

The Corporate Real Effects of CIP Deviations*

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Abstract

We study corporate real effects from Covered Interest Parity (CIP) deviations, exploiting administrative data from Norway. Banks with access to U.S. money markets increase short-term USD funding in response to CIP deviations, expanding the supply of credit at lower rates to non-financial firms. These loan-level results translate into an increase in firm-level bank debt and total debt. However, corporate real effects are mixed. Despite strong effects on corporate sales (firm output), investment in real assets does not increase. Instead, affected firms increase their holdings of financial securities, raise dividend payouts, and expand wage and input spending. Overall, our evidence suggests short-term supply shocks generate operational and financial responses, and their transmission to fixed-investment is limited.

Keywords: CIP deviations, bank lending channel, global banks

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1 Introduction

Global banks rely heavily on short-term wholesale funding markets, particularly in U.S. dollars. The USD liabilities of non-U.S. banking institutions have grown rapidly since the early 2000s, reaching nearly \$13 trillion based on data from the Bank for International Settlements (Aldasoro and Ehlers, 2018).¹ This sizeable exposure to USD-denominated unsecured short-term credit implies that disruptions or relative cost changes in U.S. wholesale funding markets may affect global banks' funding costs, balance sheets, and ultimately lending to firms.

During the European sovereign debt crisis, USD wholesale funding markets experienced substantial segmentation. While euro area banks were affected by a withdrawal of U.S. money market funding (Ivashina et al., 2015), highly rated banks in a number of safe-haven countries kept favourable access to U.S. short-term funding markets as US Money Market Funds reallocated their investments towards banks outside the euro area. Despite the size of these flows, there is little evidence on the loan- and firm-level effects of short-term wholesale funding shocks for non-financial corporations. Such shocks differ from the monetary-policy and long-term refinancing shocks studied in much of the literature: they are concentrated at short maturities and reverse quickly, leaving banks and firms uncertain about future refinancing.

In this paper we study the corporate effects of wholesale funding shocks, using Covered Interest Parity (CIP) deviations to measure them. CIP deviations arise from wholesale funding movements in the presence of limited arbitrage. Ivashina et al. (2015) show that when banks lose U.S. money-market funding and turn to FX swaps to obtain dollars, limited arbitrage capital pushes up the cost of synthetic dollars, opening a deviation from CIP. The CIP deviation is thus the equilibrium price of the underlying funding shock, and its magnitude measures the funding advantage enjoyed by banks that retain direct access to U.S. money markets (Rime et al. (2022)). At the same time, disruptions in global dollar intermediation and balance sheet constraints of financial intermediaries generate sizable CIP deviations through dislocations in FX swap markets (Du et al., 2018; Rime et al., 2022). This meant that for banks with direct access to U.S. money markets, the cost of exchanging USD into domestic currency with the exchange rate risk fully hedged was lower than borrowing local currency directly, creating a funding cost advantage. The breakdown of CIP has been dubbed as “one of the most significant developments in global financial markets” (Du et al., 2018). We exploit this mapping during the Eurozone crisis, when safe-haven Scandinavian banks

¹A large part of this borrowing activity is then transferred as loans to customers in local currency. See Ivashina et al. (2015) for more details on the role of dollar-denominated financial intermediation.

retained access while euro-area banks lost it. Using the USD/NOK CIP deviation to measure the shock, we show that banks with access (the “affected” banks) raised more short-term USD funding and passed the synthetic funding-cost advantage in NOK (via deviations from CIP) through to corporate borrowers as cheaper, more abundant credit.

We show the higher credit is supply-driven: controlling for firm-time fixed effects, we find larger volumes and lower interest rates from affected banks lending to the same firm. The new credit raises firm-level bank debt and total debt, but does not finance physical capital. Instead, affected firms accumulate financial assets and increase dividends, as well as boost operating scale (sales, wages and material costs). We call this the credit reallocation channel of short-term wholesale funding shocks: favorable funding conditions expand the supply of bank credit, which firms channel into liquid financial assets, payouts and operations, rather than fixed capital.

Identifying credit-supply effects from wholesale funding shocks is empirically challenging because banks’ funding structure is endogenous to their assets, investor preferences, funding costs, and the macroeconomic environment. We address this challenge by combining granular administrative datasets with an arguably exogenous shock: a sharp decline in the cost of direct USD funding for globally active Scandinavian banks operating in Norway during the Eurozone crisis. Unlike euro-area banks, these banks were not affected by the dry-up in USD money-market funding and instead enjoyed a sizable funding-cost advantage relative to domestic Norwegian banks. At the peak of the crisis, the implicit cost of raising NOK through USD borrowing was 140 basis points lower than direct NOK funding after hedging costs. The shock originated in global markets and was orthogonal to the Norwegian banking sector. Treatment status is stable over the sample period, allowing us to compare globally active banks — which had access to U.S. money markets — with domestic Norwegian banks that did not.²

We combine three administrative data sources. Supervisory bank-level data on balance-sheet and income-statement items capture the impact on bank funding and asset allocation. Loan-level data from the Norwegian tax authorities cover the universe of bank-firm credit relationships in Norway and identify the impact on loan volumes and rates. Firm-level annual financial statements for the population of Norwegian limited-liability companies break down fixed assets into their subcomponents — physical capital (PP&E), financial fixed assets, and inter-firm equity holdings — and provide income-statement items needed to trace operating and financial margins. We compute CIP

²The headline analysis covers the Eurozone crisis, when funding wedges were most pronounced; we also show that the same response of global banks to CIP deviations holds outside crisis periods (Canadian banks in Figure 7).

deviations from Bloomberg data on short-term unsecured commercial paper issued by Scandinavian banks.

At the bank level, affected banks increase the share of foreign-currency funding to total assets by 3–4 percentage points relative to other banks during the period of elevated CIP deviations, equivalent to a 4.2 percentage point semi-elasticity per percentage point of CIP deviation. On the asset side, they increase corporate lending by approximately 2 percentage points relative to total assets. At the loan level, exploiting within-firm-year variation (Khwaja and Mian, 2008) on the subsample of firms borrowing from both affected and other banks, credit growth is 6 percentage points higher and interest rates are 1.46 percentage points lower on loans from affected banks — a clear credit-supply expansion.

Next, we examine how firms used the increased credit, saturating the specifications with industry-year fixed effects to control for confounding industry-level shocks. Firms borrowing from affected banks experience a 0.81 percentage points higher growth in sales, but no significant increase in physical capital. The asset-side response is concentrated in financial holdings, which rise by 0.286 percentage points, almost entirely driven by securities (0.235 percentage points) rather than direct equity investments in other companies. Profitability rises by 0.159 percentage points, with the entire effect coming from financial RoA. Dividends rise by 0.481 percentage points, in line with patterns documented in Cooper and Lambertides (2018). On the operating side, wages and material costs grow alongside sales, and in fact faster, so that operating margins are compressed and operating profitability is unchanged.

These patterns suggest a credit reallocation channel rather than a real-investment channel: cheaper short-term bank credit flows through to corporate balance sheets primarily as liquid securities and dividends, with operations scaling within existing capacity. To rationalize this allocation, in Appendix B we present a parsimonious model of balance-sheet allocation under a short-term credit-supply shock. In the model, a relaxation of bank credit makes external finance effectively cheaper, but does not trigger physical investment when investment is lumpy and requires fixed setup costs. Instead, firms adjust along fast and flexible margins: they raise variable inputs to scale current operations, accumulate liquid financial assets, and increase payouts. The model predicts a pecking order of responses — balance-sheet expansion concentrated on the financial side, no capital adjustment, and operating profitability flat because higher sales are matched by higher input costs — exactly the pattern we observe.

Finally, we examine which firms drive the financial-asset response. Across a wide range of

firm characteristics, proxies for precautionary motives, such as firms' sales-growth volatility, and firm size significantly shape the response. Smaller firms and firms with more volatile sales growth account for most of the increase in securities holdings. Because affected firms simultaneously raise dividends, these observations do not support a pure constraint-relaxation account.

Our setting is closely linked to Ivashina et al. (2015), but our focus differs from theirs in two respects. First, we study the mirror image of their treatment group. Ivashina et al. (2015) examine euro-area banks that lost access to U.S. money-market funding during the Eurozone crisis and were forced to contract dollar lending; we examine the safe-haven Scandinavian banks that increased access and enjoyed a funding-cost advantage, and that consequently expanded their supply of credit, thus tracing the opposite end of the same reallocation of wholesale dollar funding. Second, and more importantly, we extend the analysis further into the real economy, while Ivashina et al. (2015) stop at the level of bank lending. We trace the new credit through to firm-level financial statements and ask how borrowers allocate it, documenting that it flows into financial securities, dividends, and operating scale rather than into fixed capital. This firm-level allocation of CIP-induced credit is the central contribution of our paper.

Keller (2024) studies borrower-level effects of currency-composition choices in emerging markets and shows that banks' arbitrage of CIP deviations reduces lending in the funding currency as resources move from traditional bank lending to arbitrage activity. The reallocation mechanism in Keller (2024) operates through a within-bank margin between two lending currencies, which requires the partially dollarised setting that characterises Peru. Our setting has essentially no domestic USD corporate lending; cheap synthetic NOK is passed through to firms rather than reallocated against an alternative lending book. We further focus on firm-level real implications of the credit expansion and uncover firm-level patterns not previously documented in this literature..

Our work contributes to recent work on CIP deviations in financial markets. A growing body of literature has established the existence of CIP deviations (Mancini-Griffoli and Ranaldo, 2011; Du et al., 2018). These deviations have been consistently different from zero since the crisis, are on average large, yet highly volatile at the same time (Du et al., 2018). CIP deviations can occur in equilibrium (Ivashina et al., 2015; Duffie, 2017), and a number of studies have examined the underlying reasons. Intermediary balance-sheet constraints feature prominently (Avdjiev et al., 2019; Du et al., 2022; Cenedese et al., 2021). Other contributions emphasize FX hedging demand and market microstructure (Borio et al., 2018; Puriya and Brauning, 2020; Liao, 2020), market segmentation and arbitrage limits (Rime et al., 2022; Ivashina et al., 2015), regulation (Du et al., 2018),

U.S. bank involvement in global liquidity provision (Correa et al., 2020), foreign safe-asset scarcity, market power, and the concentration of dollar demand (Moskowitz et al., 2024), monetary-policy spillovers (Dedola et al., 2021), deviations in emerging markets (Cerrutti and Zhou, 2023), and macroeconomic linkages to financial liberalization (Ranciere and Tornell, 2016). Unlike traditional explanations of the failure of the law of one price (Garleanu and Pedersen, 2011), most of these explanations are based on bank balance sheet constraints.

Finally, our work also complements studies on the real effects of bank funding shocks. Existing work has analyzed credit and capital effects of monetary-policy shocks and regulatory requirements with predetermined horizons (Behn et al., 2016; Iyer et al., 2014; Dell’Ariccia et al., 2021; Gropp et al., 2019; Jiménez et al., 2020; Degryse et al., 2021), the international transmission of monetary policy through global banks (Morais et al., 2019; Brauning and Ivashina, 2017), and the cross-border resilience of bank credit during financial crises (Ongena et al., 2015; Cetorelli and Goldberg, 2012; De Haas and Van Horen, 2013). We add to this literature by showing that the firm-level allocation of new credit — between productive investment, financial investment, and payouts — depends critically on the maturity and persistence of the underlying funding shock. Banerjee and Duflo (2014) document, in the Indian context, that short-term working-capital credit raises sales but not capital; we show that the same maturity asymmetry generates a financial-asset margin in a developed-economy bank-funding setting.

