bank balance sheet variables, and exposure to Italian sovereign debt and U.S. banks (and their interactions), lagged two or three periods. Italian and U.S. exposures are defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\text{ Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$. "Hansen" denotes the test of over-identifying restrictions; "AR(q)" denotes the Arellano and Bond (1991) test of q^{th} order serial correlation.

Table 7: Firms' Investment and Banks' Valuations, Controlling for Bank Losses due to the Lehman and Sovereign Debt Crises and Earnings.

Dependent variable $\frac{I_t}{K_{t-1}}$

FINVAR:	(1) CDS	(2) CDS vol	(3) Tobin's Q	(4) Equity vol	(5) PC
FINVAR_t	-1.811***	-1.430***	1.418*	-0.764**	-1.518**
	(0.605)	(0.551)	(0.826)	(0.364)	(0.687)
$\text{FINVAR}_t \times \ln(1+\text{age}_t)$	0.522***	0.399**	-0.411*	0.219**	0.434**
	(0.178)	(0.164)	(0.243)	(0.107)	(0.207)
$\frac{\$\text{ assets}_{t-1}}{\text{Total assets}_{t-1}} \times \Delta CDS_{USA,t}$	-0.314	0.117	0.963	-0.0456	-0.0562
	(0.655)	(0.700)	(0.753)	(0.680)	(0.791)
$\frac{\$\text{ assets}_{t-1}}{\text{Total assets}_{t-1}} \times \Delta CDS_{USA,t} \times \ln(1+\text{age}_t)$	0.0825	-0.0331	-0.291	0.0147	0.0119
	(0.198)	(0.213)	(0.222)	(0.202)	(0.238)
$\frac{\text{Sovereign debt held}_{t-1}}{\text{Total assets}_{t-1}} \times \Delta CDS_{ITA,t}$	0.0989	0.0125	0.0202	-0.776**	-0.108
	(0.392)	(0.383)	(0.361)	(0.310)	(0.413)
$\frac{\text{Sovereign debt held}_{t-1}}{\text{Total assets}_{t-1}} \times \Delta CDS_{ITA,t} \times \ln(1+\text{age}_t)$	-0.0334	-0.00375	-0.0149	0.208**	0.0172
	(0.114)	(0.111)	(0.100)	(0.0897)	(0.119)
ROE_t	-0.617	-0.128	0.487	0.308	-0.196
	(0.578)	(0.472)	(0.448)	(0.445)	(0.611)
$\text{ROE}_t \times \ln(1+\text{age}_t)$	0.179	0.0326	-0.146	-0.0979	0.0475
	(0.172)	(0.138)	(0.128)	(0.127)	(0.184)
$\frac{\text{Sales}_t}{\text{K}_{t-1}}$	0.129***	0.122***	0.123***	0.116***	0.119***
	(0.0320)	(0.0322)	(0.0330)	(0.0316)	(0.0366)
$\frac{\text{Cash flow}_t}{\text{K}_{t-1}}$	0.144***	0.146***	0.109***	0.141***	0.154***
	(0.0317)	(0.0302)	(0.0333)	(0.0275)	(0.0331)
N	16145	16381	17605	16752	15099
Hansen p-value	0.724	0.599	0.264	0.688	0.590
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.857	0.912	0.756	0.811	0.840

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript): $\ln(1+\text{age}_t)$. "CDS" is the average of daily bank CDS spreads over the year, "CDS vol" is the standard deviation of daily changes in the bank CDS spreads over the year, "Tobin's Q" is the average bank Tobin's Q over the year, "Equity vol" is the standard deviation of daily returns over the year, and "PC" is the first principal component of the previous four variables. Variables normalized by their standard deviation. Set of instruments: $\frac{\text{Sales}_t}{K_{t-1}}$, $\frac{\text{Cash flow}_t}{K_{t-1}}$, bank profitability variables, and exposure to Italian sovereign debt and U.S. banks (and their interactions), lagged two or three periods. Italian and U.S. exposures are defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\text{ Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$. "Hansen" denotes the test of over-identifying restrictions; "AR(q)" denotes the Arellano and Bond (1991) test of q^{th} order serial correlation.

Table 8: Firms' Investment and Banks' Valuations, Controlling for Analyst Earnings Forecasts.

Dependent variable $\frac{I_t}{K_{t-1}}$

FINVAR:	(1) CDS	(2) CDS vol	(3) Tobin's Q	(4) Equity vol	(5) PC
FINVAR_t	-0.957***	-1.220***	1.826***	-1.039***	-1.002***
	(0.352)	(0.404)	(0.609)	(0.342)	(0.380)
$\text{FINVAR}_t \times \ln(1+\text{age}_t)$	0.266**	0.331***	-0.530***	0.312***	0.284**
	(0.103)	(0.120)	(0.179)	(0.105)	(0.113)
$\text{Earnings forecasts}_{t-1:t+1}$	0.634**	0.679**	0.403**	0.541**	0.567**
	(0.308)	(0.314)	(0.185)	(0.232)	(0.278)
$\text{Earnings forecasts}_{t-1:t+1} \times \ln(1+\text{age}_t)$	-0.194**	-0.206**	-0.121**	-0.164**	-0.173**
	(0.0949)	(0.0974)	(0.0560)	(0.0707)	(0.0856)
$\frac{\text{Sales}_t}{\text{K}_{t-1}}$	0.158**	0.183***	0.222***	0.125***	0.149**
	(0.0676)	(0.0682)	(0.0617)	(0.0414)	(0.0734)
$\frac{\text{Cash flow}_t}{\text{K}_{t-1}}$	0.128***	0.103***	0.0664*	0.119***	0.111***
	(0.0349)	(0.0359)	(0.0348)	(0.0321)	(0.0363)
N	16596	16832	18056	17243	15590
Hansen p-value	0.582	0.765	0.176	0.193	0.500
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.530	0.303	0.998	0.603	0.442

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript): $\ln(1+\text{age}_t)$. "CDS" is the average of daily bank CDS spreads over the year, "CDS vol" is the standard deviation of daily changes in the bank CDS spreads over the year, "Tobin's Q" is the average bank Tobin's Q over the year, "Equity vol" is the standard deviation of daily returns over the year, and "PC" is the first principal component of the previous four variables. $\text{Earnings forecasts}_t$ denotes the discounted sum of analyst earnings forecasts for years $t-1$, t and $t+1$. Variables normalized by their standard deviation. Set of instruments: $\frac{\text{Sales}_t}{K_{t-1}}$, $\frac{\text{Cash flow}_t}{K_{t-1}}$, $\text{Earnings forecasts}_t$, and exposure to Italian sovereign debt and U.S. banks (and their interactions), lagged two or three periods. Italian and U.S. exposures are defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\ \text{Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$. "Hansen" denotes the test of over-identifying restrictions; "AR(q)" denotes the Arellano and Bond (1991) test of q^{th} order serial correlation.

