FINANCE RESEARCH SEMINAR
SUPPORTED BY UNIGESTION

"All You Need is Cash:

Corporate Cash Holdings and Investment after the Financial Crisis"

Neeltje VAN HOREN
Bank of England

Friday, May 3, 2019, 10:30-12:00
Room 126, Extranef building at the University of Lausanne

UNIGESTION

All You Need is Cash: Corporate Cash Holdings and Investment after the Financial Crisis

by

Andreas Joseph, Christiane Kneer, Neeltje van Horen and Jumana Saleheen[*]

April, 2019

Abstract

This paper shows that UK firms with high pre-crisis cash holdings relative to their industry rivals invest significantly more than their cash-poor counterparts after the global financial crisis. The differential effect already appears during the crisis but is amplified in the recovery phase, resulting in a persistent and growing investment gap. This amplification effect is absent in the pre-crisis period. Over the same period, cash-rich firms persistently capture market share from their cash poor rivals, especially in industries where rivals are financially constrained, less affected by the crisis, and more competitive. This suggests that the ability to continue to invest during the crisis gives cash-rich firms a competitive edge that lasts far beyond the crisis years. Consistent with a causal effect of a shock to firms borrowing capacity, the positive impact of having cash is greatest for young and small firms. Our results show that liquid assets are a much more important determinant of firms' long-term growth after a financial crisis than previously thought.

JEL Classification Codes: E22, E32, E44, G32

Keywords: Firm investment, cash holdings, credit constraints, financial crisis

1. Introduction

The Great Moderation was accompanied by a sense of stability which seemed to make it unnecessary for firms to set money aside for a rainy day. Companies with cash in their coffers were viewed with suspicion and corporate activists urged firms to pay dividends or buy back shares.[1] Beliefs about corporate cash holdings shifted with the onset of the financial crisis with some highlighting advantages of maintaining a liquid balance sheet as a way to mitigate the tightening of financial constraints or even benefit from the situation.[2] But, as this paper shows, the advantages of holding cash at this crucial moment were larger and more long-lived than firms and economists might have expected.

Using UK firm-level data covering both SMEs and large firms, we start by documenting three stylized facts. First, firms' cash holdings just before the onset of the financial crisis in 2006 show large dispersion within narrowly defined industries (Figure 1). As such, when credit conditions unexpectedly tightened some firms could draw on liquid assets, while other firms in the same industry could not. Second, the difference in fixed asset growth between firms with high and low cash holdings relative to their industry rivals is much larger in the first two years of the global financial crisis (2007-2009) compared to the tranquil period preceding it (2001-2003) (Figure 2). Third, the divergence in fixed asset growth between cash-rich and cash-poor firms is amplified during the recovery period following the crisis as cash-poor firms continued to divest and cash-rich firms continued to invest. This pattern is completely absent in the tranquil period where fixed asset growth of both types of firms is positive in the long run (Figure 3). In this paper, we investigate these stylized facts and show how investment dynamics vary with initial cash holdings and provide a possible explanation for the amplification of the cash effect after the global financial crisis.

During financial crises credit conditions tighten, external finance becomes more costly and cash flows decrease. Cash holdings can mitigate the impact of the crisis in several ways. Cash provides a firm with an internal source of funds when external finance becomes more costly and cash flows are low. The firm can use its cash to cover its expenditures and pay off debt, thus avoiding inefficient liquidation of its assets to meet its obligations and prevent bankruptcy.

---

[1] "The Corporate Savings Glut," *The Economist*, July 7, 2005; "Behind Those Stockpiles of Corporate Cash," *Wall Street Journal*, October 22, 2006; or "Companies Are Piling Up Cash," *The New York Times*, March 4, 2008.
[2] "All You Need Is Cash," *The Economist*, November 20, 2008; "Desperately Seeking a Cash Cure", *The Economist*, November 20, 2008.

Furthermore, when asset prices decline cash preserves its value and can serve as high-quality collateral that a firm can pledge.

Firms with ample cash at hand can thus more easily continue to operate and even seize profitable investment opportunities despite the tightening of financial conditions. Their cash starved rivals by contrast have to forgo profitable investment opportunities, may be forced to liquidate fixed assets and may even struggle to survive the crisis.[3] As a result an investment gap between cash-poor and cash-rich firms opens up. At the same time, cash-rich firms may be able to acquire assets at discounted prices from their struggling competitors and capture the market share of failing and shrinking firms (Froot, Scharfstein and Stein, 1993). They may also exploit the weak financial position of their rivals by investing strategically in R&D, the location of stores and plants, distribution networks or advertising (Campello, 2006).

During the recovery phase when demand returns and credit conditions improve, cash-rich firms will have more capacity to meet this demand and can subsequently reinvest their earnings, increasing their capacity further. This allows them to capture even more market share, generate additional revenue and subsequently invest more. Cash-poor rivals, due to their loss in production capacity and their reduced market share will have difficulty catching up with their cash-rich rivals and see their positions weaken further. This mechanism becomes even stronger when banks that were burned by the financial crisis only resume lending to low risk firms. As a result, the investment gap between cash-rich and cash-poor firms that opens during the crisis amplifies during the recovery phase due to self-reinforcing mechanisms.

The mechanism described above implies that a firm's pre-crisis cash position relative to its industry rivals is a strong predictor of long-term investment and market share growth after a financial crisis. To test this premise, we apply local projections in the spirit of Jorda (2005). We start by estimating differences in firms' investment dynamics in response to the financial crisis over the period 2007-2014.[4] For each horizon j (where j ranges from 1 to 7) we trace out the impact of the crisis for firms with different pre-crisis levels of relative-to-rivals cash holdings. We test whether initial cash holdings boost investment as theory predicts and assess whether the effect

---

[3] Campello, Graham and Harvey (2010) survey over 1,000 Chief Financial Officers (CFOs) in the US and find that when firms are unable to borrow they tend to rely on internally generate cash flows and cash reserves to finance attractive investments. Furthermore, the majority of financially constrained firms surveyed said that they sold assets in order to obtain cash to fund operations in 2008.