The rest of the paper is organised as follows: Section 2 describes the fundamentals of CIP deviations. Sections 3 and 4 describe data and methodology. Section 5 presents the empirical results. Appendix B presents a parsimonious model that rationalizes the empirical patterns. Section 6 provides a policy discussion. Section 7 concludes.

2 International Capital Flows and CIP deviations

CIP is a central condition in finance, postulating that interest rates should be equal across currencies after accounting for the price of hedging exchange rate risk through an FX swap contract. For example, a bank with access to money markets around the globe can choose to obtain funding across a range of currencies. Suppose a Scandinavian bank needs to obtain NOK for a period of 3 months. It can either obtain it in USD and enter an FX swap contract to hedge the exchange rate risk, or resort to direct funding in NOK. Letting F denote the FX forward price (NOK per USD), S the FX spot price, i_s the unsecured funding cost in foreign currency (USD) and i_d the unsecured

funding cost in domestic currency (NOK), the CIP condition states that:

$$\underbrace{\frac{F}{S}(1 + i_{\$})}_{\text{Synthetic NOK funding cost (USD borrowing hedged via FX swap)}} = \underbrace{(1 + i_d)}_{\text{Funding cost in domestic currency (NOK)}} \quad (1)$$

If CIP does not hold, global lenders can obtain funds in the cheaper currency and enter an FX-swap contract to convert this funding to the currency of interest. Such lenders will then secure funds in the chosen currency at a lower price than their peers without access to foreign markets.

Although CIP is close to an arbitrage identity, it has been violated systematically since the global financial crisis. Du et al. (2018) and Rime et al. (2022) document that non-zero CIP deviations have been the rule rather than the exception over the past decade, appearing across a wide range of currency pairs and persisting well outside crisis episodes. The USD/NOK pair is no exception. Figure 1 plots the 3-month CIP deviation for NOK, measured as the gap between the direct cost of NOK funding and the cost of NOK funding obtained synthetically through hedged USD borrowing. The deviation is negative throughout the sample — synthetic NOK is persistently cheaper than direct NOK — and widens sharply during the Eurozone crisis, reaching about 140 basis points at its height. Comparable advantages were present for the USD against other currencies, notably CAD, JPY, CHF, and AUD.

–Insert Figure 1–

The Eurozone crisis is a sharp instance of how such deviations arise. During the European sovereign debt crisis, euro-area banks were constrained in U.S. short-term funding markets (Ivashina et al., 2015) and faced high direct dollar funding costs, primarily because of their large holdings of European government debt and their exposure to euro break-up risk. To cover their dollar needs, these banks turned to the FX-swap market, borrowing in euros and swapping into dollars; that is, they raised their demand for synthetic dollars. With limited arbitrage capital available to absorb this demand, the price of synthetic dollars was bid up and CIP deviations widened across several currency pairs (Ivashina et al., 2015).

The safe-haven banks were on the other side of this adjustment. As U.S. money-market funds withdrew from euro-area issuers, they redirected funding toward highly rated banks outside the euro area, including the large Scandinavian banks operating in Norway. Figure 2 shows this directly:

the outstanding USD commercial paper and certificates of deposit that U.S. money-market funds held against euro-area banks fell sharply from mid-2011, while their holdings of paper issued by high-quality non-euro-area banks rose over the same window. These banks therefore did not merely retain access to U.S. wholesale funding; they obtained more of it. Holding cheap dollars in excess of their own dollar needs, they supplied dollars to the swap market in exchange for synthetic NOK, providing exactly the arbitrage flow that was in scarce supply.³ The global banks operating in the Norwegian market experienced no deterioration in U.S. money-market conditions, and hence enjoyed a substantial funding-cost advantage over banks without such access.

–Insert Figure 2–

As a first-order approximation, equation 1 can be written as:

$$\underbrace{i_{\$}}_{\text{USD funding cost}} + \underbrace{(f - s)}_{\text{FX-swap implicit interest rate differential}} \approx \underbrace{i_d}_{\text{NOK funding cost}} \quad (2)$$

A CIP deviation can in principle reflect either a difference in cash funding costs across currencies or a dislocation in the price of the FX swap itself. Figure 3 decomposes the 3-month USD/NOK CIP deviation into the elements of equation 2: the cash USD funding rate ($i_{\$}$) faced by Scandinavian banks (blue), the FX hedging cost, equal to the forward premium (F/S), measured in per cent (red), and the direct NOK rate (i_d , green). If CIP held perfectly, the sum of the USD rate and the hedging cost would equal the NOK rate. The decomposition is informative about the source of the wedge: from mid-2011 to end-2012 the cash USD funding rate remained relatively stable, while the forward premium in the swap market moved substantially, with little change in the direct NOK rate. The widening of the CIP deviation thus materialized through the price of synthetic dollars

³The mechanism in Ivashina et al. (2015) operates in our setting; we are simply on the opposite side of it. In their model, euro-area banks that lose dollar funding cover the shortfall synthetically, borrowing euros and swapping into dollars, and thereby demanding synthetic dollars. When arbitrage capital is limited, this one-sided demand cannot be fully absorbed: the cost of synthetic dollars is bid up, and a CIP deviation opens in which raising dollars through the euro leg is expensive. The safe-haven banks we study sit on the other leg of exactly this trade. Having raised cheap dollars directly in U.S. money markets, they are long dollars and short domestic currency, and they supply dollars to the swap market in exchange for synthetic NOK — which is the very arbitrage flow that Ivashina et al. (2015) show to be in scarce supply. The same friction that generates the basis is therefore what allows these banks to earn it: because arbitrage balance sheet is scarce, their dollar supply only partially offsets the euro-area shortfall, the deviation does not close, and the funding-cost advantage persists and is passed through to their borrowers. Were such arbitrage capital unlimited, the basis would be competed to zero and no funding advantage would remain to transmit.

in the FX-swap market, rather than through the level of the cash USD rate faced by banks with money-market access.

This pattern is consistent with the mechanism in Ivashina et al. (2015), once one accounts for the segmentation of the dollar money market. In their setting, the withdrawal of money-market funding raised the cash dollar funding cost for the euro-area banks that lost access. The dollar shortfall of these banks is what drives up the price of synthetic dollars in the swap market, and hence the forward premium, for all participants. The safe-haven banks faced the opposite force on the cash side: money-market funds redirected funding toward them, so their supply of cash dollars increased and their own cash dollar cost, if anything, fell rather than rose. The two movements are not in tension — they are the two sides of a segmented market. The basis widens because of the stressed banks’ shortfall, while the safe-haven banks, whose cash dollar cost is flat or lower, face that same wide basis as a pure arbitrage opportunity rather than as an increase in their own funding cost. The decomposition in Figure 3 shows precisely this for the Scandinavian banks: their cash USD rate is rather stable while the forward premium moves, so for them the wedge is something to monetize.

–Insert Figure 3

Not all banks in the Norwegian market could exploit this cost advantage. The Norwegian banking system comprises a small number of highly rated, globally oriented commercial banks with access to the U.S. commercial paper market, alongside a much larger number of domestically oriented savings banks without such access. The smaller savings banks are not rated by the international credit agencies required for U.S. commercial paper issuance, but they have low operational complexity and high capital ratios, so the two groups are broadly comparable in credit quality. Access to U.S. money markets is effectively available only to large banks: money market funds require a rating from at least one of the main agencies, and fixed issuance costs make commercial paper economical only at large amounts. Throughout the paper, we refer to the banks with such access as “affected” banks.

CIP deviations are not confined to the episode studied here. Du et al. (2018) and Rime et al. (2022) document that they have been the rule rather than the exception over the past decade, including outside crisis periods and across a range of currency pairs. We do not have detailed loan-level data for other currencies, but Figure 7 in the Appendix shows the analogous CD-issuance

pattern for Canadian banks during a tranquil period: as the USD/CAD CIP deviation widened, Canadian banks increased their short-term USD issuance. This indicates that the mechanism we identify is not specific to the Eurozone crisis episode, but operates whenever CIP deviations create a funding-cost wedge for banks with access to U.S. money markets.

3 Data

3.1 Description of data sources

We construct our measure of CIP deviations from the synthetic 3-month NOK rate implied by Scandinavian banks' USD commercial paper funding. The USD rate is the commercial paper rate for high-quality banks reported by the Federal Reserve, which we cross-check against the individual commercial paper rates of two of the largest banks active in the Norwegian market quoted on Bloomberg. Adding the 3-month FX-swap forward premium yields the synthetic NOK rate. The CIP deviation is the synthetic 3-month NOK rate minus the 3-month Norwegian Interbank Offered Rate (Nibor), our proxy for domestic short-term funding costs.⁴ FX spot rates, forward points, and trading days come from Bloomberg.

Our analysis combines three administrative data sources. (1) Supervisory bank-level data from Norges Bank, available quarterly, covers balance-sheet and income-statement items. (2) An administrative loan-level dataset from the Norwegian tax authorities records, at year-end, the outstanding loan balance and interest paid for every bank-firm credit relationship in Norway. (3) Firm-level annual financial statements for all Norwegian private and public limited liability companies provide profit-and-loss and balance-sheet data, including a granular breakdown of fixed assets into physical capital, firm-to-firm lending, and equity holdings of other firms.

3.2 Sample selection and data construction

We work with a subset of the combined dataset, defined by two criteria. First, we restrict attention to firms with positive debt, assets, sales, and capital. Second, we truncate firm-level dependent variables at the 5th and 95th percentiles. When a firm has multiple loans at the same bank, we aggregate to the relationship-year level. Our final sample runs from 2009q1 to 2012q4.

⁴As a robustness check, we compare Nibor to the rate on actual commercial paper issuance in NOK and find them comparable.

3.3 Summary statistics

We classify a bank as “affected” if it had issued commercial paper in a foreign currency by the end of 2010, and as a control bank otherwise.

–Insert Table 1–

Table 1 reports bank-level summary statistics together with the (aggregate) CIP funding deviation. The average CIP funding deviation is 49 bps (s.d. 38 bps), meaning issuing funding abroad in an average quarter is 49 bps cheaper than issuing in NOK after hedging costs. Roughly 19% of affected banks’ liabilities are short-term foreign funding (s.d. 10%). Affected banks have somewhat higher equity ratios, more liquid assets, and larger size than other banks.

Table 2 compares, as of end-2010, the firm characteristics that enter the heterogeneity analysis of Section 5.3 across firms served by at least one affected bank and firms served only by control banks.

–Insert Table 2–

Affected firms are somewhat smaller, slightly less equity-financed, marginally less likely to hold the top rating, and have more volatile sales growth. All differences are precisely estimated, reflecting the large sample, but economically modest. Their direction matters for selection: smaller, lower-rated, more thinly capitalized firms with more volatile cash flows are the firms typically expected to fare worse in a financial crisis, as they have less access to alternative funding sources and tend to retrench rather than expand when uncertainty rises. If selection on these observables drove our results, affected firms would underperform control firms in the post period. Our findings of higher sales and operations growth, increased securities holdings and dividends, move in the opposite direction. The one pre-period difference running the other way is liquidity: affected firms hold 1 percentage point more cash relative to assets, consistent with a stronger ex-ante precautionary motive — the same motive that the heterogeneity analysis in Section 5.3 identifies behind the securities response.

The table also speaks directly to the main confounding concern, namely differential exposure to the Eurozone shock through trade. Exporters are rare in both groups — 2.0% of affected firms

and 2.9% of control firms — and affected firms are, if anything, significantly *less* export-oriented. The Norwegian sample is dominated by small and medium-sized firms with a domestic focus, for which the Eurozone crisis transmits through the domestic credit channel that we identify rather than through collapsing foreign demand, sovereign stress, or currency risk on foreign-denominated revenues. A class of alternative explanations — that affected firms responded to the Eurozone shock through non-credit channels — is therefore unlikely in our setting; to the extent export exposure matters at all, it works against finding stronger outcomes for affected firms.