Table 9: Firms' Investment and Banks' Valuations, CDS v. Tobin's Q.

Dependent variable $\frac{I_t}{K_{t-1}}$	(1)	(2)	(3)
CDS_t	-1.159***		
	(0.417)		
$\text{CDS}_t \times \ln(1+\text{age}_t)$	0.325***		
	(0.124)		
Tobin's Q_t	0.00526		
	(0.840)		
Tobin's $\text{Q}_t \times \ln(1+\text{age}_t)$	0.0126		
	(0.248)		
CDS vol_t		-1.642***	
		(0.550)	
CDS $\text{vol}_t \times \ln(1+\text{age}_t)$		0.460***	
		(0.154)	
Equity vol_t		0.531	
		(0.430)	
Equity $\text{vol}_t \times \ln(1+\text{age}_t)$		-0.157	
		(0.127)	
PC (CDS, CDS $\text{vol})_t$			-1.460***
			(0.542)
PC (CDS, CDS $\text{vol})_t \times \ln(1+\text{age}_t)$			0.419***
			(0.156)
PC (Q, Equity $\text{vol})_t$			0.716
			(0.640)
PC (Q, Equity $\text{vol})_t \times \ln(1+\text{age}_t)$			-0.220
			(0.193)
$\frac{\text{Sales}_t}{\text{K}_{t-1}}$	0.125***	0.120***	0.122***
	(0.0380)	(0.0360)	(0.0365)
$\frac{\text{Cash flow}_t}{\text{K}_{t-1}}$	0.141***	0.149***	0.136***
	(0.0290)	(0.0316)	(0.0287)
N	16762	16028	15590
Hansen p-value	0.577	0.720	0.531
AR(1) p-value	0.000	0.000	0.000
AR(2) p-value	0.792	0.600	0.703

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript): $\ln(1+\text{age}_t)$. "CDS" is the average of daily bank CDS spreads over the year, "CDS vol" is the standard deviation of daily changes in the bank CDS spreads over the year, "Tobin's Q" is the average bank Tobin's Q over the year, "Equity vol" is the standard deviation of daily returns over the year, and "PC" is the first principal component of the previous four variables. Variables normalized by their standard deviation. Set of instruments: $\frac{\text{Sales}_t}{K_{t-1}}$, $\frac{\text{Cash flow}_t}{K_{t-1}}$, and exposure to Italian sovereign debt and U.S. banks (and their interactions), lagged two or three periods. Italian and U.S. exposures are defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\ \text{Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$. "Hansen" denotes the test of over-identifying restrictions; "AR(q)" denotes the Arellano and Bond (1991) test of q^{th} order serial correlation.

Table 10: Firms' Investment and Banks' Valuations, Levels v. Volatilities.

Dependent variable $\frac{I_t}{K_{t-1}}$		
	(1)	(2)
CDS_t	-0.150***	
	(0.0549)	
$\text{CDS}_t \times \ln(1+\text{age}_t)$	0.0320***	
	(0.00973)	
CDS vol residual_t	-0.416***	
	(0.0509)	
CDS vol $\text{residual}_t \times \ln(1+\text{age}_t)$	0.117***	
	(0.0140)	
Tobin's Q_t		1.596**
		(0.720)
Tobin's $\text{Q}_t \times \ln(1+\text{age}_t)$		-0.475**
		(0.209)
Equity vol residual_t		-0.935***
		(0.350)
Equity vol $\text{residual}_t \times \ln(1+\text{age}_t)$		0.281***
		(0.105)
$\frac{\text{Sales}_t}{\text{K}_{t-1}}$	0.114***	0.115***
	(0.0334)	(0.0372)
$\frac{\text{Cash flow}_t}{\text{K}_{t-1}}$	0.148***	0.133***
	(0.0299)	(0.0314)
N	16560	17271
Hansen p-value	0.282	0.290
AR(1) p-value	0.000	0.000
AR(2) p-value	0.620	0.945

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript): $\ln(1+\text{age}_t)$. "CDS" is the average of daily bank CDS spreads over the year, "CDS vol" is the standard deviation of daily changes in the bank CDS spreads over the year, "Tobin's Q" is the average bank Tobin's Q over the year, "Equity vol" is the standard deviation of daily returns over the year, and "PC" is the first principal component of the previous four variables. Variables normalized by their standard deviation. Set of instruments: $\frac{\text{Sales}_t}{K_{t-1}}$, $\frac{\text{Cash flow}_t}{K_{t-1}}$, and exposure to Italian sovereign debt and U.S. banks (and their interactions), lagged two or three periods. Italian and U.S. exposures are defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\ \text{Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$. "Hansen" denotes the test of over-identifying restrictions; "AR(q)" denotes the Arellano and Bond (1991) test of q^{th} order serial correlation.

Table 11: Firms' Employment and Banks' Valuations.