[4] See Favara and Imbs (2015), Jorda, Schularick, and Taylor (2013), Mian, Sufi, and Verner (2017) and Wix (2017) for recent applications of local projection techniques in finance.

is amplified over longer time horizons when self-reinforcing dynamics set in. To control for aggregate demand shocks and investment opportunities we use four-digit industry fixed effects. The fixed effects will absorb for each investment horizon the impact of any industry conditions, including industry-specific uncertainty, credit demand and other factors affecting all firms in an industry in the same way.

We use a comprehensive firm-level dataset capturing private and publicly listed UK firms from Moody's (previously Bureau van Dijk) FAME database. The database has detailed firm level balance sheet information. It is manually constructed using different vintages of the data and covers the period 1999 to 2014. This dataset is ideally suited for our purpose for several reasons. First, it covers small and young firms and is not confined to large, publicly listed companies which are usually the focus of studies on corporate investment. This is important for any analysis on the effects of financial crises as small and young firms typically require more lender screening and monitoring and are therefore more likely to be affected by a tightening of financial constraints (Almeida, Campello and Weisbach, 2004; Iyer, Peydro, da-Rocha-Lopes and Schoar, 2014). Second, it covers both the period leading up to the crisis, the crisis itself and the recovery period. This allows us to compare cash-investment sensitivities during the financial crisis and its aftermath with the sensitivities during a tranquil period and test to what extent a tightening of credit conditions alters this sensitivity.

We find that firms with ex ante high levels of cash relative to their industry rivals invest more during the financial crisis. This confirms the findings of Duchin, Ozbas and Sensoy (2010) who document a positive relationship between cash and investment for publicly listed firms in the US.[5] Importantly, as predicted by the mechanism described above, the positive effect of relative-to-rivals cash not only persists but is amplified during the recovery phase. Across all industries, a firm in the 90th percentile of the relative cash distribution grows its stock of fixed assets between 2007 and 2009 by 7.0 percentage points more than a firm in the 10th percentile. Extending the horizon to 2014, this difference increases to 15.8 percentage points. Thus, the initial investment gap between cash-rich and cash-poor firms that opens during the crisis grows significantly during the recovery phase.

---

[5] Different from us, their paper differentiates between firms according to their absolute levels of cash, not their cash holdings relative to their rivals as we do.

We estimate a similar model for the pre-crisis, tranquil period. If it were generally the case that cash-rich firms invest more in the long term than their cash-poor rivals, we should find a similar trajectory of the cash-investment sensitivity parameter during this period. Instead, we find that the amplification effect we document is unique to the post-crisis recovery period and is not present in the tranquil period that preceded the global financial crisis. This strengthens our confidence that the effect we document is driven by a tightening of credit conditions.

A key identifying assumption underlying our approach is that the firm's cash position is not positively correlated with future investment opportunities (i.e. unobserved firm-specific demand shocks) following the crisis. We measure the firm's relative cash position in 2006, i.e. almost 2 years prior to the onset of the financial crisis, to ensure that our results are not driven by reverse causality. As the global financial crisis was unexpected, it is unlikely that firms were hoarding cash in 2006 in anticipation of a credit supply shock that would affect their future ability to invest.

A lingering concern could be that cash-rich firms exhibit certain (unobservable) characteristics that can explain why they would perform better in the aftermath of a crisis even without high levels of cash reserves. To assuage concerns that this is driving our results, we control for several measures of pre-crisis firm performance. In addition, we conduct a cross-sectional analysis based on firm-level measures of financial constraints, commonly used in the literature. We find that the impact of relative cash is particularly strong for young firms and, to a lesser extent, for small firms which are more likely to become financially constrained during a crisis.[6] These results suggest that the effect of pre-crisis cash holdings on investment results from a tightening of credit constraints.

Next, we test whether changes in competition could explain the amplification effect we document. We apply the local projections methodology as before but replace fixed asset growth with market share growth as the dependent variable. In line with a competition channel, we find that firms with high initial levels of cash capture market share from their cash-poor industry rivals during the crisis and that this effect is amplified during the recovery phase. During the tranquil period we find, in line with Fresard's (2010) evidence for publicly listed firms in the US, that

---

[6] This finding is in line with Cloyne, Ferreira, Froemel and Surico (2016) who show that especially young (and not small) firms in the UK tend to adjust their capital expenditure in reaction to monetary policy shocks. Furthermore, age, and not size, has been shown to be a critical determinant for employment dynamics over the business cycle (Haltiwanger, Jarmin and Miranda, 2013).

cash-rich firms tend to increase their market share in the short-run. However, this effect is smaller than during the crisis period. Furthermore, as in the investment regressions, we do not observe an amplification of the cash-effect over time.

The positive impact of cash holdings on market share growth during the crisis and the recovery period is greatest for small and young firms. When exploiting variation in industry characteristics we find that the cash-performance sensitivity is stronger in industries where firms on average tend to be smaller, younger and have higher shares of intangible fixed assets. This suggests that the benefits of having cash are especially large in industries where rivals become more financially constrained during downturns. In addition, we find the effect to be strongest in industries that were more competitive and in industries that were less affected by the crisis. This shows that for the cash-effect to materialize there need to be investment opportunities during the crisis and space for firms to advance their position.