4 Methodology

Our empirical strategy compares outcomes at affected and other banks (and at treated and control firms) before and after the CIP-shock. The Eurozone crisis escalated in the fall of 2011, sharply lowering the cost of foreign-currency funding for affected Norwegian banks (Figure 1); by the summer of 2012, most of the cost advantage had receded. We therefore treat 2011 and 2012 as the post period and 2009 and 2010 as the pre period.

Identification. We rely on a standard parallel-trends assumption: in the absence of the CIP shock, outcomes for affected and other banks (at the bank- and loan-level) and for treated and control firms (at the firm-level) would have evolved similarly.

Two threats are immediate. First, the two groups of banks and firms could differ systematically over the sample period for reasons unrelated to the shock — for example, if affected banks have different business models. We address this with a dynamic specification that tests for pre-trend differences before the shock. Second, even with parallel pre-trends, treated and control units could be hit by unobserved confounding shocks during the post period — for example, if affected firms are more export-oriented and were therefore differentially affected by the Eurozone slowdown. We address this with two layers of fixed effects: at the loan-level, we follow Khwaja and Mian (2008) and use within-firm-year variation; at the firm-level, we use within-industry-year variation to compare similar firms borrowing from different types of banks.

Bank-level. We estimate

$$\Delta Y_{b,t} = \alpha_b + \sum_{\tau} \delta_{\tau} \mathbf{1}_{t=\tau} + \sum_{\tau} \gamma_{\tau} (D_b \times \mathbf{1}_{t=\tau}) + \sum_{\tau} \eta_{\tau} (X_b \times \mathbf{1}_{t=\tau}) + \epsilon_{b,t} \quad (3)$$

where b indexes banks and t indexes quarters. The outcome $\Delta Y_{b,t}$ is the change in foreign-currency short-term funding. The treatment indicator D_b equals 1 for banks with positive short-term foreign funding prior to the shock. X_b contains the equity-to-assets ratio, $\log(\text{assets})$, and the liquidity-to-assets ratio, all measured prior to the shock.

Loan-level. We estimate

$$\Delta Y_{b,f,t} = \alpha_b + \alpha_{f,t} + \gamma (\mathbf{1}_{t \in \{2011, 2012\}} \times D_b) + \epsilon_{b,f,t} \quad (4)$$

where f indexes firms. The outcome is loan-level credit growth or the change in interest rate. We saturate the specification with bank fixed effects and, for the subsample of firms borrowing from multiple banks (about 10% of the sample), with firm-year fixed effects $\alpha_{f,t}$ (Khwaja and Mian, 2008).

Firm-level. We estimate

$$\Delta Y_{f,t} = \alpha_f + \alpha_{j(f),t} + \gamma (\mathbf{1}_{t \in \{2011, 2012\}} \times D_f) + \epsilon_{f,t} \quad (5)$$

where $\Delta Y_{f,t}$ is one of a broad set of firm balance-sheet and income-statement outcomes, α_f are firm fixed effects, and $\alpha_{j(f),t}$ are industry-year fixed effects that hold industry-level shocks fixed. The firm-level treatment indicator D_f is the maximum of D_b across all banks the firm borrows from.

5 Empirical Analysis

We trace the impact of CIP deviations through three layers of the data: bank-level balance sheets, loan-level relationships, and firm-level outcomes. The analyses follow the design specified in Section 4.

5.1 Bank-level analysis - effect on foreign funding

We estimate equation (3) with the share of foreign funding to total assets as the dependent variable. Figure 4 plots the time-varying difference between affected and other banks, with 95% confidence intervals.

–Insert Figure 4

The two groups evolve in parallel until 2011q3, when affected banks sharply increase their foreign funding ratio. The timing coincides with the escalation of the Eurozone crisis and the onset of large CIP deviations (Figure 1). The peak difference is approximately 3.7 percentage points in 2012q1, with semi-elasticity 4.2 percentage points per percentage point of CIP deviation (Table 3). Once the shock reverts and the commercial paper matures, the foreign-funding ratio reverts toward pre-treatment levels. The pattern is consistent with affected banks using their access to U.S. money markets to exploit the CIP funding-cost advantage.

Table 3 confirms that the relationship is not specific to the Eurozone crisis. Estimating the model over the full sample with CIP deviations interacted with the bank treatment dummy, a 1 percentage point increase in CIP deviations raises the foreign-funding ratio by 4.2 percentage points and the corporate-lending ratio by 1.7 percentage points.

–Insert Table 3–

The first column in Table 4 shows that the increase in foreign funding translates to higher corporate lending shares. The portfolio share of lending to corporate lending is about 2 percentage points higher for affected firms. A natural concern with the bank-level analysis is that this difference could reflect confounding demand shocks rather than a credit-supply expansion. We address this concern next at the loan level.

5.2 Loan-level analysis

Loan-level data allow us to identify a credit-supply expansion by (i) examining both quantity and price responses and (ii) controlling for firm-specific demand factors with firm-year fixed effects.

–Insert Table 4–

Table 4 reports the results. In column (1), loan-level credit growth is 3.2 percentage points higher at affected banks than at other banks (mean credit growth in the sample is -6.8 percentage points). Column (2) restricts the sample to firms borrowing from at least one affected and one other bank — about 10% of all loan-firm pairs — and includes firm-year fixed effects. Within firm and year, credit growth is 6 percentage points higher at affected banks (mean: -10.5 percentage points). Column (3) repeats the within-firm-year estimation with the change in effective interest

rate as dependent variable, and finds a 1.46 percentage point decline. Higher volumes at lower rates within the same firm-year are the signature of a supply-driven expansion.

5.3 Firm-level analysis

Higher credit translates mechanically into higher firm-level debt, but the allocation of the new credit on the asset and revenue sides is an open question. Firms could expand long-term capital, scale operations within existing capacity, or use the cheaper credit for financial purposes (replacing more expensive external financing, engaging in carry trades, or distributing payouts). The outcome depends on the firm’s financial constraints and on the maturity of the credit it receives: Banerjee and Duflo (2014), for instance, document that short-term working-capital credit raises sales without inducing capital formation.

Table 5 reports the response of sales, financial assets, capital, and current assets. Affected firms experience 0.81 percentage points higher sales growth (column 1; sample mean 2.67 percentage points) and 0.286 percentage points higher financial-asset growth (column 2). Neither capital (column 3) nor current assets (column 4) responds significantly.

–Insert Table 5–

Figures 5 and 6 corroborate the dynamic pattern: sales and financial assets shift upward in 2011 and remain elevated in 2012, while pre-shock differences are statistically indistinguishable from zero.

–Insert Figure 5–

–Insert Figure 6–

Table 6 shows that the new credit on the liability side is concentrated in short-term debt. Bank debt and total debt rise (columns 1–2), the increase is driven by the short-term component (column 4), and long-term debt and equity are unaffected (columns 3 and 5). This maturity structure is consistent with the nature of the shock: cheaper short-term credit is transmitted to firms as short-term liabilities and is allocated primarily to liquid balance-sheet items rather than fixed investment,

in line with Gamba and Triantis (2008). In column 1, the 2 percentage point increase in bank debt at the firm level means that firms did not merely substitute by shifting more credit to affected banks (from which, as shown earlier, multiple-relationship firms borrowed 6 pp more than from control banks in a given year): there was an overall increase in bank debt at the firm level.

–Insert Table 6–

Exploring the effects on financial assets and sales

Tables 7 to 9 unpack the channels behind the sales and financial-asset responses. Table 7 reports the response of revenue and cost components. Column (1) reproduces the sales coefficient from Table 5. Wages rise by 0.456 percentage points (column 2) and total operating costs by 2.93 percentage points (column 3) — considerably faster than sales, so that operating margins compress rather than expand. The implied pattern is one of aggressive scale-up: firms add labor and material inputs but generate less than proportional revenue gains. Column (7) reports a small but statistically significant rise in overall RoA of 0.159 percentage points, which as we show is driven in the financial component.

–Insert Table 7–

Table 8 decomposes the overall return-on-assets response into its operating and financial components, and the two margins behave very differently. The total RoA effect of 0.159 percentage points (column 1, significant at the 10% level) is almost entirely a financial phenomenon. Operational RoA, defined as earnings before interest, taxes, and amortization scaled by assets, rises by a statistically insignificant 0.039 percentage points (column 2), while financial RoA, defined as net financial income over assets, increases by 0.064 percentage points and is precisely estimated (column 3, significant at the 1% level). The improvement in profitability is therefore attributable to the financial side of the firm: affected firms earn a spread on the securities they accumulate, whereas the profitability of their core operations is flat. This unchanged operating RoA is the direct counterpart of the margin compression documented in Table 7, where costs grow faster than sales, so that a higher volume of operating activity does not translate into a higher operating return.

–Insert Table 8–

Approximately 80 % of financial assets are held to maturity and as such fixed assets. Given the lack of responses on current assets, we proceed by decomposing fixed financial assets. In Table 9, we decompose financial assets into direct holdings of other companies (equity stakes) and securities (bonds and other tradable instruments). This comprises of liquid assets that firms use to for long-term liquidity management. The financial-asset response (column 1) is driven almost entirely by securities (column 3), not by direct equity investments (column 2). Dividends rise by 0.481 percentage points (column 4). Affected firms thus reallocate their newly available credit toward liquid securities issued by other firms, earning a spread that shows up as higher financial RoA, and simultaneously distribute more cash to shareholders.

–Insert Table 9–

In unreported regressions, the growth in total fixed assets (PP&E plus financial fixed assets) is 0.44 percentage points higher for affected firms, significant at the 10% level. In our database, fixed assets include PP&E and financial assets; given that the capital coefficient itself is small and insignificant (Table 5, column 3), the fixed-asset response is driven by the financial-asset component. Comparing this effect to the effect on total debt in column 2 of Table 6, and scaling by the relative size of fixed assets to total debt (1.2), implies that approximately 37% ($0.44 \times 1.2 / (0.44 \times 1.2 + 0.924)$) of the CIP-induced debt increase is transmitted to fixed assets — predominantly through financial holdings rather than physical capital.

Drivers of increased security holdings

Finally, we investigate why firms respond to an increase in credit supply by increasing their security holdings. We consider two non-exclusive explanations. The first centers on precautionary savings: firms with volatile sales growth or undiversified income streams may accumulate liquid securities for precautionary reasons once the cost of financing such positions falls (Opler et al., 1999; Gao et al., 2013; Riddick and Whited, 2009). The second is a relaxation of credit constraints: firms that were previously rationed at smaller scales — typically smaller firms — may use the new credit to expand all balance-sheet items, including liquid assets, simply because they were constrained before. We use two proxies that map to both readings: firm size and the volatility of

sales growth. Larger and less volatile firms are less likely to have either a strong precautionary motive or binding constraints (Crouzet and Mehrotra, 2020). Other forces could also matter. Firms with low investment opportunities, or firms with high foreign-market exposure, might respond differently to the CIP-induced credit supply expansion. We therefore include proxies for these and for other firm characteristics in the heterogeneity analysis.

Table 10 reports the results. Of the firm characteristics considered, only the proxies for precautionary motives and constraints — firm size and sales-growth volatility — significantly shape the response of securities holdings to the credit-supply expansion. Specifically, firms that are smaller or have more volatile sales growth significantly increase their securities holdings compared to other firms borrowing from the same global bank. The increase in security holdings declines by 0.5 percentage points per 1 million NOK increase in assets, and firms with a 1 standard deviation lower sales-growth volatility have 2.7 percentage point lower growth in securities.