Dependent variable: $\Delta \ln(\text{Employees})_t$

	(1)	(2)	(3)	(4)	(5)
FINVAR:	CDS	CDS vol	Tobin's Q	Equity vol	PC
FINVAR_t	-0.261***	-0.428**	0.769***	-0.00564	-0.376**
	(0.0812)	(0.184)	(0.235)	(0.0974)	(0.178)
$\text{FINVAR}_t \times \ln(1+\text{age}_t)$	0.0492***	0.0535***	-0.231***	0.0296	0.0458**
	(0.0139)	(0.0175)	(0.0587)	(0.0200)	(0.0218)
$\ln(\text{Employees}_{t-1})$	-0.00984	0.000291	0.0167	-0.111*	-0.139**
	(0.0442)	(0.0521)	(0.0330)	(0.0619)	(0.0699)
$\frac{\text{Sales}_t}{\text{Total assets}_{t-1}}$	0.0226	0.0256	0.174*	-0.0803	0.0208
	(0.108)	(0.135)	(0.0984)	(0.133)	(0.138)
$\frac{\text{Cash flow}_t}{\text{Total assets}_{t-1}}$	0.305***	0.346***	0.329***	0.340***	0.354***
	(0.0836)	(0.0944)	(0.0877)	(0.0938)	(0.104)
N	15466	15433	16262	15301	14082
Hansen p-value	0.184	0.177	0.334	0.375	0.558
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.170	0.303	0.352	0.558	0.367
FINVAR:	CDS	CDS vol	Tobin's Q	Equity vol	PC
FINVAR_t	-0.515***	-0.643**	2.868**	-0.226	-0.592**
	(0.178)	(0.265)	(1.115)	(0.256)	(0.276)
$\text{FINVAR}_t \times \ln(\text{Total assets}_{t-1})$	0.0438***	0.0586***	-0.289***	0.0293	0.0598***
	(0.0154)	(0.0195)	(0.109)	(0.0235)	(0.0232)
$\ln(\text{Employees}_{t-1})$	0.0304	0.181	0.386*	0.0428	0.0466
	(0.111)	(0.167)	(0.220)	(0.161)	(0.166)
$\frac{\text{Sales}_t}{\text{Total assets}_{t-1}}$	0.236**	0.166	0.104	0.00702	0.00625
	(0.105)	(0.155)	(0.161)	(0.117)	(0.124)
$\frac{\text{Cash flow}_t}{\text{Total assets}_{t-1}}$	0.316***	0.369***	0.501***	0.317***	0.381***
	(0.0835)	(0.112)	(0.125)	(0.0813)	(0.0880)
N	15513	15481	16311	15340	14119
Hansen p-value	0.376	0.312	0.684	0.461	0.532
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.177	0.301	0.358	0.567	0.349

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript): $\ln(1 + \text{age}_t)$ or $\ln(\text{assets}_{t-1})$. "CDS" is the average of daily bank CDS spreads over the year, "CDS vol" is the standard deviation of daily changes in the bank CDS spreads over the year, "Tobin's Q" is the average bank Tobin's Q over the year, "Equity vol" is the standard deviation of daily returns over the year, and "PC" is the first principal component of the previous four variables. Variables normalized by their standard deviation. Set of instruments: $\frac{\text{Sales}_t}{\text{Total assets}_{t-1}}$, $\frac{\text{Cash flow}_t}{\text{Total assets}_{t-1}}$, $\ln(\text{Employees}_t)$, and exposure to Italian sovereign debt and U.S. banks (and their interactions), lagged two or three periods. Italian and U.S. exposures are defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\ \text{Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$. "Hansen" denotes the test of over-identifying restrictions; "AR(q)" denotes the Arellano and Bond (1991) test of q^{th} order serial correlation.

Table 12: Firms' Bank Borrowing and Banks' Valuations.

Dependent variable: $\Delta \ln(\text{Bank Debt})_t$

	(1)	(2)	(3)	(4)	(5)
FINVAR:	CDS	CDS vol	Tobin's Q	Equity vol	PC
FINVAR_t	-0.111***	-0.122***	0.182**	-0.0719**	-0.132***
	(0.0429)	(0.0463)	(0.0816)	(0.0295)	(0.0508)
$\text{FINVAR}_t \times \ln(1+\text{age}_t)$	0.0181***	0.0121**	-0.0560***	0.0149**	0.0216***
	(0.00534)	(0.00566)	(0.0183)	(0.00660)	(0.00601)
$\ln(\text{Bank debt}_{t-1})$	-0.0288***	-0.0285**	-0.0287**	-0.0329**	-0.0285**
	(0.00955)	(0.0114)	(0.0128)	(0.0140)	(0.0124)
N	10574	10520	11015	10499	9761
Hansen p-value	0.969	0.743	0.999	0.977	0.998
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.233	0.227	0.477	0.436	0.192
FINVAR:	CDS	CDS vol	Tobin's Q	Equity vol	PC
FINVAR_t	-0.355***	-0.442**	1.032**	-0.602***	-0.710***
	(0.137)	(0.175)	(0.460)	(0.190)	(0.201)
$\text{FINVAR}_t \times \ln(\text{assets}_{t-1})$	0.0274**	0.0338**	-0.0992**	0.0559***	0.0600***
	(0.0123)	(0.0159)	(0.0434)	(0.0176)	(0.0185)
$\ln(\text{Bank debt}_{t-1})$	-0.0284***	-0.0200**	-0.0270**	-0.0113	-0.0145
	(0.00975)	(0.0102)	(0.0120)	(0.00983)	(0.0102)
N	10574	10572	11015	10541	9802
Hansen p-value	0.986	0.851	0.658	0.879	0.982
AR(1) p-value	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.230	0.228	0.482	0.464	0.206

Notes: System GMM with year-specific effects. Additional controls (omitting the i subscript): Sales growth_{t-1}, $\frac{\text{Tangible assets}_{t-1}}{\text{Total assets}_{t-1}}$, $\frac{\text{Sales}_t}{\text{Total assets}_{t-1}}$, $\frac{\text{Cash flow}_t}{\text{Total assets}_{t-1}}$, $\ln(1+\text{age}_t)$ or $\ln(\text{assets}_{t-1})$. "CDS" is the average of daily bank CDS spreads over the year, "CDS vol" is the standard deviation of daily changes in the bank CDS spreads over the year, "Tobin's Q" is the average bank Tobin's Q over the year, "Equity vol" is the standard deviation of daily returns over the year, and "PC" is the first principal component of the previous four variables. Variables normalized by their standard deviation. Set of instruments: $\frac{\text{Sales}_t}{\text{Total assets}_{t-1}}$, $\frac{\text{Cash flow}_t}{\text{Total assets}_{t-1}}$, Sales growth_t, $\frac{\text{Tangible assets}_{t-1}}{\text{Total assets}_{t-1}}$, and exposure to Italian sovereign debt and U.S. banks (and their interactions), lagged two or three periods. Italian and U.S. exposures are defined as $\frac{\text{Sovereign debt held}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(Italy)}_t$ and $\frac{\$\ \text{Assets}_{i,2006}}{\text{Total assets}_{i,2006}} \times \text{CDS(US Banks)}_t$. Robust standard errors in parentheses. *: $p < 0.10$; **: $p < 0.05$; ***: $p < 0.01$. "Hansen" denotes the test of over-identifying restrictions; "AR(q)" denotes the Arellano and Bond (1991) test of q^{th} order serial correlation.

Table 13: Aggregate effects and allocative efficiency: investment.