Our findings support the idea that the financial crisis increased financial frictions which provided cash-rich firms with a strategic advantage over their cash-poor (and hence more financially constrained) rivals. The ability to continue to invest during a crisis gives cash-rich firms a competitive edge that not only benefits them during a crisis but that lasts far beyond the crisis years. Our findings therefore show that having a liquid balance sheet when the credit cycle turns is a much more important determinant of firms' long-term growth after a financial crisis than previously thought.

The remainder of the paper is structured as follows. The next section discusses how this paper contributes to the literature. Section 3 discusses the empirical strategy and the data. Section 4 reports the results on the long-run effects of relative-to-rivals cash on firm investment and section 5 reports its impact on market share growth. Section 6 concludes.

2.   Literature

According to the Modigliani-Miller theorem (Modigliani and Miller, 1958) a firm's capital structure is irrelevant for its investment decisions. Assuming perfect capital markets and complete information, different forms of funding are perfectly substitutable. The cost of capital is therefore the same for internal and external finance. However, asymmetric information between borrower and lenders (Stiglitz and Weiss, 1981; Meyers and Majluf, 1984) can drive a wedge between the

cost of internal and external finance. This leads to financial constraints which can negatively affect firms' investment decisions (Fazzari, Hubbard and Petersen, 1988).

During the global financial crisis the cost of external finance increased sharply. As banks reduced the supply of credit, borrowing from banks became more expensive and less accessible for firms (Ivashina and Scharfstein, 2010; Santos, 2011). While larger firms were able to switch to other sources of external funding like corporate bonds, small firms were not able to compensate for the credit crunch (Iyer, Peydro, da-Rocha-Lopes and Schoar, 2014). This had important real effects. Firms linked to banks that were more affected by the financial crisis reacted to the tightening of credit conditions by cutting down on investment, employment and output (e.g. Chodorow-Reich, 2014; Ongena, Peydro and Van Horen, 2015; Cingano, Manaresi and Sette, 2016)

Conditioning on a tightening of credit conditions, a number of studies explore how firms' balance sheet characteristics affected the impact of the crisis focusing primarily on the liability side of the firm's balance sheet. Almeida, Campello, Laranjeira and Weisbrenner (2012) show that firms which had to roll over debt when credit conditions tightened, reduced investment in the short run. Wix (2017) finds that firms constrained by maturing debt did not make up for this temporary investment gap after the crisis and this negatively affected their long-term growth. He conjectures that the absence of a catch-up effect during the recovery phase was the result of wage rigidities. Credit-constrained firms were forced to adjust their wage bill by laying off their workforce during the crisis, which during the recovery made it more costly to scale up. Giroud and Mueller (2017) show that US firms with higher leverage at the onset of the crisis reduced employment (and investment) more in response to a drop in consumer demand. Duval, Hong and Timmer (2017) present cross-country evidence suggesting that firms entering the crisis with a high share of maturing debt and higher leverage cut back more on intangible investment which weakened productivity growth after the crisis. Focusing on debt overhang, Kalemli-Ozcan, Laeven and Moreno (2018) find that leverage and high shares of short-term debt before the crisis were associated with lower investment rates of European firms after the crisis.

However, very little is known about the role of corporate cash holdings. This is surprising as cash holdings can be particularly valuable when the cost of external finance rises and when cash flows are low. Already Keynes (1936) highlighted the advantage of a liquid balance sheet for undertaking valuable investment projects when they arise, particularly in the presence of financial

7

constraints. In line with this, several papers provide evidence that financially constrained firms hold more cash for precautionary motives (e.g. Opler, Pinkowitz, Stulz and Williamson, 1999; Faulkender and Wang, 2006; Acharya, Almeida and Campello, 2007), especially after negative macroeconomic shocks (Almeida, Campello and Weisbach, 2004). And that cash reserves allow financially constrained firms to invest more especially when their hedging needs are high (Denis and Sibilkov, 2010).[7]

Only very few papers provide insights in the role of cash holdings during a financial crisis. In a paper most closely related to ours, Duchin, Ozbas and Sensoy (2010) show that publicly listed firms in the US with high cash holdings before the onset of the crisis reduced investment significantly less during the first year of the crisis but this difference disappears in the second year. Song and Lee (2012), studying publicly listed firms in Asia after the Asian financial crisis, find that the crisis permanently increased their demand for cash reserves and that firms reduced investment in order to build up their reserves. Arslan, Florackis and Ozkan (2006) focus on the Turkish financial crisis in 2001-2002 and confirm that the hedging role of cash is more critical during a financial crisis. Chang, Benson and Faff (2017) find that equity markets placed a higher value on cash holdings during the global financial crisis than before the crisis.

Our paper adds to this literature in several ways. First, it shows that the cash-investment sensitivity is not only positive for publicly listed firms, but is even larger for small and young firms. Second, it shows that this effect is not short-lived but that the investment gap between cash-rich and cash-poor firms widens during the recovery period. Third, it provides evidence that one of the underlying drivers behind this effect is the ability of cash-rich firms to outcompete their cash-poor rivals and capture their market share. This suggests that the ability to continue to invest during the crisis gives cash-rich firms a competitive edge that lasts well beyond the crisis itself.

The role of liquid assets affecting the behaviour of economic agents has recently also received more attention in other contexts. Jeenas (2018) shows that in response to contractionary monetary policy shocks firms with fewer liquid assets reduce investment more. Kaplan, Moll and

---

[7] The findings in these papers are consistent with the idea that higher cash holdings are a value-increasing response to costly external finance. An alternative view presented in the literature is that financially constrained firms hold high cash reserves due to value-reducing agency problems and empire-building behavior of managers (Jensen and Meckling, 1976; Jensen, 1986). The evidence on this is mixed. While studies by Harford (1999), Pinkowitz, Stulz, and Williamson (2006), Dittmar and Mahrt-Smith (2007), and Harford, Mansi, and Maxwell (2008) report evidence consistent with the agency cost view, Mikkelson and Partch (2003), for example, find no evidence that firms with high cash holdings perform any worse than firms with low cash holdings.