The cross-sectional pattern is consistent with both a precautionary motive and a relaxation of binding credit constraints — the two readings are observationally equivalent in this exercise alone. We tilt toward the precautionary interpretation because affected firms also increase dividend payouts (Table 9). A pure constraint-relaxation account predicts retention rather than payout, since previously rationed firms would internally fund growth opportunities. The combination of higher security holdings *and* higher dividends is more easily reconciled with a story in which firms use cheaper external funds to build up precautionary buffers and to distribute slack capacity to shareholders, rather than one in which the additional funds simply substitute for previously unavailable internal financing.

–Insert Table 10–

6 Policy implications

The short-term wholesale funding channel we document carries refinancing risk: in our setting, the funding consists of *unsecured* commercial paper and certificates of deposit, instruments that have historically dried up in bad times — including the Global Financial Crisis and the European sovereign debt crisis. Norwegian policymakers have flagged this concern explicitly:

“This funding comprises short-term paper and deposits from money market funds and large companies. Deposits can be withdrawn quickly and are not considered stable. Short-term money market funding is considered unstable owing to short maturities” (Norges Bank, 2018).

Although CIP deviations are orthogonal to domestic monetary policy, the funding channel we document has implications for monetary authorities. Banks partially insure against refinancing risk by holding more central-bank reserves, but private incentives to borrow short-term following positive CIP deviations may leave individual banks under-insured: banks do not fully internalize the fire-sale externalities their maturity transformation can generate (Stein, 2012). Our results — that CIP-induced short-term funding flows through to corporate balance sheets primarily as liquid securities and dividends rather than as productive capital — are consistent with these externality-based concerns. Whether to regulate short-term wholesale funding via reserve requirements or haircuts on commercial paper liabilities is beyond the scope of our welfare analysis, but the credit-reallocation pattern we document suggests that the social benefit from short-term wholesale funding inflows may be smaller than the private benefit captured by the borrowing banks and their corporate clients.

Our results also speak to the contrast between short-term and long-term wholesale funding shocks. The 2011 European Central Bank Long-Term Refinancing Operations (LTRO) provided euro-area banks with three-year funding at the same interest rate and collateral terms as their short-term operations, with the explicit aim of reducing rollover risk and supporting bank-funded investment. Our findings imply that the maturity of the underlying funding shock matters not only for whether real effects materialize but also for how the credit is allocated within the firm: short-term shocks generate sales scaling and financial-asset accumulation, but not capital formation. Quantifying whether long-term funding shocks generate different reallocation patterns is a natural next step.

7 Conclusion

We exploit cross-sectional differences among Norwegian banks in their access to U.S. money markets during the 2011–2012 Eurozone crisis to study how a short-term wholesale funding shock — generated by widening CIP deviations and orthogonal to domestic monetary policy — transmits through banks to firms.

Affected banks pass the funding-cost advantage through as more credit at lower rates. At

the firm level, however, the new credit does not finance physical capital. Instead, firms scale operations within existing capacity, accumulate liquid securities issued by other firms, and increase dividend payouts. Operating margins are compressed; the rise in profitability is concentrated in the financial component. Smaller firms and firms with more volatile sales growth account for most of the financial-asset response, consistent with a precautionary-savings interpretation. Appendix B provides a parsimonious model in which lumpy capital adjustment plus a flexible variable-input margin generates exactly this pattern — balance-sheet expansion concentrated on the liquid and operating sides, with capital sluggish in the short run. The findings are economically sizable in the cross-section of firms in our sample; we leave aggregate quantification to future work.

References

- ALDASORO, I. AND T. EHLERS (2018): “The Geography of Dollar Funding of Non-US Banks,” *Bis quarterly review*, Bank for International Settlements.
- AVDJIEV, S., W. DU, C. KOCH, AND H. S. SHIN (2019): “The dollar, bank leverage, and deviations from covered interest parity,” *American Economic Review: Insights*, 1, 193–208.
- BANERJEE, A. V. AND E. DUFLO (2014): “Do Firms Want to Borrow More? Testing Credit Constraints Using a Directed Lending Program,” *Review of Economic Studies*, 81, 572–607.
- BEHN, M., R. HASELMANN, AND P. WACHTEL (2016): “Procyclical capital regulation and lending,” *The Journal of Finance*, 71, 919–956.
- BORIO, C., M. IQBAL, R. McCAULEY, P. McGUIRE, AND V. SUSHKO (2018): “The failure of covered interest parity: Fx hedging demand and costly balance sheets,” .
- BRAUNING, F. AND V. IVASHINA (2017): “Monetary policy and global banking,” Tech. rep., National Bureau of Economic Research.
- CENEDESE, G., P. DELLA CORTE, AND T. WANG (2021): “Currency Mispricing and Dealer Balance Sheets,” *The Journal of Finance*, 76, 2763–2803.
- CERRUTTI, E. AND H. ZHOU (2023): “Uncovering CIP Deviations in Emerging Markets: Distinctions, Determinants, and Disconnect,” *Working Paper*.
- CETORELLI, N. AND L. GOLDBERG (2012): “Banking globalization and monetary transmission,” *The Journal of Finance*, 67, 1811–1843.
- COOPER, I. A. AND N. LAMBERTIDES (2018): “Large dividend increases and leverage,” *Journal of Corporate Finance*, 48, 17–33.
- CORREA, R., W. DU, AND G. LIAO (2020): “U.S. Banks and Global Liquidity,” *Working Paper*.
- CROUZET, N. AND N. R. MEHROTRA (2020): “Small and large firms over the business cycle,” *American Economic Review*, 110, 3549–3601.
- DE HAAS, R. AND N. VAN HOREN (2013): “Running for the Exit? International Bank Lending During a Financial Crisis,” *The Review of Financial Studies*, 26, 244–285.

- DEDOLA, L., G. GEORGIADIS, J. GRAB, AND A. MEHL (2021): “Does a Big Bazooka Matter? Quantitative Easing Policies and Exchange Rates,” *Journal of Monetary Economics*, 117, 489–506.
- DEGRYSE, H., A. KARAPETYAN, AND S. KARMAKAR (2021): “To ask or not to ask: Bank capital requirements and loan collateralization,” *Journal of Financial Economics*, 142, 239–260.
- DELL’ARICCIA, G., D. KADYRZHANOVA, C. MINOIU, AND L. RATNOVSKI (2021): “Bank Lending in the Knowledge Economy,” *The Review of Financial Studies*, 34, 5036–5076.
- DU, W., B. HEBERT, AND A. W. HUBER (2022): “Are Intermediary Constraints Priced?” *The Review of Financial Studies*, 36, 1464–1507.
- DU, W., A. TEPPER, AND A. VERDELHAN (2018): “Deviations from covered interest rate parity,” *The Journal of Finance*, 73, 915–957.
- DUFFIE, D. (2017): “Post-crisis bank regulations and financial market liquidity,” *Working Paper*.
- GAMBA, A. AND A. TRIANTIS (2008): “The Value of Financial Flexibility,” *Journal of Finance*, 63, 2263–2296.
- GAO, H., J. M. HARFORD, AND K. LI (2013): “Determinants of corporate cash policy: Insights from private firms,” *Journal of Financial Economics*, 109, 623–639.
- GARLEANU, N. AND L. H. PEDERSEN (2011): “Margin-based Asset Pricing and Deviations from the Law of One Price,” *The Review of Financial Studies*, 24, 1980–2022.
- GROPP, R., T. MOSK, S. ONGENA, AND C. WIX (2019): “Bank response to higher capital requirements: Evidence from a quasi-natural Experiment,” *Review of Financial Studies*, 32, 266–299.
- IVASHINA, V., D. S. SCHARFSTEIN, AND J. C. STEIN (2015): “Dollar funding and the lending behavior of global banks,” *The Quarterly Journal of Economics*, 130, 1241–1281.
- IYER, R., J.-L. PEYDRO, S. DA ROCHA-LOPES, AND A. SCHOAR (2014): “Interbank liquidity crunch and the firm credit crunch: Evidence from the 2007–2009 crisis,” *Review of Financial Studies*, 27, 347–372.

- JIMÉNEZ, G., A. MIAN, J. L. PEYDRÓ, AND J. SAURINA (2020): “The real effects of the bank lending channel,” *Journal of monetary economics*, 115, 162–179.
- KELLER, L. (2024): “Arbitraging Covered Interest Rate Parity Deviations and Bank Lending,” *American Economic Review*, 114, 2633–67.
- KHWAJA, A. I. AND A. MIAN (2008): “Tracing the impact of bank liquidity shocks: Evidence from an emerging market,” *American Economic Review*, 98, 1413–42.
- LIAO, G. Y. (2020): “Credit migration and covered interest rate parity,” *Journal of Financial Economics*, 138, 504–525.
- MANCINI-GRIFFOLI, T. AND A. RANALDO (2011): “Limits to arbitrage during the crisis: Funding liquidity constraints and covered interest parity,” *Working Paper*.
- MORAIS, B., J.-L. PEYDRO, J. ROLDAN-PENA, AND C. RUIZ-ORTEGA (2019): “The international bank lending channel of monetary policy rates and QE: Credit supply, reach-for-Yield, and real Effects,” *The Journal of Finance*, 74, 55–90.
- MOSKOWITZ, T. J., C. P. ROSS, S. Y. ROSS, AND K. VASUDEVAN (2024): “Quantities and Covered-Interest Parity,” Finance and Economics Discussion Series 2024-079, Board of Governors of the Federal Reserve System.
- NORGES BANK (2018): “Financial Stability Report 2018,” Norges Bank, Oslo, available at <https://www.norges-bank.no/>.
- ONGENA, S., J.-L. PEYDRO, AND N. VAN HOREN (2015): “Shocks Abroad, Pain at Home? Bank-Firm-Level Evidence on the International Transmission of Financial Shocks,” *IMF Economic Review*, 63, 698–750.
- OPLER, T., L. PINKOWITZ, R. STULZ, AND R. WILLIAMSON (1999): “The determinants and implications of corporate cash holdings,” *Journal of Financial Economics*, 52, 3–46.
- PURIYA, A. AND F. BRAUNING (2020): “Demand Effects in the FX Forward Market: Micro Evidence from Banks’ Dollar Hedging,” *The Review of Financial Studies*, 34, 4177–4215.
- RANCIERE, R. G. AND A. TORNELL (2016): “Financial Liberalization, Debt Mismatch, Allocative Efficiency, and Growth,” *American Economic Journal: Macroeconomics*, 8, 1–44.

- RIDDICK, L. A. AND T. M. WHITED (2009): “The corporate propensity to save,” *The Journal of Finance*, LXIV, 1729–1766.
- RIME, D., A. SCHRIMPF, AND O. SYRSTAD (2022): “Covered Interest Parity Arbitrage,” *Review of Financial Studies*, 35, 5185–5227.
- STEIN, J. (2012): “Monetary policy as financial stability regulation,” *The Quarterly Journal of Economics*, 127, 57–95.