	(1) NEG	(2) POS	(3) NET	(4) SUM	(5) EXC	(6) EFF
$(\text{CDS}_{it} - \text{CDS}_{it-1})$						
2007	0.08%	0.04%	-0.04%	0.12%	0.08%	0.98
2008	0.54%	0.43%	-0.11%	0.97%	0.86%	0.90
2009	0.22%	0.38%	0.16%	0.60%	0.44%	0.93
2010	0.70%	0.60%	-0.10%	1.30%	1.20%	0.97
2011	3.12%	2.44%	-0.68%	5.56%	4.88%	0.91
Average	0.93%	0.77%	-0.16%	1.71%	1.49%	0.94

Notes: Aggregate effects of ΔCDS_{it} on firms' capital accumulation. The table refers to the difference between the actual investment and the counter-factual investment if banks' CDS spreads had stayed at the previous year's level values. NEG_t is the ratio between the aggregate negative difference and the aggregate average capital over the current and previous year (see equation (5)). POS_t is the ratio between the aggregate positive difference and the previous year's total capital (see equation (6)). NET_t is defined as $\text{NET}_t = \text{POS}_t - \text{NEG}_t$; SUM_t is defined as $\text{SUM}_t = \text{POS}_t + \text{NEG}_t$; whereas EXC_t is defined as $\text{EXC}_t = \text{SUM}_t - |\text{NET}_t|$. EFF_t is a measure of allocative efficiency defined in equation (7).

Table 14: Aggregate effects and allocative efficiency: employment.

	(1) NEG	(2) POS	(3) NET	(4) SUM	(5) EXC	(6) EFF
$(\text{CDS}_{it} - \text{CDS}_{it-1})$						
2007	0.14%	0.00%	-0.14%	0.14%	0.00%	0.99
2008	1.76%	0.00%	-1.76%	1.76%	0.00%	0.97
2009	0.34%	0.00%	-0.34%	0.34%	0.00%	0.99
2010	0.38%	0.00%	-0.38%	0.38%	0.00%	0.99
2011	1.92%	0.00%	-1.92%	1.92%	0.00%	0.89
Average	0.91%	0.00%	-0.91%	0.91%	0.00%	0.96

Notes: Aggregate effects of ΔCDS_{it} on firms' employment. The table refers to the difference between the actual employment and the counter-factual employment if banks' CDS spreads had stayed at the previous year's level values. NEG_t is the ratio between the aggregate negative difference and the aggregate average capital over the current and previous year total employment (see equation (8)). POS_t is the ratio between the aggregate positive difference and the aggregate average capital over the current and previous year total employment (see equation (9)). NET_t is defined as $\text{NET}_t = \text{POS}_t - \text{NEG}_t$; SUM_t is defined as $\text{SUM}_t = \text{POS}_t + \text{NEG}_t$; whereas EXC_t is defined as $\text{EXC}_t = \text{SUM}_t - |\text{NET}_t|$.

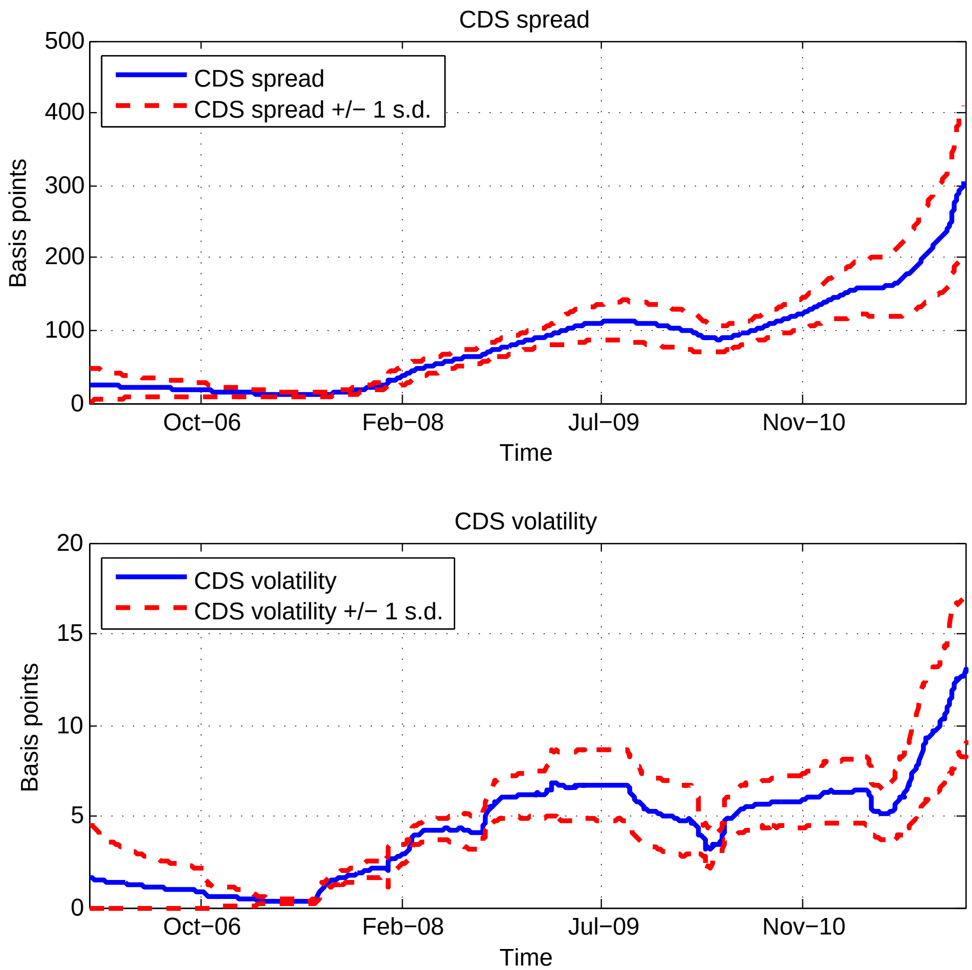


Figure 1: Level and volatility of the CDS spreads for Italian banks; sample 2006–2011.