Violante (2018) show that heterogeneity in liquid wealth across households has an important impact on the transmission of monetary policy shocks. And Cloyne and Surico (2016) show that mortgaged households with a high share of illiquid wealth (their house) react more strongly to a fiscal policy stimulus, suggesting that liquidity constraints are an important determinant of the transmission of fiscal policy. Similar in spirit to these studies our paper shows that the shock-sensitivity of firms is governed by the liquidity of their balance sheet.

3.   Empirical methodology and data

Our paper aims to test whether a firm's pre-crisis cash position relative to its industry rivals is a strong predictor of long-term investment growth after a financial crisis and to examine whether changes in competition dynamics are a potential underlying driver. In this section we explain the empirical methodology that underlines our investment regressions and discuss the data and variables used for this analysis. We explain the methodology and variables used to assess the competition mechanism in Section 5.

3.1   Empirical methodology

We employ a local projections regression framework (Jorda, 2005). Local projections allow us to estimate how firms' investment over horizon $j > 0$ responds to the financial crisis conditional on firm i's cash position relative to its rivals just before the crisis. We study pre-crisis cash levels since we are interested in how balance sheet conditions going into the crisis affect the firm during and after the crisis. Furthermore, as the global financial crisis was unexpected, it is unlikely that firms were prior to the crisis hoarding cash in anticipation of a credit supply shock that would affect their ability to invest once the crisis hit. As such this variable is more exogenous.

We regress fixed asset growth between 2007 and horizon j ($\Delta lnFA_{i,07+j}$) on the firm's initial cash position and a number of control variables, where $\Delta lnFA_{i,07+j}$ is defined as the log difference of fixed assets between 2007 and year 2007+ j. Our model is as follows:

$$\Delta lnFA_{i,07+j} = \beta_j Relative\ Cash_{i,06} + \gamma_j X_i + \sum_{k=0}^{1} \theta_{kj}\Delta lnFA_{i,07-k} + \rho_{sj} + \vartheta_{rj} + \varepsilon_{ij} \ (1)$$

where subscript *i* indexes the firm and *j* the horizon over which fixed asset growth is measured. We set *j* to range from one to seven to study firms' fixed asset growth up to 2014. *Relative Cash* is defined as the cash holdings of the firm relative to the cash holdings of its rivals and is measured in 2006. γ_j is a coefficient vector, and X_i is a matrix of firm-level control variables that might affect a firm's investment decisions and may directly correlate with the firm's cash position. In particular, we include two age dummies, *Mature* and *Old*, the dummy variable *Group* which indicates whether a firm is part of a corporate group or not, and the dummy variable *Public* which indicates whether the firm is publicly listed or not. We also include two continuous variables: *Size* defined as the log of total assets and *Leverage* defined as total liabilities over total assets. All these control variables are measured in 2006. To control for the fact that investment decisions can be lumpy the model also includes pre-crisis annual fixed asset growth (one and two periods lagged). In an extension of the model we also include the first and second lag of pre-crisis annual turnover and profit growth. ρ_{sj} is a vector of four-digit industry fixed effects; ϑ_{rj} is a vector of regional fixed effects; and ε_{ij} is the error term. The exact definitions of all variables are provided in the next section.

Regressions are estimated for each horizon separately using OLS and standard errors are clustered at the four-digit industry level. As we estimate a separate regression for each horizon, the industry and region fixed effects are akin to including industry-year and region-year fixed effects in a panel regression. These fixed effects thus absorb all demand and productivity shocks at the industry and regional level that can affect a firm's investment decisions throughout the crisis and its aftermath.

The key coefficients of interest in regression (1) are the different estimates for β_j, which measure the sensitivity of firms' investment decisions at horizon *j* to their cash holdings prior to the onset of the crisis. Because of the dynamic nature of the coefficients, we will present the estimation results as graphs, plotting the estimates of β_j over horizons *j* = 1,…7. A positive estimate for β_j implies that the fixed assets of firms with larger initial cash holdings relative to their rivals grow faster over horizon *j*.

3.2   *Firm balance sheet data*

Our primary data source is the FAME database provided by Moody's (previously by Bureau van Dijk). The FAME database is a subset of the more commonly used Amadeus (European firms) and

Orbis (global firms) datasets also provided by Moody's. It includes balance sheet information, cash flow statements and profit and loss accounts of UK companies. The data are collated from the publicly available filings of each firm at Companies House, the official UK firm registrar, and therefore captures most of the UK's corporate universe.[8] The dataset is different from datasets that are commonly used in the literature studying the real effects of financial crises and corporate investment decisions such as Compustat or Worldscope, as these only contain information on (large) publicly listed companies. However, the vast majority of companies in FAME are small and medium sized firms (SMEs), which are privately owned. The FAME dataset therefore allows us to specifically study the post-crisis investment behavior of both SMEs and young firms, i.e. the types of firms which were most affected by a tightening of financial conditions during the crisis.

As we will explain below, a critical part of our identification relies on comparing firms' cash-investment sensitivities during the crisis and its aftermath with firms' sensitivities during a tranquil period. This allows us to demonstrate that we do not pick up some common relationship between cash holdings and long-term investment, but instead capture a post-crisis feature that is related to a tightening of credit constraints. To perform this comparison, we require a dataset that covers not only the global financial crisis and its recovery, but also the pre-crisis tranquil period. The key complicating factor is that FAME is a live database and historical information of inactive or dissolved companies is only retained up to five years after firm exit. As a result, we would introduce survival bias in the earlier years of our analysis if we relied exclusively on a recent FAME download of the firm data.