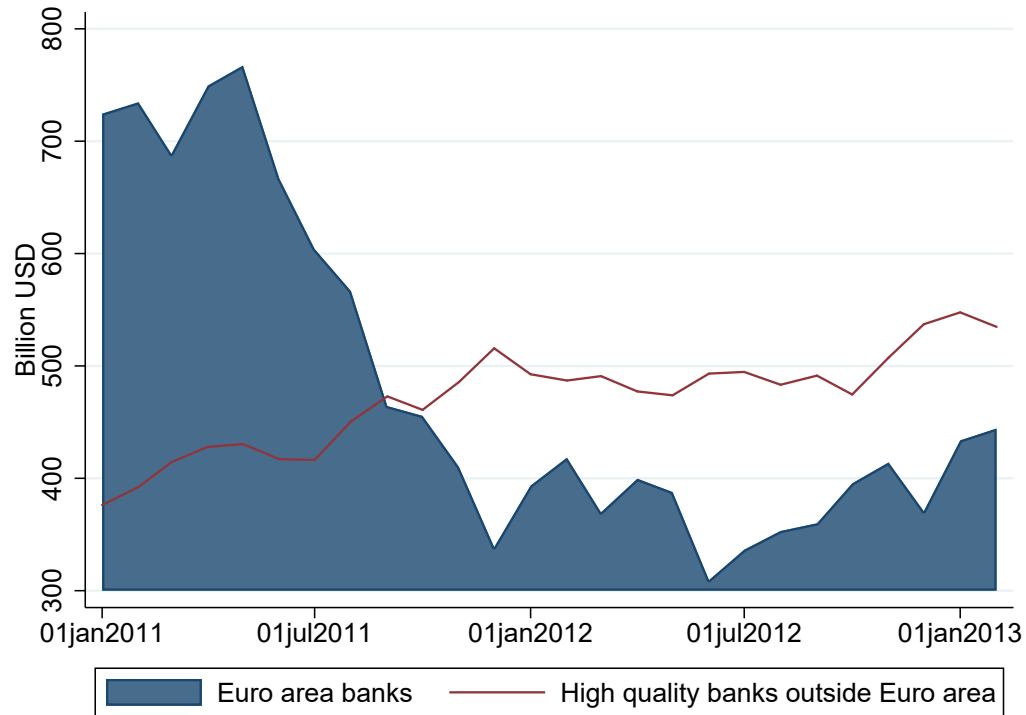
8 Figures and Tables

Figure 1: CIP funding deviations with 3-month maturity between USD and NOK



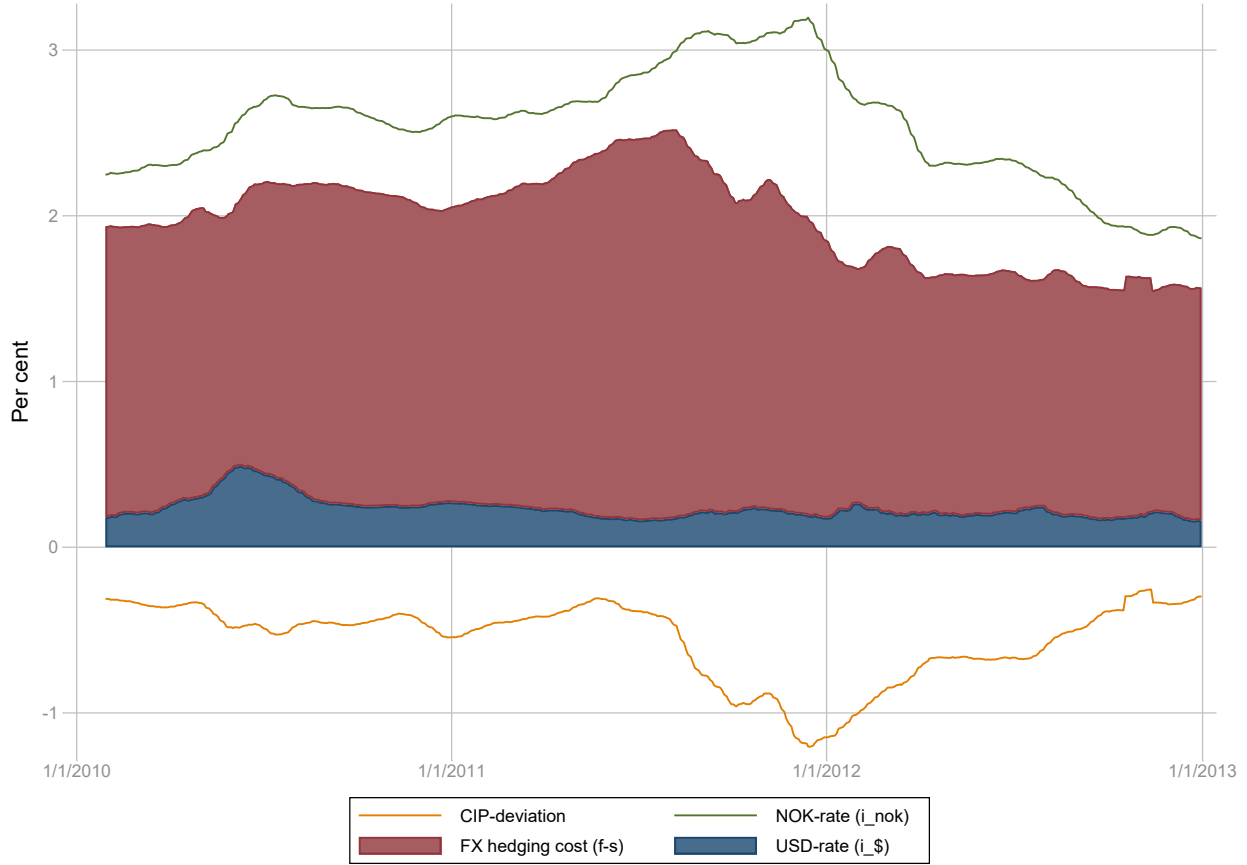
Notes: This figure depicts the CIP funding deviations for banks with access to 3-month unsecured funding in USD. The CIP deviation is defined as 3-month interbank rate in Norway (NIBOR) minus the FX-swap implied rate in NOK from the 3-month CP rate in USD for highly rated banks. A negative value indicates cheaper USD hedged funding as compared to domestic borrowing in NOK. Data source: Bloomberg.

Figure 2: **Short-term USD funding (CP/CD) held by Money Market Funds**



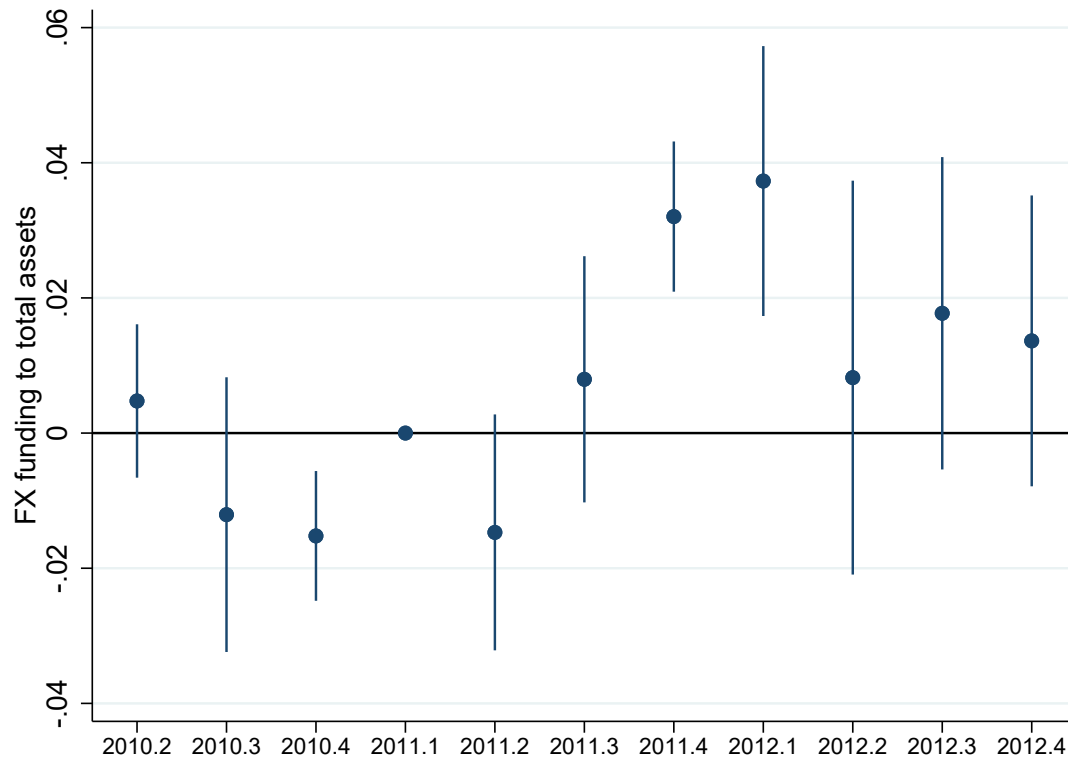
Notes: This graph shows outstanding amount of Commercial Paper (CP) and Certificate of Deposits (CD) denominated in USD held by US Money Market Funds and issued by euro area banks and high quality banks outside Euro area (Australia, Canada, Denmark, Norway, Sweden, Switzerland), respectively. Money Market Funds are the largest investor in short term debt issued by banks. Source: Office of Financial Research

Figure 3: Decomposing the CIP-deviations



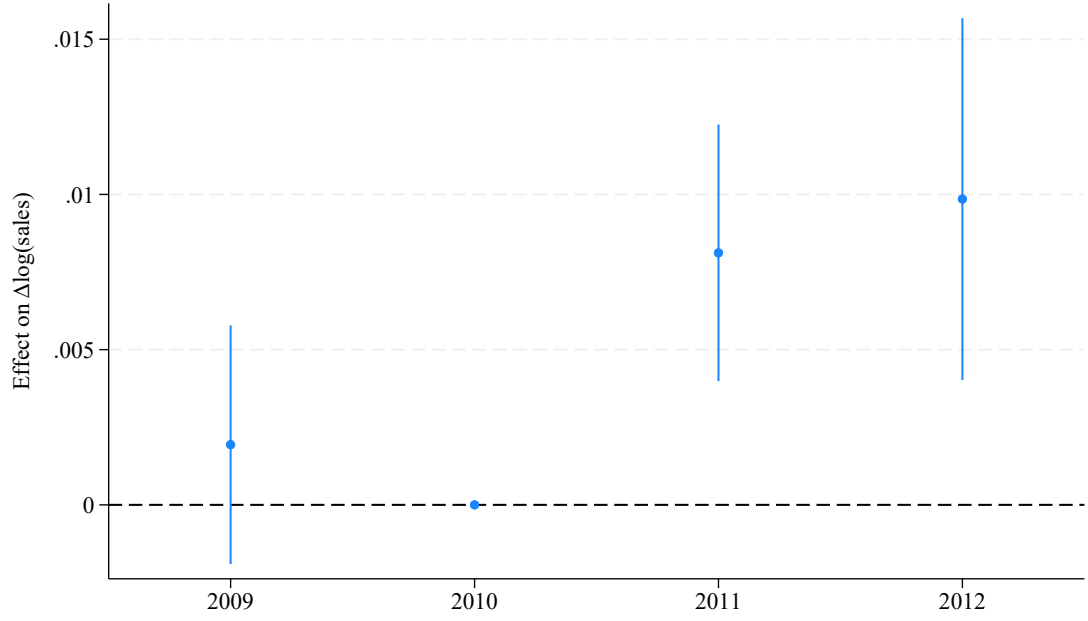
Notes: This figure decomposes the CIP deviation in the NOK/USD foreign exchange cross. It illustrates the development in the various components - the USD-rate, the hedging cost that is equal to the forward premium and the direct NOK-rate. The implicit NOK-rate faced by high-quality Scandinavian banks stems from borrowing in USD and hedging the FX risk, and is the sum of the USD-rate and the forward premium. The difference between the implicit NOK- rate and the direct NOK-rate equals the CIP deviation. The data is calculated as rolling 1-month averages to increase visibility. Sample period is from January 2010 to December 2013. Data source: Bloomberg.