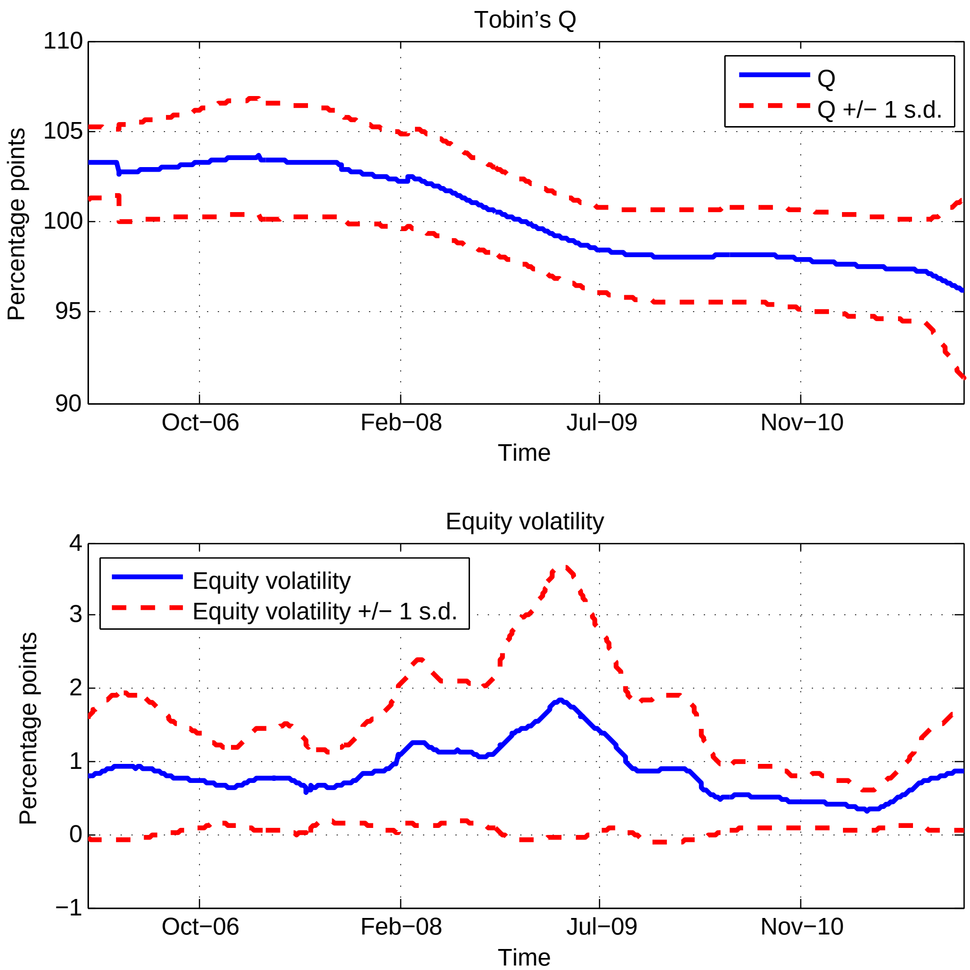


Figure 2: Level and volatility of the stock market valuations for Italian banks; sample 2006–2011.

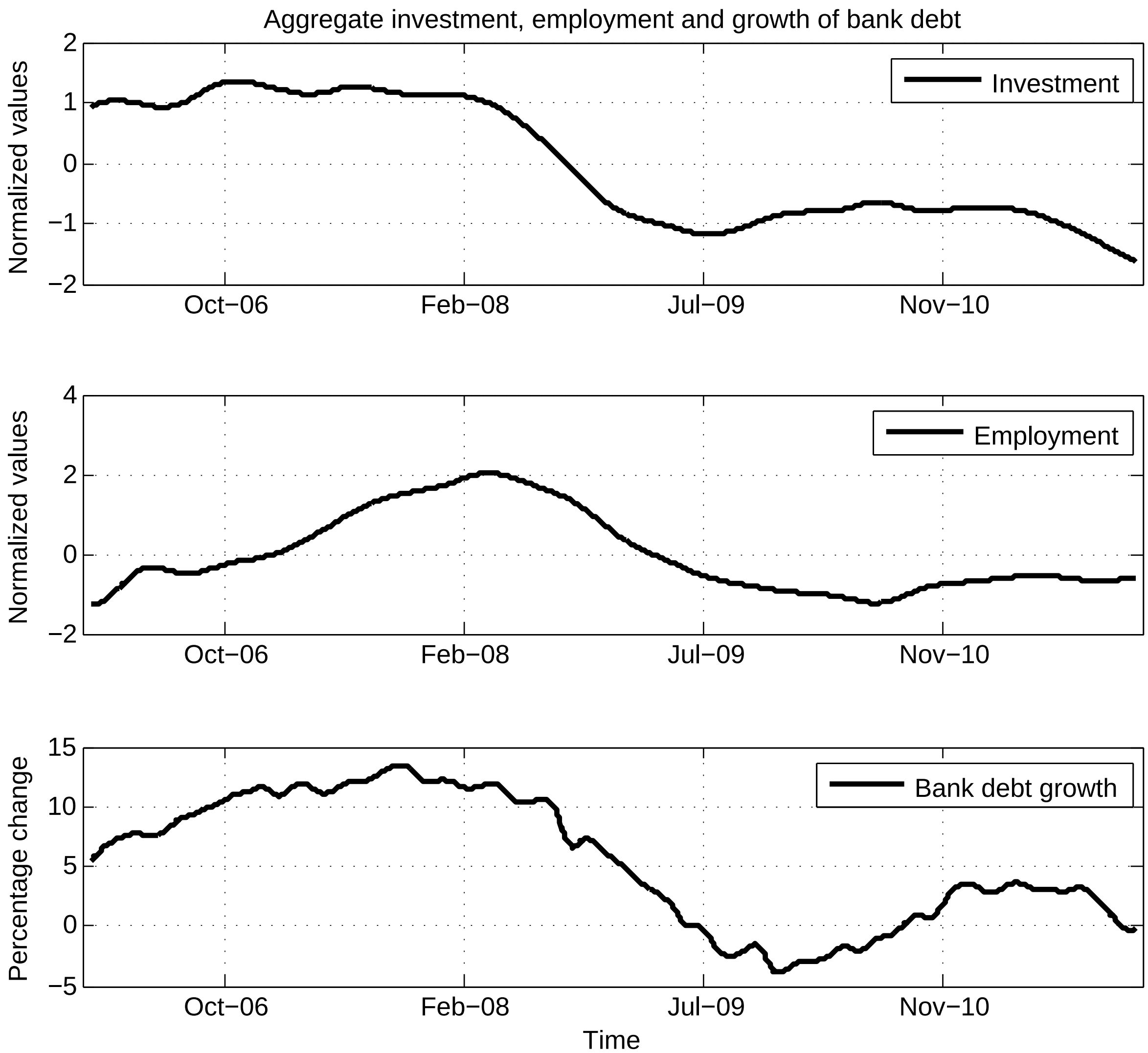


Figure 3: Aggregate investment, employment and bank debt growth for Italian firms; sample 2006–2011.