To obtain representative firm accounts for the pre-crisis period, we therefore manually construct our dataset by using archived vintages of the database and by overlaying the historical data with more recent versions.[9] Each vintage contains ten years of financial accounts for all active companies and five years for the inactive or dissolved companies.[10] For each vintage, a unique account is identified via the combination of the account filing date and the firm's Companies House registration number. Vintages are then overlaid by using from the different

---

[8] Companies House collects and publishes data on registered companies subject to the Companies Act 2006, including limited liability firms, partnerships but excluding sole traders.
[9] As discussed in great detail by Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych and Yesiltas (2015) and implemented for the UK by Bahaj, Foulis and Pinter (2017), the use of historical information and careful treatment of the data is crucial to construct an accurate firm level panel using data provided by Moody's.
[10] We have access to the following vintages: March 2007, April 2012 and May 2017.

vintages the latest non-missing observation for each field by firm identifier. This exercise significantly reduces survival bias and substantially improves data coverage.

All firms are by law required to report to Companies House, but reporting requirements vary by firm size. Broadly this means that basic information is available for all firms, but that more specific variables (such as Ebitda, turnover, employment, etc.) are only reported by a (small) subset of large firms.[11] Furthermore, UK firms are not required to submit their accounts during a specific month of the year. Firms' annual accounts therefore cover different 12-month periods depending on the reporting month. To determine which calendar year the firm's accounts correspond to, we assign accounts reported in the first half of a year to the previous calendar year and reports submitted in the second half of a year to the current calendar year.[12]

Firms are classified by four digit codes of the 2007 UK Standard Industry Classification. We follow the literature and exclude firms that operate in certain industries.[13] We only use the unconsolidated statement of firms to avoid double-counting and to ensure that we focus as much as possible on the domestic component of the activity of firms that operate internationally. This implies that we include firms that are single entities and firms that are part of a group (10 percent of the firms in our sample). Firms that are part of a group can potentially also access capital from their parent which could reduce the importance of cash holdings as a determinant of a firm's investment decisions. We control for this in our analysis.

3.3   Regression variables

Our dependent variable is the growth in fixed assets. Investment in fixed assets can be measured on a gross or net basis i.e. with or without depreciation. If investment expenditures equal the depreciation of capital equipment, then gross investment is positive, but net investment is zero. We focus on net investment as measured by the log difference in fixed assets since net investment matters most for the future productivity of the firm.

---

[11] See Bahaj, Foulis and Pinter (2017) for a detailed description of firm reporting requirements in the UK.

[12] The vast majority of accounts cover a 12-month period. However, we also observe some irregular or multiple filings in a single year by firms. In these cases, we assign as the year of filing the year into which most of the accounting period of fell. In case of multiple filings, reported values are averaged relative to a 12-month period. E.g. two turnover values covering nine months belonging to the same year are scaled to match a 12-month period and then averaged.

[13] Specifically, we excluded firms operating in, finance and insurance, public administration, education, human health and social work, activities of households as employers and activities of extraterritorial organizations and bodies.

Our key variable of interest is the level of corporate cash holdings prior to the global financial crisis, as measured by bank deposits over total assets. We are primarily interested in the level of cash that a firm holds relative to its rivals in the same industry. This is because the competitive advantage that a firm potentially gains by holding cash buffers will depend on the cash holdings of its competitors. Furthermore, as is well established in the literature, the importance of cash holdings for mitigating financial constraints depends critically on industry characteristics. Cash holdings are for example more valuable in industries with high hedging needs (e.g. Alemeida, Campello and Weisbach, 2004), with volatile cash flows (Kim, Mauer and Sherman, 1998, Opler, Pinkowitz, Stulz and Williamson, 1999, Han and Qiu, 2007) and where the correlation between cash flows and investment opportunities is low (Acharya, Almeida and Campello, 2007).

To construct a measure of relative-to-rivals cash holdings, we follow MacKay and Philips (2005) and Fresard (2010) and standardize the ratio of cash to total assets within each industry at the four-digit level. Specifically, we compute *Relative Cash* by subtracting from the firm's cash holdings its industry mean and divide the difference by the industry standard deviation in 2006. Measuring cash this way accounts for the fact that a 5 percent cash deviation in an industry with a standard deviation of 3 percent provides more value than it does in an industry with a standard deviation of 10 percent.

We include a number of firm-specific variables to control for the main determinants of investment. Small firms and young firms tend to rely more on internal funds to finance their investment so it is important to control for firm size and age to assess the independent effect of relative-to-rivals cash holdings. We define the variable *Size* as the log of total assets in 2006. We measure the age of each firm as the number of years between the firm's incorporation date and 2006. Based on this variable we create two dummy variables to differentiate between firms at different stages of their life cycle: *Mature* which is one if the firm's age in 2006 is between 10 and 19 years and *Old* which is one if the firm is 20 years or older (young firms are therefore in the omitted category).

A number of studies show that the level of (pre-crisis) debt negatively impacted investment during the crisis period (see, among others, Duval, Hong and Timmer, 2017, Kalemli-Ozcan, Laeven and Moreno, 2018). As leverage might also be correlated with cash holdings, we control for *Leverage* defined as the firm's total liabilities over total assets in 2006.