Figure 4: **Relative growth in foreign funding (affected banks)**



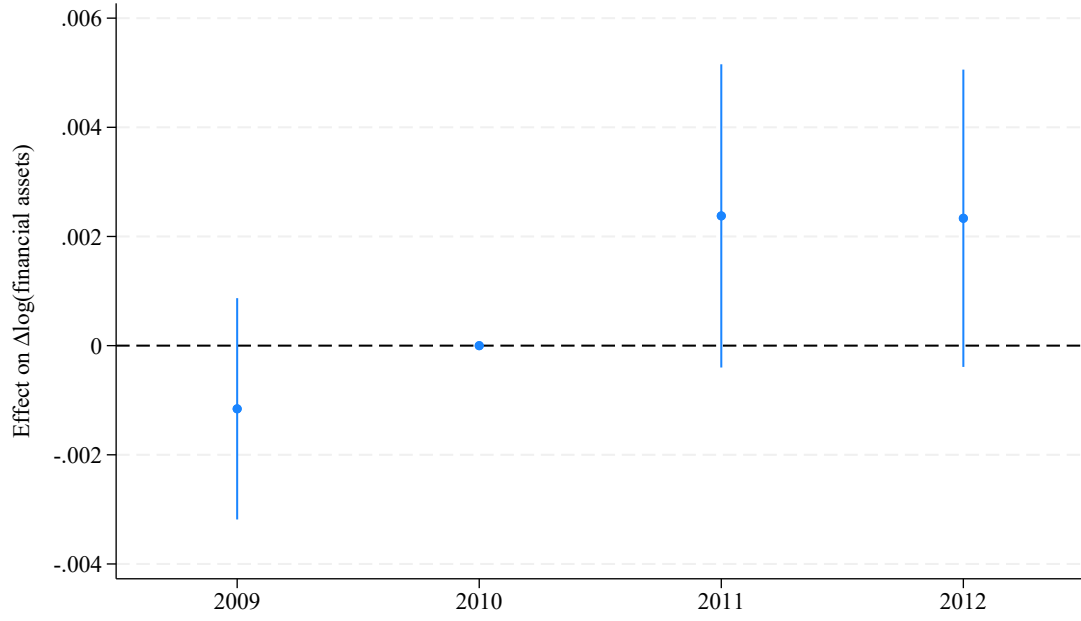
Notes: This figure shows the estimated γ_τ from equation (3) using the foreign funding relative to total assets as outcome variable. Dots indicate point estimates and vertical lines are the associated 95% confidence interval. All coefficients are plotted relative to 2011q1.

Figure 5: **Relative growth in corporate sales**



Notes: This figure shows the estimated γ_τ from equation (3) using log corporate sales to total assets as dependent variable. Dots indicate point estimates and vertical lines are the associated 95% confidence intervals. All coefficients are plotted relative to 2011q1.

Figure 6: **Relative growth in financial assets**



Notes: This figure shows the estimated γ_τ from equation (3) using corporate financial assets to total assets as dependent variable. Dots indicate point estimates and vertical lines are the associated 95% confidence interval. All coefficients are plotted relative to 2011q1.

Table 1: **Summary statistics, bank-level**

	(1)		(2)		Difference
	Control		Affected		
	Mean	Std. dev	Mean	Std. dev	
CIP funding deviation			-0.49	0.38	—
Short-term foreign fund ratio			0.19	0.10	—
Equity / Assets	0.04	0.02	0.06	0.04	-0.011***
Deposits / Assets	0.62	0.13	0.62	0.22	0.005
Central bank deposits / Assets	0.03	0.08	0.02	0.04	0.01
Corporate loans / Assets	0.21	0.08	0.19	0.11	0.02
Log(Assets)	10.99	1.28	11.77	1.81	-0.78**
Observations	117		23		

Notes: This table reports summary statistics at the bank level. All values based on end of 2010 balance-sheet statement. Summary statistics are computed for banks active in international short-term funding market (column (2)) and other banks (column (1)). *** indicates $p < 0.01$ and ** indicates $p < 0.05$, where p is the p-value on a test of equality across groups.

Table 2: **Summary statistics, firm-level**

	Affected	Control	Difference	S.E.	Obs.
Log(Assets)	8.483	8.731	-0.248***	(0.015)	32765
Equity / Assets	0.283	0.302	-0.019***	(0.002)	32765
Cash / Assets	0.138	0.128	0.010***	(0.002)	32765
Top rating	0.846	0.859	-0.013***	(0.004)	32768
Exporter	0.020	0.029	-0.009***	(0.002)	32768
Sd(sales growth)	0.097	0.090	0.007***	(0.001)	32768

Notes: This table reports pre-period summary statistics at the firm level for the characteristics used in the heterogeneity analysis (Table 10). All values are based on end-of-2010 statements. Affected firms patronize at least one affected bank active in international short-term funding markets; control firms borrow only from other banks. The difference column reports the affected-minus-control difference in means. Variable definitions are provided in Table 11. *** indicates $p < 0.01$, where p is the p-value on a test of equality of means across groups.

Table 3: **Panel regression of CIP deviations and bank balance sheet outcomes**

	(1)	(2)
	Foreign funding to total assets	Corporate loans to total assets
$CIP_t \times D_b$	0.042*** (0.007)	0.017** (0.008)
N	1470	1522
R-squared	0.942	0.948
Mean of dependent variable	0.0214	0.217
Bank FE	Yes	Yes
Year FE	Yes	Yes

Notes: Sample period runs from 2009q1 to 2012q4. Column (1) considers the foreign funding to total assets as dependent variable. Column (2) considers corporate loans to total assets as dependent variable. Standard errors clustered at the bank-level. * p<0.1, ** p<0.05, ***p<0.01.

Table 4: **Bank- and loan-level results**

	(1)	(2)	(3)	(4)
	Corporate credit / assets	Credit growth	Credit growth	Δ interest rate
$D_b \times \text{Post}$	0.0184* (0.0107)	0.0321** (0.0127)	0.0605** (0.0305)	-0.0146** (0.00640)
N	2028	162315	15745	12383
R-squared	0.94	0.00356	0.484	0.502
Mean of dependent variable	0.216	-0.0687	-0.105	0.00134
Bank FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	No	No
Firm-Year	NA	No	Yes	Yes
Unit of observation	Bank-level	Loan-level	Loan-level	Loan-level
Sample	All	All	Multiple banks	Multiple banks

Notes: Column (1) reports a bank-level regression of corporate credit over total assets on $D_b \times \text{Post}$. Columns (2)–(4) report loan-level estimates of equation (4) using credit growth (columns 2 and 3) and change in interest rate (column 4) as outcome variables. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Mean and standard deviations are taken over the full sample period (2009 - 2012). $\text{Post} = 1$ for 2011 and 2012, and zero otherwise. Column (2) considers the full sample. Columns (3) and (4) consider only firms borrowing from at least one affected and one internationally non-active bank. Loan-level dependent variables are truncated at the 5th and 95th percentile. Loan-level standard errors are two-way clustered at the bank and firm level; column (1) standard errors are clustered at the bank level.

Table 5: **Firm level results: sales and assets**

	(1)	(2)	(3)	(4)
	$\Delta \log(\text{Sales})$	$\Delta \log(\text{Financial Assets})$	$\Delta \log(\text{Capital})$	$\Delta \log(\text{Current Assets})$
Post= $1 \times D=1$	0.00808*** (0.00201)	0.00286** (0.00112)	0.000575 (0.00294)	-0.00180 (0.00538)
N	126017	126017	126017	126017
No. of clusters	109	109	109	109
Mean of dep. var.	0.0267	0.00544	-0.0204	0.0299
SD of dep. var.	0.130	0.0798	0.179	0.342
Firm FE	Yes	Yes	Yes	Yes
Year-Industry FE	Yes	Yes	Yes	Yes
R-squared	0.355	0.341	0.379	0.272

Notes: This table reports results from estimating equation (5) using selected firm-level outcomes as dependent variables. Coefficients and means are reported in log-difference units; multiply by 100 for percentage points. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Sample period 2009–2012. Post = 1 for 2011 and 2012, and zero otherwise. Dependent variables are truncated at the 5th and 95th percentile. Standard errors are two-way clustered at the bank and firm level.

Table 6: **Firm-level results: capital structure**

	(1) $\Delta \log(\text{bank debt})$	(2) $\Delta \log(\text{total debt})$	(3) $\Delta \log(\text{long-term debt})$	(4) $\Delta \log(\text{short-term debt})$	(5) $\Delta \log(\text{equity})$
Post= $1 \times D=1$	0.0193** (0.00974)	0.00924* (0.00512)	-0.00616 (0.00443)	0.0102* (0.00576)	0.00588 (0.00386)
N	126017	126017	126017	126017	126017
No. of clusters	109	109	109	109	109
Mean of dep. var.	-0.0614	0.0447	-0.0462	0.0417	0.0576
SD of dep. var.	0.466	0.347	0.300	0.375	0.244
Firm FE	Yes	Yes	Yes	Yes	Yes
Year-Industry FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.319	0.273	0.346	0.264	0.378

Notes: This table reports results from estimating equation (5) using different firm-level capital-structure outcomes as dependent variables across columns. Coefficients and means are reported in log-difference units; multiply by 100 for percentage points. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Sample period 2009–2012. Post = 1 for 2011 and 2012, and zero otherwise. Dependent variables are truncated at the 5th and 95th percentile. Standard errors are two-way clustered at the bank and firm level.

Table 7: **Further firm-level results: revenues and costs**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	$\Delta \log(\text{Sales})$	$\Delta \log(\text{Wages})$	$\Delta \log(\text{Costs})$	$\Delta \log(\text{Invent. cost})$	$\Delta \log(\text{Material cost})$	$\Delta \log(\text{Other cost})$	ΔRoA
Post=1×D=1	0.00808*** (0.00201)	0.00456** (0.00184)	0.0293*** (0.00717)	0.00452* (0.00271)	0.0116 (0.00813)	0.0157*** (0.00577)	0.00159* (0.000918)
N	126017	126017	126017	126017	126017	126017	126017
No. of clusters	109	109	109	109	109	109	109
Mean of dep. var.	0.0267	0.0309	0.0445	-0.000862	0.0165	0.0429	-0.00195
SD of dep. var.	0.130	0.113	0.579	0.151	0.514	0.473	0.179
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.355	0.382	0.287	0.257	0.264	0.289	0.209

Notes: This table reports results from estimating equation (5) using a range of firm-level outcomes. Columns (1)–(6) correspond to revenue and cost components, while column (7) reports effects on Return on Assets (RoA). Coefficients and means in columns (1)–(6) are reported in log-difference units; multiply by 100 for percentage points. * p<0.1, ** p<0.05, *** p<0.01. Sample period 2009–2012. Post = 1 for 2011 and 2012, and zero otherwise. Standard errors are two-way clustered at the bank and firm level. Dependent variables are truncated at the 5th and 95th percentile.