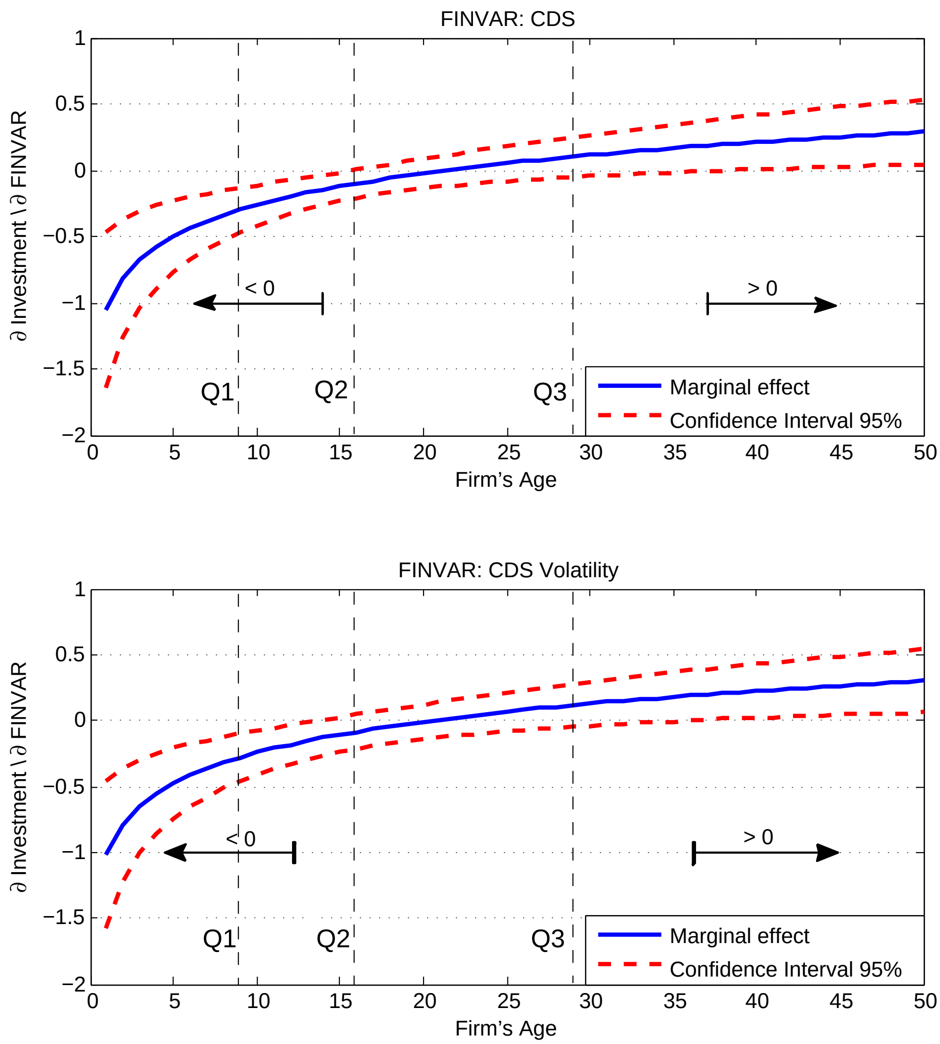
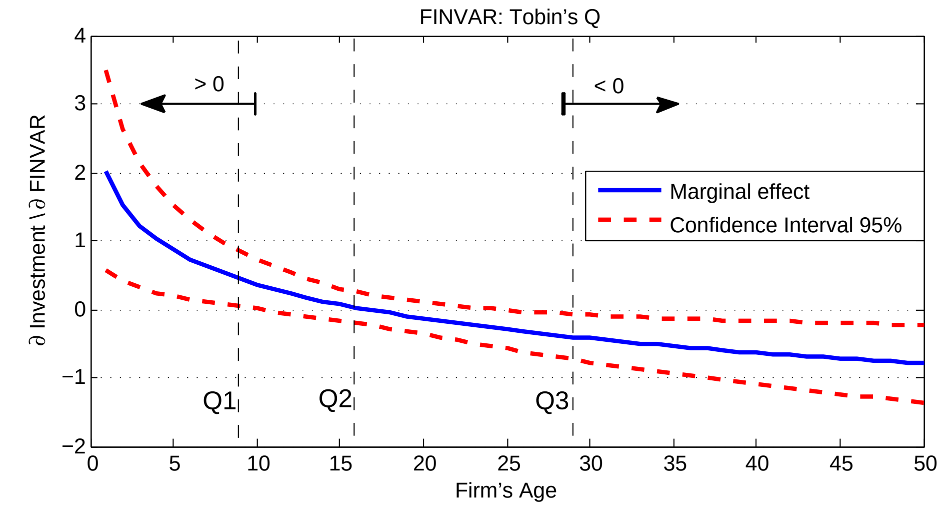


Figure 4: Marginal effect of a unitary increase in FINVARit on firm investment for different values of firm age. The black arrows highlight the regions of significance. Investment is expressed in units of standard deviations. FINVAR: CDS and CDS volatility.



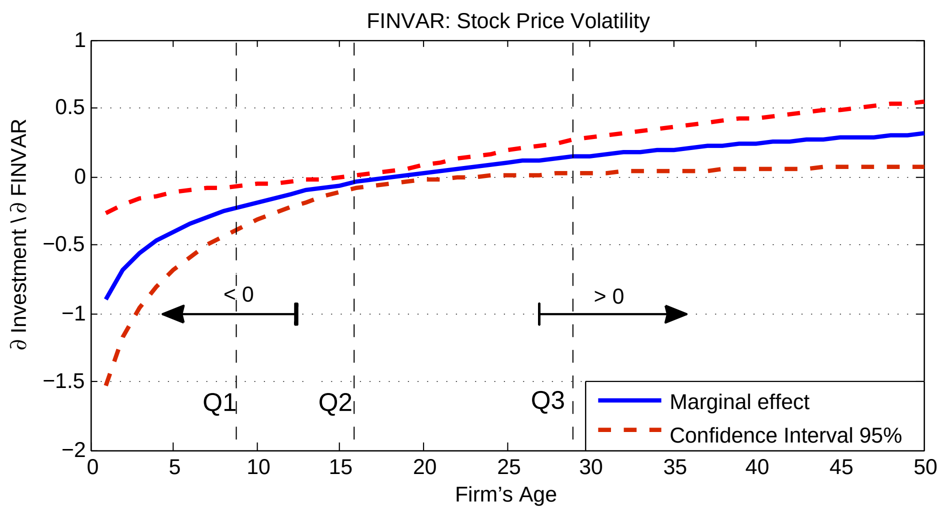


Figure 5: Marginal effect of a unitary increase in FINVAR_{it} on firm investment for different values of firm age. The black arrows highlight the regions of significance. Investment is expressed in units of standard deviations. FINVAR: Tobin's Q and equity volatility.