Some of the firms in our sample are part of a business group and have access to liquidity through their corporate group. Access to an internal capital market can mitigate financial constraints of affiliated firms (see Boutin, Cestone, Fumagalli, Pica and Serrano-Velarde, 2013). We therefore include a dummy variable *Group* which is one if the firm has a parent and reports an ultimate owner in FAME. Firms that do not report an ultimate owner or whose ultimate owning company name is the same as the firm name are considered as stand-alone entities.[14] Finally, we control for whether the firm is listed or not by including the variable *Public* to account for the fact that publicly listed firms have additional sources of external finance available.

Investment tends to be lumpy and is often partially financed with internal funds. Firms with low cash holdings in 2006 might have invested immediately beforehand and therefore have lower investment needs in the years to come. To control for this we include a variable that captures investment of the firm in the pre-crisis period, *Pre-crisis Investment*, which equals the log difference of fixed assets between 2005 and 2006 and between 2006 and 2007.

For the subset of firms for which we have more detailed balance sheet information we create two additional variables that control for the pre-crisis performance of the firm which might be correlated with both high cash holdings and future investment opportunities. We control for *Pre-crisis Turnover* which is defined as the log difference in turnover measured over the same period as *Pre-crisis Investment* and for *Pre-crisis Profit* which captures the profit growth of the firm in the two years leading up to the crisis. To limit the effect of outliers, we drop observations below the first and above the 99th percentile for the continuous firm variables.

In our analysis we focus on those firms with complete data on investment, relative-to-rivals cash and the control variables for each year in the sample. This to ensure that we are following the same set of firms over time and that the parameters are not affected by entry or exit. This implies that we study a sample of 236,700 firms for our main analysis and 28,383 firms when we also include the pre-crisis turnover and profit measures as controls. Table 1 shows descriptive statistics for the sample.

3.4   Characteristics of cash-rich and cash-poor firms

---

[14] We like to thank Bahaj, Foulis and Pinter (2017) for sharing this information with us.

As is apparent from Figure 1, there exists wide variation in average cash holdings at the industry level, ranging from close to zero to almost 50 percent of fixed assets. This reflects the fact that firms in some industries tend to hold higher levels of cash, for example due to higher hedging needs and more volatile cash flows. At the same time there exists substantial variation across firms within industries as the average standard deviation is 21 percent. This is the variation we will exploit throughout the paper.

To shed light on the type of firm with high or low cash holdings relative to its rivals, we compare the characteristics of firms with high levels of cash and firms with low levels of cash relative to their industry rivals as measured in 2006 (Table 2). High-cash firms are defined as those in the upper quartile of the relative-to-rivals cash distribution and low-cash firms are those in the lower quartile. Firms with high cash relative to their rivals hold on average 56 percent of their assets in liquid form, while low-cash firms only hold 3 percent on average. Comparing other pre-crisis characteristics of the two types of firms, we find that high-cash firms tend to be small, somewhat younger, have less fixed assets and are less leveraged and invested more.

4. Long run effects of relative-to-rivals cash on investment

In this section we examine, using local projections, to what extent a firm's pre-crisis cash position relative to its industry rivals is a strong predictor of long-term investment after a financial crisis.

4.1 Results: Post-crisis investment and relative-to-rivals cash

Figure 4 graphically presents the results of the local projection regressions. The solid lines depict the β_j estimates for each horizon. The two dotted lines represent the 90 percent confidence intervals. The panel on the left shows the estimates for the full sample of firms. The parameter is positive and significant during the crisis (first two parameter estimates), indicating that firms with high cash holdings going into the crisis tend to experience higher growth in their fixed assets relative to their cash-poor rivals. This is consistent with the occurrence of a credit supply shock mitigated by the availability of liquid assets. It confirms the findings of Duchin, Ozbas and Sensoy (2010) and shows that, as expected, cash holdings did not only benefit large, publicly listed US corporates but also SMEs active in the UK.

Interestingly, the parameter continues to be positive beyond the initial crisis years and even increases over the recovery period. In other words, the positive impact of high relative-to-rivals

cash is not only persistent but is amplified over time. Thus firms with relatively high levels of cash prior to the crisis continued to invest more compared to their low cash rivals even when the crisis subsided, credit became more readily available and demand returned. Quantitatively the estimates imply that, across all industries, the stock of fixed assets of a firm in the 90th percentile of the relative cash distribution grows by 7 percentage points more by 2009 than that of a firm in the 10th percentile. Extending the period to 2014, this number increases to 15.8 percentage points.

While our model controls for investment opportunities at the industry level (by including four-digit industry fixed effects) our baseline model does not control for investment opportunities at the firm level. This might bias our results if cash holdings are positively correlated with the firm's investment opportunities in the years ahead. Firms might decide to hold more cash precisely because they expect their investment opportunities to be greater in the long run. This is usually addressed by including Tobin's q as a control variable. Unfortunately, this variable is only available for publicly listed. Instead, we extend the model by including two variables that capture the pre-crisis performance of the firm: turnover growth and profits in the two years prior to the crisis. A firm that performs well and makes profits has higher levels of retained earnings that it can hold as cash. At the same time, these firms might want to invest more in the future. If this is the case, then the positive relationship between liquid assets and long-term investment might not be driven by a tightening of credit conditions but by high performing firms saving more to finance their future investment.

As only larger firms report these balance sheet items in the UK, we can only estimate this model for a much smaller sample of large firms. The results (Figure 4, right hand panel) show that when we control for pre-crisis performance of the firm the parameters show a very similar pattern. Not surprisingly, as large and older firms are likely less financially constrained during the crisis, the parameters are slightly smaller than for the full sample, but we still observe a strong amplification effect over the sample period.