Table 8: **Further firm-level results: profitability**

	(1) Δ RoA	(2) Δ RoA (operational)	(3) Δ RoA (financial)
Post=1 $\times$ D=1	0.00159* (0.000918)	0.000386 (0.000951)	0.000635*** (0.000204)
N	126017	126017	126017
No. of clusters	109	109	109
Mean of dependent variable	-0.00195	-0.00124	0.0000685
SD of dependent variable	0.0632	0.0668	0.0127
Firm FE	Yes	Yes	Yes
Year-Industry FE	Yes	Yes	Yes
R-squared	0.209	0.211	0.244

Notes: This table reports results from estimating equation (5) with Return on Assets (RoA) and its components as dependent variables. Column (1) uses total RoA; column (2) uses operational RoA, defined as earnings before interest, taxes, and amortization relative to total assets; column (3) uses financial RoA, defined as net financial income relative to total assets. Coefficients and means are changes in ratios; multiply by 100 for percentage points. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Sample period 2009–2012. Post = 1 for 2011 and 2012, and zero otherwise. Standard errors are two-way clustered at the bank and firm level. Dependent variables are truncated at the 5th and 95th percentile.

Table 9: **Firm-level results: financial decisions**

	(1) $\Delta \log(\text{Financial assets})$	(2) $\Delta \log(\text{Direct investments})$	(3) $\Delta \log(\text{Securities})$	(4) $\Delta \log(\text{Dividends})$
$\text{Post}_t \times D_f$	0.00286** (0.00112)	0.00488 (0.00494)	0.00235** (0.00116)	0.00481** (0.00228)
N	126017	126017	126017	126017
No. of clusters	109	109	109	109
Mean of dep. var.	0.00544	0.00837	-0.00934	0.0312
Firm FE	Yes	Yes	Yes	Yes
Year-Industry FE	Yes	Yes	Yes	Yes
R-squared	0.341	0.285	0.342	0.314

Notes: This table reports results from estimating equation (5) using firm-level financial decisions as dependent variables. Direct investments are defined as the total value of equity holdings in other companies. Coefficients and means are reported in log-difference units; multiply by 100 for percentage points. $\text{Post} = 1$ for 2011 and 2012, and zero otherwise. Standard errors two-way clustered at the bank and firm level. Dependent variables are truncated at the 5th and 95th percentile. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. The effect on RoA is reported in Table 7, column (7).

Table 10: **Firm-level credit reallocation I**

	(1) $\Delta \log(\text{Securities})$	(2) $\Delta \log(\text{Securities})$	(3) $\Delta \log(\text{Securities})$	(4) $\Delta \log(\text{Securities})$	(5) $\Delta \log(\text{Securities})$	(6) $\Delta \log(\text{Securities})$	(7) $\Delta \log(\text{Securities})$	(8) $\Delta \log(\text{Securities})$
$\text{Post}_t \times D_f$	0.00179* (0.00101)	0.00181* (0.00101)	0.00265 (0.00186)	0.00119 (0.00134)	0.00557* (0.00303)	0.00144 (0.00103)	0.00205* (0.00106)	-0.000705 (0.00129)
$\text{Post}_t \times D_f \times \text{Asset (mill NOK)}_{f,2010}$		-0.00489** (0.00244)						
$\text{Post}_t \times D_f \times \text{Equity/Assets}_{f,2010}$			-0.00337 (0.00576)					
$\text{Post}_t \times D_f \times \text{Cash/Assets}_{f,2010}$				0.00283 (0.00437)				
$\text{Post}_t \times D_f \times \text{Top rating}_{f,2010}$					-0.00449 (0.00352)			
$\text{Post}_t \times D_f \times \text{Exporter}_{f,2010}$						0.0115 (0.00728)		
$\text{Post}_t \times D_f \times \text{Profit/Assets}_{f,2010}$							-0.000526 (0.000415)	
$\text{Post}_t \times D_f \times \text{SD(Sales growth)}_{f,2010}$								0.0274*** (0.00991)
N	126017	120804	120797	126017	120804	120804	114321	126017
No. of clusters	109	109	109	109	109	109	109	109
Mean of dependent variable	-0.00934	-0.00961	-0.00961	-0.00934	-0.00961	-0.00961	-0.00989	-0.00934
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year-Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports results from estimating equation (5) on $\Delta \log(\text{Securities})$ with treatment interactions on firm characteristics measured in 2010. Coefficients and means are reported in log-difference units; multiply by 100 for percentage points. $\text{Post} = 1$ for 2011 and 2012, and zero otherwise. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$. Sample period 2009–2012. Dependent variable truncated at the 5th and 95th percentile. Standard errors two-way clustered at the bank and firm level.

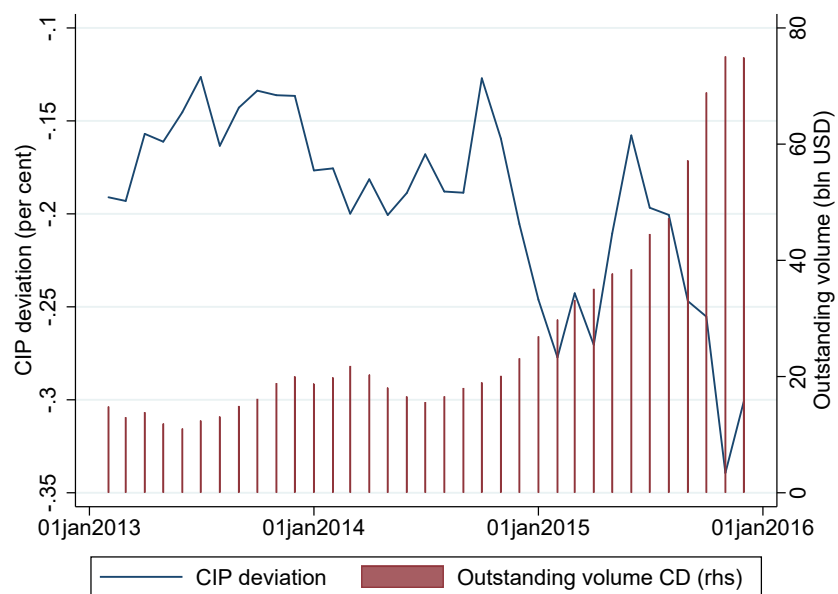
A Appendix A: Additional figures and tables

Table 11: **Variable definitions**

Variable	Definition
<i>Panel A: Bank-level (quarterly supervisory data, Norges Bank)</i>	
CIP funding deviation	Synthetic 3-month NOK rate (USD commercial paper rate for high-quality banks plus the 3-month FX-swap forward premium) minus the 3-month Norwegian Interbank Offered Rate (Nibor), in percentage points.
Short-term foreign fund ratio	Short-term foreign-currency funding over total assets.
Equity / Assets	Book equity over total assets.
Deposits / Assets	Customer deposits over total assets.
Central bank deposits / Assets	Deposits held at Norges Bank over total assets.
Corporate loans / Assets	Loans to non-financial corporations over total assets.
Log(Assets)	Natural logarithm of total assets.
<i>Panel B: Firm-level (annual financial statements)</i>	
Log(Assets)	Natural logarithm of total assets.
Equity / Assets	Book equity over total assets.
Cash / Assets	Cash and cash equivalents over total assets.
Top rating	Indicator equal to one if the firm is in the highest credit-rating category.
Exporter	Indicator equal to one if the firm reports positive export revenue.
Sd(sales growth)	Standard deviation of the firm's annual sales growth, computed over the pre-period.
Bank debt	Outstanding debt owed to banks.
Total debt	Sum of short-term and long-term debt.
Securities	Holdings of bonds and other tradable instruments, classified as financial fixed assets.
Direct investments	Total value of equity holdings in other companies.
RoA	Net income over total assets.
RoA (operational)	Earnings before interest, taxes, and amortization over total assets.
RoA (financial)	Net financial income over total assets.

Notes: Bank-level variables are from quarterly supervisory reports; firm-level variables are from annual financial statements for the population of Norwegian limited-liability companies. Summary-statistics values are measured at end-2010.

Figure 7: **CIP deviations USDCAD and Canadian banks short-term borrowing in USD**



Notes: This graph shows USDCAD CIP deviations along with Canadian banks outstanding volume of Certificates of Deposits (CD). Source: Bloomberg and LSEG.

B Model: Balance-sheet allocation under a short-term credit-supply shock

This section presents a parsimonious framework that rationalizes the four firm-level patterns documented in Section 5: scaled-up operations, accumulated financial assets, higher payouts, and unchanged physical capital. The key ingredients are (i) a short-term credit-supply shock that increases the availability of funds, (ii) a variable input that scales current-period operations and revenue, and (iii) lumpy adjustment in fixed investment, which makes physical capital sluggish when funding advantages are transitory.

B.1 Environment

Time is $t \in \{0, 1\}$. The firm enters $t = 0$ with predetermined capital K_0 and internal cash X_0 . At $t = 0$ it chooses long-term investment $I \geq 0$ (which becomes productive only at $t = 1$), a variable input $M \geq 0$ (labor and materials, used in current-period production), liquid/financial assets $A \geq 0$, and a dividend payout $D \geq 0$. It can draw a bank credit line $L \in [0, \bar{L}]$ at net rate r_L . Capital next period is

$$K_1 = (1 - \delta)K_0 + I. \quad (6)$$

Operating revenues at $t = 1$ are

$$R(K_1, M), \quad (7)$$

with $R_K(\cdot) > 0$, $R_{KK}(\cdot) < 0$, $R_M(\cdot) > 0$, $R_{MM}(\cdot) < 0$. The variable input M is paid out at $t = 0$ and supports period- $t = 1$ output, capturing wages and materials that scale operations within existing productive capacity.

Fixed investment is lumpy, with adjustment cost

$$\Phi(I) = \mathbf{1}\{I > 0\} f + \frac{\kappa}{2} I^2, \quad (8)$$

where $f > 0$ and $\kappa > 0$.

Holding liquid/financial assets delivers a concave payoff $v(A)$, with $v'(A) > 0$ and $v''(A) < 0$, which subsumes both financial returns and the liquidity service (expected savings on costly external finance next period).⁵

Activating a financial position entails a fixed participation cost $\xi > 0$, incurred only when

⁵Microfoundation: suppose A earns gross financial return r_A and, in addition, mitigates a convex expected issuance cost $\phi(\cdot)$ at $t = 1$ due to a future cash flow shock; then $v(A) = r_A A - \phi(A)$ with $\phi'(\cdot) > 0$, $\phi''(\cdot) > 0$, so that $v'(A) = r_A - \phi'(A)$ is positive and decreasing. This allows $A > 0$ even if $r_A < r_L$.

$A > 0$. The cost ξ admits four interpretations: a minimum investment scale for securities holdings, an access cost to private debt markets, the cost of acquiring financial sophistication or advisory capacity, and the cost of establishing leverage access. The four are observationally equivalent at this level of abstraction; each generates the same activation-threshold structure derived below.

Dividends D deliver a payout benefit $g(D)$, with $g'(\cdot) > 0$ and $g''(\cdot) < 0$, capturing tax preference, agency, or signaling motives that make payouts valuable on the margin.

B.2 Financing

The firm faces a budget constraint

$$A + I + M + D \leq X_0 + L \quad (\text{BC})$$

and a credit-line ceiling

$$L \leq \bar{L}. \quad (\text{BB})$$

B.3 Problem

At $t = 0$ the firm chooses (A, M, I, D, L) to maximize expected $t = 1$ payout, where the credit cost is recognized as the net rate r_L multiplied by the drawn amount:⁶

$$\Pi = R((1 - \delta)K_0 + I, M) - \Phi(I) + v(A) - \xi \mathbf{1}\{A > 0\} + g(D) - r_L L \quad (9)$$

subject to (BC)–(BB) and $A, M, I, D, L \geq 0$. Let $\lambda \geq 0$ be the multiplier on (BC) and $\mu \geq 0$ on (BB). The Lagrangian is

$$\mathcal{L} = R(K_1, M) - \Phi(I) + v(A) - \xi \mathbf{1}\{A > 0\} + g(D) - r_L L + \lambda (X_0 + L - A - I - M - D) + \mu (\bar{L} - L). \quad (10)$$

First-order conditions. If the relevant choice is interior, the first-order conditions are:
(*Liquidity, conditional on participation $A > 0$*)

$$v'(A) = \lambda. \quad (11)$$

⁶Writing the credit cost as $r_L L$ treats the principal as rolled over at $t = 1$, so that only the net interest cost enters the date-1 payout. Subtracting the gross repayment $(1 + r_L)L$ and crediting the principal L as date-1 resources yields the same objective up to a constant and identical first-order conditions.