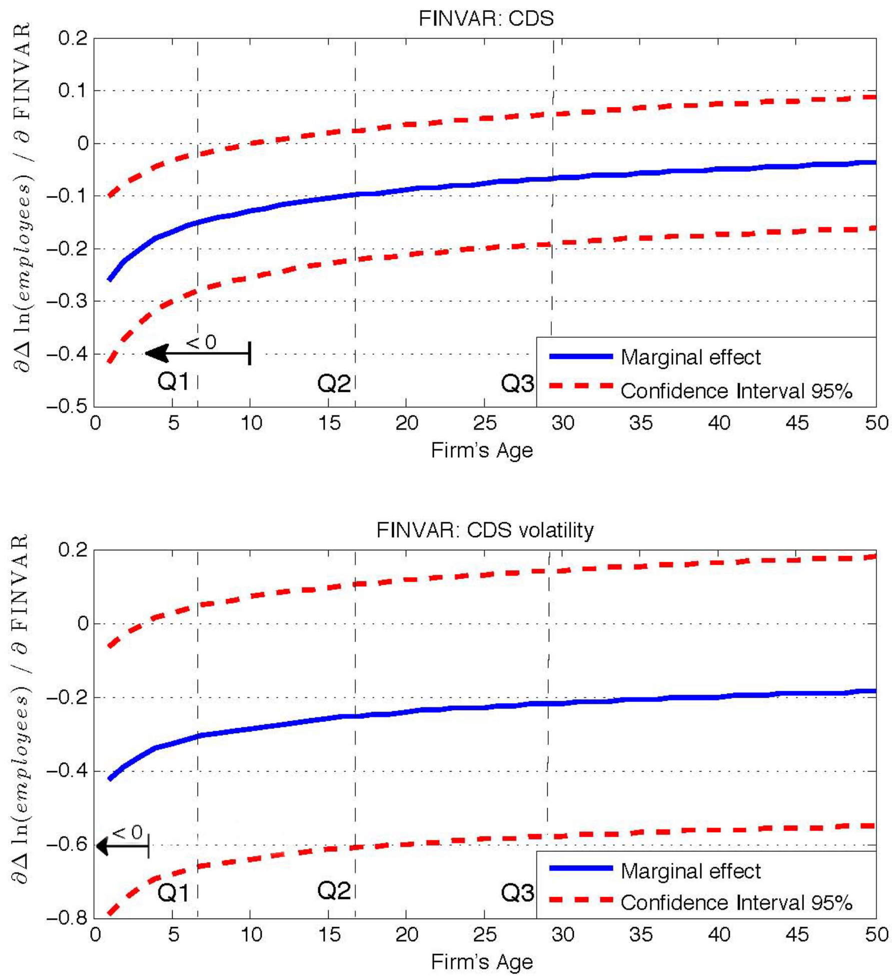


Figure 6: Marginal effect of a unitary increase in FINVARit on firm employment growth for different values of firm age. The black arrows highlight the regions of significance. Employment growth is expressed in units of standard deviations. FINVAR: CDS and CDS volatility.

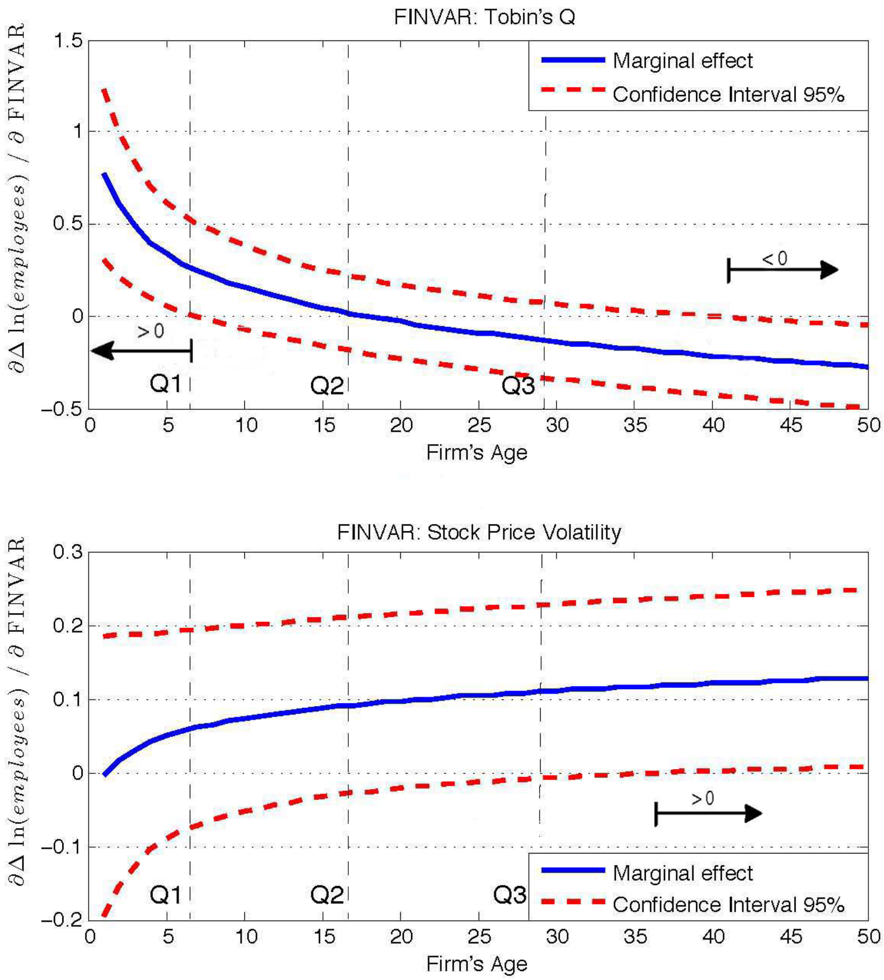
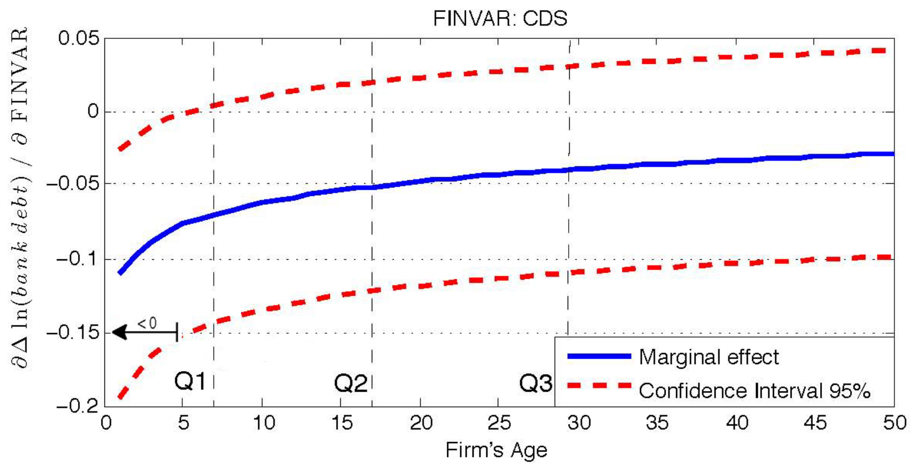