4.3   Results: Relative-to-rivals cash and investment during a tranquil period

We next examine to what extent the amplification effect we document is a distinct feature of a financial crisis. To this end we estimate a similar model for the pre-crisis, tranquil period. If it were generally the case that cash-rich firms invest more in the long-term relative to their cash-poor

rivals, we should find a similar trajectory of the cash-investment sensitivity parameter during this period.

We measure a firm's cash position in 2000 and trace out the cash-investment sensitivity parameter for the period 2001-2007.[15] The control variables are the same as in the baseline crisis model and are measured in 2000, except for *Pre-crisis Investment* which is defined as annual fixed asset growth between 1999 and 2000 and between 2000 and 2001. As before, we focus on the set of firms with complete data on investment, relative-to-rivals cash and the control variables for each year in the sample period and end up with a sample of 159,326 firms.

The results depicted in Figure 5 are striking. Similar to the estimates for the 2007-2014 period, we observe that the estimate for β_j is positive and significant for all 6 years indicating that firms with relative high levels of cash tend to invest more, also during the tranquil period. However, for each horizon the parameter is statistically significant lower in the tranquil compared to the crisis period. Furthermore, while during the tranquil period the parameter increases in the first two years, it stays the same for the rest of the sample period. In other words, the amplification effect that we document for the crisis period is absent during the pre-crisis, tranquil period.

A potential concern with this analysis is that firms in the crisis sample could be different from firms in the tranquil sample. If the sample of firms we observe in the tranquil period contains a larger share of firms with a naturally low cash to long-term investment sensitivity than this might explain the difference between the two periods. To ensure that this is not driving in our results and that firms in the two samples are comparable we match the firms in our crisis sample with one firm from the tranquil sample along some key characteristics and re-estimate the model for the two periods on the sample of matched firms. We require the two firms to match exactly in terms of their four-digit industry, region and age group and the deciles of their size, relative cash and market share growth, where for the crisis sample all variables are measured in 2006 and for the tranquil sample in 2000. This leaves us with a sample of 30,994 firms for both periods.

The estimates for β_j for the matched sample are shown in the right hand side panel of Figure 5. The results are very similar to those for the unmatched samples. Interestingly, the parameters capturing the cash-investment sensitivity over one and two years in both periods are no longer statistically different from each other. As in the full sample results on the left, parameter

---

[15] We choose a horizon of six years and not seven because we do not want the tranquil period to overlap with the crisis period.

estimates for the longer horizons clearly diverge, with cash-investment sensitivities only increasing over time in the aftermath of the financial crisis. If we compare the estimates for the two samples we see that a firm in the 90th percentile of the relative cash distribution grows its stock of fixed assets over a 6 year horizon by 4.8 percentage points more than a firm in the 10th percentile during normal times, but by 15.7 percentage points more after a financial crisis.

These results show that even though in the short-run high cash firms tend to invest more in general, the amplification effect that we observe in the aftermath of the crisis is not present in normal times. In normal times, cash holdings boost investment in the first two years but do not drive additional capital accumulation in subsequent years. For the crisis period, on the other hand, we document an increase in the investment gap over time as initial cash holdings in 2006 lead to more capital accumulation even eight years after the crisis in the year 2014. Tighter credit constraints during a crisis thus seem to amplify the effect of initial cash holdings and puts firms on divergent investment paths.

4.4   Results: Cross-sectional analysis

As additional evidence that our results are indeed the consequence of a tightening of financial constraints due to the financial crisis, we conduct a cross-sectional analysis based on firm-level measures of financial constraints. If liquid assets are beneficial because credit conditions deteriorate during a financial crisis, this effect should be particularly strong for firms that are likely to become more financially constraint when banks reduce their credit supply. We use two proxies of financial constraints commonly used in the literature to identify a firm's exposure to credit supply shocks: the age and size of the firm.

We first split the sample of firms into young firms (less than 10 years old in 2006) and old firms (20 years or older in 2006) and estimate the regression for the longest horizon, i.e. using fixed asset growth between 2007 and 2014 as the dependent variable. The results are presented in the upper panel of Table 3. For brevity, we only display the cash coefficients. The results show that comparing young and old firms, the parameter is almost double the size for the sample of young firms. Quantitatively, a young firm in the 90th percentile of the relative cash distribution grows its stock of fixed assets by 21.7 percentage points more than a young firm in the 10th percentile by 2014. For old firms this difference is only 9.4 percentage points.

Next we examine the difference between small and large firms, where small firms are those in the lower quartile of the size distribution and large firms are those in the highest quartile

of the size distribution. The results (Table 4, lower panel) show that the relative-to-rivals cash–investment sensitivity is larger for small firms, however the difference between the large and the small firms is not significant.[16] These results suggest that the effect of pre-crisis cash holdings on investment results from a tightening of credit constraints.

5. Relative-to-rivals cash and market share growth

In the previous section we documented the emergence of an investment gap between cash-rich and cash-poor firms during the crisis which is amplified during the recovery period. In this section we explore whether competition dynamics are a possible driver behind this widening investment gap.

5.1 Competition dynamics

When credit conditions tighten firms that are starved of cash may be forced to liquidate fixed assets and forgo profitable investment opportunities. They may even struggle to survive. Their cash-rich rivals by contrast can more easily continue to operate and seize profitable investment opportunities despite the tightening of credit. As the capacity of cash-poor firms to meet demand during the crisis declines cash-rich firms can capture the market share of these shrinking or failing firms (Froot, Scharfstein and Stein, 1993). Cash-rich firms may even be able to acquire assets at discounted prices from their struggling competitors, putting them at an even more advantageous position. Thus, even if customer demand contracts during the crisis, the market for cash-rich firms may actually expand.