(Variable input)

$$R_M(K_1, M) = \lambda. \quad (12)$$

(Dividends)

$$g'(D) = \lambda. \quad (13)$$

(Credit line)

$$\lambda - \mu = r_L. \quad (14)$$

(Investment)

$$\text{If } I > 0 : \quad R_K(K_1, M) - \Phi'(I) = \lambda; \quad \text{if } I = 0 \text{ and } R_K((1-\delta)K_0, M) - \Phi'_+(0) \leq \lambda, \text{ no investment.} \quad (15)$$

Complementary slackness:

$$\mu(\bar{L} - L) = 0 \quad \text{and} \quad \lambda(X_0 + L - A - I - M - D) = 0. \quad (16)$$

Proposition 1 (Inaction region for fixed investment). *There exist thresholds $\underline{\bar{L}} \leq \bar{\bar{L}}$ such that optimal investment is $I^*(\bar{L}) = 0$ for every $\bar{L} \in [\underline{\bar{L}}, \bar{\bar{L}}]$. Across this inaction region the firm undertakes no investment, so $K_1 = (1 - \delta)K_0$ regardless of the shock. A transitory short-term funding advantage keeps $\bar{L}$ inside the region, so capital does not adjust; only a large and persistent relaxation that pushes $\bar{L}$ above $\bar{\bar{L}}$ triggers a (discrete) investment.*

Proof. Let $V_0(\bar{L})$ be the firm's optimized value at the capital corner $I = 0$, and $V_+(\bar{L})$ its optimized value under the best interior investment $I > 0$, the latter already net of the fixed setup cost f . The firm stays at the corner, $I^* = 0$, iff

$$G(\bar{L}) \equiv V_+(\bar{L}) - V_0(\bar{L}) \leq 0.$$

At an interior optimum the investment first-order condition is $R_K((1 - \delta)K_0 + I, M) - \kappa I = \lambda(\bar{L})$, defining the optimal interior scale $I_+(\bar{L}) > 0$; since cheaper credit lowers λ , $I_+(\bar{L})$ is increasing in $\bar{L}$. Evaluating the activation gain at I_+ ,

$$G(\bar{L}) = \underbrace{\left[R((1 - \delta)K_0 + I_+, M) - R((1 - \delta)K_0, M) \right]}_{\text{revenue gain, bounded by } R_{KK} < 0} - \lambda(\bar{L}) I_+ - \frac{\kappa}{2} I_+^2 - f.$$

G is continuous and increasing in $\bar{L}$: as credit relaxes, λ falls and I_+ rises, so the gain grows. The fixed cost f enters as a constant wedge—even where the marginal product R_K exceeds the shadow value λ , so the firm would invest a little absent frictions, the lump f holds $G < 0$ until the *discrete* gain is large enough to recover it. Consequently $I^* = 0$ is not a knife-edge: it holds across an entire range of credit conditions. For all $\bar{L}$ low enough that the (concavity-bounded) revenue gain cannot cover f we have $G(\bar{L}) < 0$, which delimits the inaction region $[\underline{\bar{L}}, \bar{\bar{L}}]$; throughout it the firm undertakes no investment, so $K_1 = (1 - \delta)K_0$. Because activation requires paying f , I^* leaves zero only by jumping discontinuously to $I_+ > 0$ once $\bar{L}$ clears $\bar{\bar{L}}$ —it never drifts continuously off the corner. A short-lived funding advantage delivers only a brief, bounded relaxation that keeps $\bar{L}$ within $[\underline{\bar{L}}, \bar{\bar{L}}]$, leaving capital unadjusted; a comparable but persistent (long-maturity) shock can raise the cumulative gain enough to cross $\bar{\bar{L}}$. $\square$

Proposition 1 rationalizes why we observe no statistically significant response of physical capital. In the inaction region, a transitory funding advantage does not warrant paying the fixed setup cost f of adjusting the capital stock, so $I^* = 0$ even as credit becomes cheaper. Short-term credit expansions therefore generate real effects through flexible margins — variable inputs and financial assets — rather than through capital formation.

Proposition 2 (Reallocation along flexible margins). *Conditional on $I^* = 0$, a relaxation of the credit limit raises variable inputs, liquid assets, and dividends, and leaves capital flat:*

$$\frac{dM}{d\bar{L}} > 0, \quad \frac{dA}{d\bar{L}} > 0, \quad \frac{dD}{d\bar{L}} > 0, \quad \frac{dI}{d\bar{L}} = 0.$$

Proof. With $I^* = 0$ the budget is $M + A + D = B$, where $B \equiv X_0 + \bar{L}$, so $\frac{dM}{d\bar{L}} + \frac{dA}{d\bar{L}} + \frac{dD}{d\bar{L}} = 1$. For a firm participating in financial markets, differentiate the interior conditions $R_M(K_1, M) = v'(A) = g'(D) = \lambda$ (the non-participation case simply drops the A -block):

$$\frac{dM}{d\bar{L}} = \frac{1}{R_{MM}} \frac{d\lambda}{d\bar{L}}, \quad \frac{dA}{d\bar{L}} = \frac{1}{v''} \frac{d\lambda}{d\bar{L}}, \quad \frac{dD}{d\bar{L}} = \frac{1}{g''} \frac{d\lambda}{d\bar{L}}.$$

Substituting into the differentiated budget,

$$\left(\frac{1}{R_{MM}} + \frac{1}{v''} + \frac{1}{g''} \right) \frac{d\lambda}{d\bar{L}} = 1 \implies \frac{d\lambda}{d\bar{L}} = \left(\frac{1}{R_{MM}} + \frac{1}{v''} + \frac{1}{g''} \right)^{-1} < 0,$$

since $R_{MM}, v'', g'' < 0$. Each derivative is then a ratio of two negatives, hence positive; $dI/d\bar{L} = 0$

by Proposition 1. □

Proposition 2 is the central allocation result. With the borrowing constraint binding and the firm in the inaction region, marginal credit is allocated to liquid financial assets, variable inputs, and dividends rather than to fixed investment — exactly the pattern of firm-level responses documented in Tables 5–9. The variable-input margin M is what generates the empirical sales increase: $R(K_1, M)$ rises with M even when K_1 is fixed.

Proposition 3 (Financial ROA rises; operating ROA need not). *Under the conditions of Proposition 2, there is a threshold $\bar{L}^*$ such that the firm holds no financial assets for $\bar{L} < \bar{L}^*$ and a strictly positive position $A_+(\bar{L}) > 0$ for $\bar{L} \geq \bar{L}^*$, with A^* jumping up at $\bar{L}^*$. Define operating and net financial returns on their own asset bases,*

$$r_{op} \equiv \frac{R(K_1, M)}{M}, \quad r_{fin} \equiv \begin{cases} \frac{v(A) - \xi}{A} & A > 0, \\ 0 & A = 0. \end{cases}$$

Then a credit expansion within the inaction region (i) makes r_{fin} jump discontinuously from 0 to a strictly positive level, and (ii) leaves r_{op} non-increasing. (iii) total ROA can rise, with the entire increase carried by the financial component.

Proof. (i) *Entry and the financial-ROA jump.* Net of the funds cost, the financial block contributes $v(A) - \xi - \lambda A$ if $A > 0$ and 0 otherwise, so the firm holds $A > 0$ iff $\max_A \{v(A) - \lambda A\} \geq \xi$, i.e. at $v'(A^*) = \lambda$,

$$v(A^*) - \lambda A^* \geq \xi. \tag{17}$$

Small or cash-constrained firms have a tight budget and high λ before the shock, so (17) fails and $A^* = 0$, $r_{fin} = 0$. The credit expansion lowers λ (Proposition 2); once λ falls below the threshold λ^* solving (17) with equality, the firm enters and A^* jumps to a positive level.⁷ At entry $v(A^*) \geq \xi + \lambda A^* > \xi$, so

$$\Delta r_{fin} = \frac{v(A^*) - \xi}{A^*} > 0. \tag{18}$$

(ii) *Operating ROA is non-increasing.* With $I^* = 0$, $K_1 = (1 - \delta)K_0$ is fixed, so $r_{op} =$

⁷The jump is bounded away from zero. As $A \rightarrow 0^+$, $v(A) - \lambda A \rightarrow v(0) \leq \xi$, so (17) can hold only at a position $A^* \geq A_{\min} > 0$ that recovers ξ . Hence Δr_{fin} does not shrink with the size of the shock: it is triggered by crossing λ^* , not by how far λ falls.

$R(K_1, M)/M$ moves only through M :

$$\frac{\partial r_{op}}{\partial M} = \frac{1}{M} \left(R_M(K_1, M) - \frac{R(K_1, M)}{M} \right).$$

By strict concavity ($R_{MM} < 0$) with $R(K_1, 0) \geq 0$, $R(K_1, M) \geq R(K_1, 0) + M R_M \geq M R_M$, i.e. the average product weakly exceeds the marginal product, so the bracket is ≤ 0 and $\partial r_{op}/\partial M \leq 0$. Since $dM/d\bar{L} > 0$ (Proposition 2), r_{op} does not rise.

(iii) *Total ROA rises through the financial component.* Assuming away taxes and discontinued items, so that total net income is the sum of operating and financial income, total return decomposes as

$$\text{ROA} = \frac{M}{TA} \cdot \frac{\text{Operating income}}{OA} + \frac{A}{TA} \cdot \frac{\text{Financial income}}{A}, \quad (19)$$

where TA is total assets, $OA = M$ the operating assets, Operating income $= R(K_1, M)$, and Financial income $= v(A) - \xi$; the two return factors are Operating income/ $OA = r_{op}$ and Financial income/ $A = r_{fin}$. Before entry $A = 0$, so the financial term in (19) is absent and $\text{ROA} = (M/TA) r_{op}$. Entry switches the financial term on at a strictly positive level while r_{op} does not rise, so total ROA is pulled up entirely through the financial component. $\square$

Proposition 3 clarifies why operating profitability need not rise even when firms expand activity. The firm scales the variable input M to the point where its marginal product equals the shadow cost of funds λ ; this leaves operating margins compressed rather than expanded, consistent with the cost growth in excess of sales growth documented in Table 7. Financial ROA rises mechanically as the firm accumulates liquid assets, accounting for the entire response of overall RoA, matching the evidence: financial RoA rises significantly while operating RoA is statistically flat.

Intuitively, the key economic insight is the distinction between an *extensive* margin and an *intensive* margin. The firms that cross $\bar{L}^*$ are the small ones, previously priced out of financial markets by the entry cost ξ . Because the financial-ROA jump is an *extensive*-margin object, its size does not depend smoothly on the size of the credit shock; it depends on whether the threshold is crossed. So even a modest funding wedge produces a discrete securities response. The variable input M , by contrast, responds on the intensive margin: the firm expands operations smoothly as more credit becomes available, and M moves continuously along its first-order condition. The change in operating ROA is at best zero, when M does not move, and otherwise a small, smooth response proportional to how much M adjusts.