Figure 7: Marginal effect of a unitary increase in FINVAR_{it} on firm employment growth for different values of firm age. The black arrows highlight the regions of significance. Employment growth is expressed in units of standard deviations. FINVAR: Tobin's Q and equity volatility.



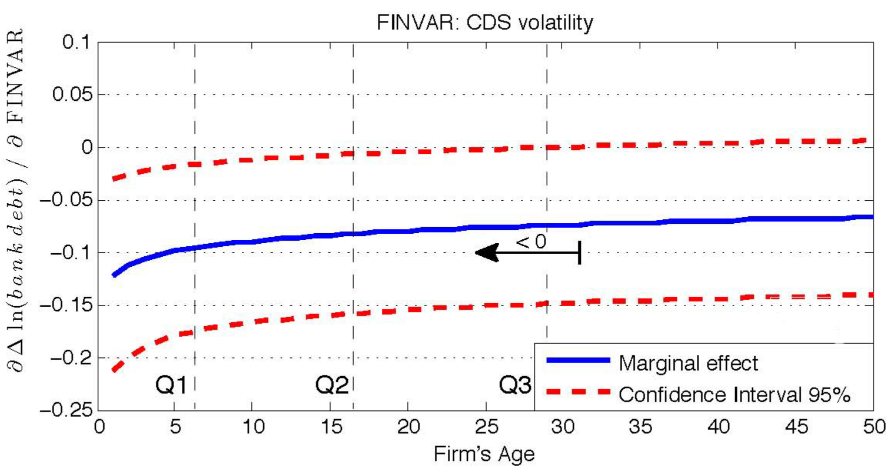


Figure 8: Marginal effect of a unitary increase in FINVARit on firm bank-debt growth for different values of firm age. The black arrows highlight the regions of significance. Bank-debt growth is expressed in units of standard deviations. FINVAR: CDS and CDS volatility.

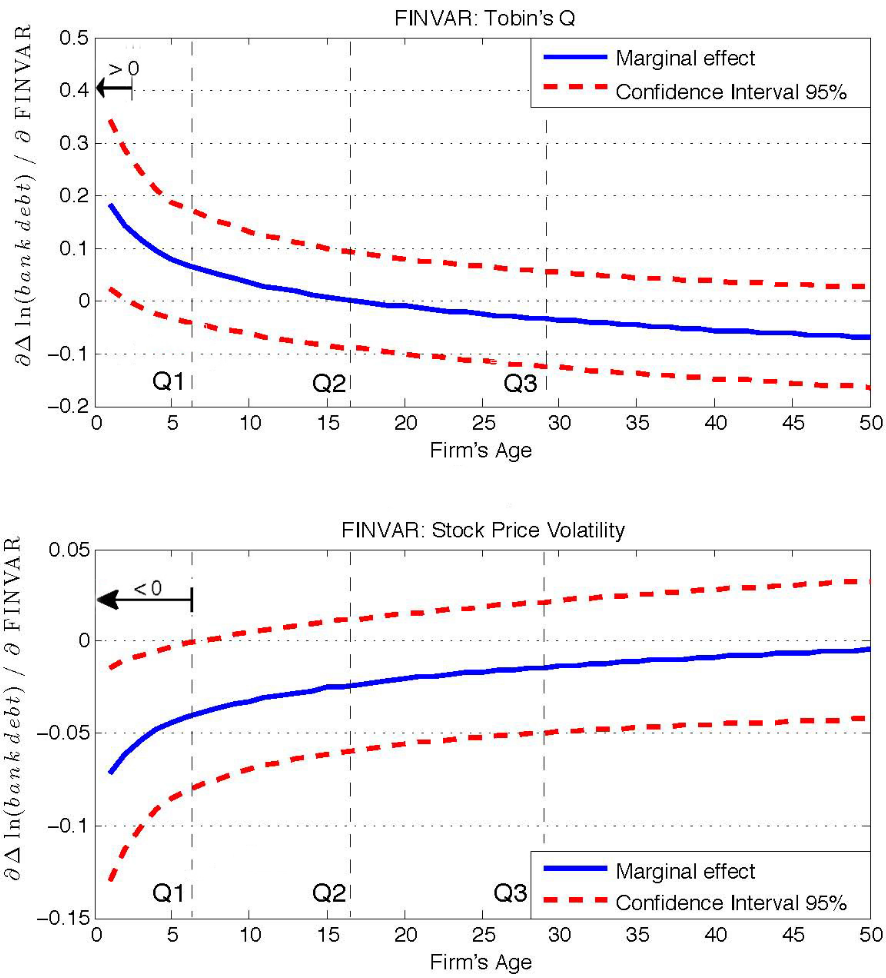


Figure 9: Marginal effect of a unitary increase in FINVAR_{it} on firm bank-debt growth for different values of firm age. The black arrows highlight the regions of significance. Bank-debt growth is expressed in units of standard deviations. FINVAR: Tobin's Q and equity volatility.