In addition, cash-rich firms can invest in competitive strategies that allow them to further increase their market share at the expense of cash-poor rivals. Having cash at hand enables firms to invest strategically in R&D, the location of stores and plants, distribution networks or advertising (Campello, 2006). This will improve their future competitive position. Furthermore, the presence of firms with large amounts of cash can deter rivals from entering a market or from expanding their capacity (Benoit, 1984). In addition, cash reserves may allow firms to strategically lower their prices to steal market share from financially weak competitors that have to increase their prices in order to generate cash flow (Gilchrist, Schoenle, Sim and Zakrajsek, 2017).

---

[16] Our finding that the difference especially plays up for young firms and less so for small (and potentially old firms) is in line with the findings of Cloyne, Ferreira, Froemel and Surico (2016) who show that especially young (and not small) firms in the UK tend to adjust their capital expenditure in reaction to monetary policy shocks.

While these channels are also present during normal times, they likely intensify when cash flow is low, credit conditions tighten and external finance becomes more costly. Fresard (2010), studying publicly listed US firms, shows that in normal times cash-rich firms systematically increase their market share in the short-run at the expense of their cash-poor rivals. While not explicitly focusing on the financial crisis, he also finds that this effect is stronger when rivals face tighter financing constraints suggesting that the mechanism he documents might indeed be more potent during a crisis.

Feedback effects could reinforce the shifts in firms' competitive positions that occur during the crisis and amplify the effect of initial cash holdings on market share growth during the recovery phase. When demand returns and credit conditions improve in the aftermath of the crisis, cash-rich firms are particularly well placed to meet this demand. This improves their earnings and strengthens their balance sheets, allowing them to capture even more market share and to increase their investment expenditure in the future. Firms with limited liquid assets going into the crisis may therefore not be able to catch up with their cash-rich rivals and see their positions weaken further.

This section assesses whether there is support for the mechanism outlined above. We test how pre-crisis cash holdings affect a firm's market share growth in the crisis and the recovery phase. This will allow us to assess whether the amplification of the investment gap over time could be driven by the ability of high-cash firms to gain market share which subsequently puts them on a better growth trajectory relative to their cash-poor rivals.

5.2   *Regression specification*

Similar to our investment regression, we now estimate how the firm's market share grows over the horizon $j > 0$ following the financial crisis conditional on firm i's cash position relative to its rivals just before the crisis. We regress a firm's market share growth over the different horizons j, $\%\Delta MShare_{i,07+j}$, on the firm's cash position and a number of control variables. Market share growth is defined as the growth rate of the firm's market share between 2007 and year 2007+j, where market share is defined as the ratio of the firm's assets over the total industry assets at the

four-digit level. As such the variable measures a firm's asset growth in relation to that of its competitors.[17] The model is as follows:

$$\%\Delta MShare_{i,07+j} = \beta_j Relative\ Cash_{06,i} + \gamma_j X_i + \sum_{k=0}^{1} \theta_{kj} \%\Delta MShare_{i,07-k} + \vartheta_{rj} + \varepsilon_{ij}\ (2)$$

where subscript i indexes the firm and j the horizon over which market share growth is measured, with j ranging from one to seven. *Relative Cash* is defined as the cash holdings of the firm relative to the cash holdings of its rivals as measured in 2006. The control variables are the same as in specification (1), except that we now control for pre-crisis market share growth instead of pre-crisis investment in order to capture firm characteristics that may have driven the firm's competitive position in the past (one and two periods lagged); ϑ_{rj} is a vector of regional fixed effects; and ε_{ij} is the error term. As the dependent variable is a relative-to-industry variable all industry related factors are already removed from the estimates and there is no need to include industry fixed effects. Regressions are again estimated for each horizon separately using OLS and standard errors are clustered at the four-digit industry level.

To assess to what extent the tightening of financial constraints during the financial crisis affected the importance of cash holdings for subsequent firm performance, we compare the cash - market share growth sensitivity during the crisis and its aftermath, with the sensitivity in a tranquil period. If the strategic advantage of cash strengthens when financial constraints tighten, the cash–performance sensitivity should become stronger as well. We therefore estimate the same model also for our tranquil period where relative-to-rivals cash is again measured in 2000 and model (2) is estimated for each horizon between 2001 and $2001 + j$, where j again ranges from one to six.

5.3   Results: Market share growth and relative-to-rivals cash

Figure 6 presents the estimates for β_j for each horizon. The panel on the left shows the estimates for both the crisis and the tranquil period for the full sample of firms and on the right for the

---

[17] Ideally, a firm's market share is measured in terms of its sales. However, in the UK this variable is only available for a subset of very large firms. As particularly firms that are more financially constrained should benefit from having large cash holdings, focusing on large firms only would lead to a substantial downward sample selection bias. As such we opt for focusing on a firm's market share in terms of its total assets.

matched sample. The results indicate that firms with high levels of cash relative to their rivals experience higher market share growth in the following years. As expected, and in line with the findings of Fresard (2010), the coefficient on relative-to-rivals cash is significant and positive during the first year in both the tranquil and crisis sample. However, the parameter is substantially larger for the crisis sample (albeit not always significantly different) and has a more pronounced upwards trajectory, in both the full and the matched sample. Taking the estimates from the matched sample, a firm in the 90th percentile of the relative cash distribution increases its market share after 6 years by 9.2 percentage points more than a firm in the 10th percentile after a financial crisis. For the tranquil period the difference is only 3.3 percentage points.

If cash holdings enable firms to gain a competitive advantage over their rivals this effect should be stronger for those firms that are more likely to be financially constrained. As before, we split the sample into old and young firms and estimate the regressions for the longest horizon, i.e. we use market share growth between 2007 and 2014 as the dependent variable. The results in Table 4 show that young firms that are cash-rich gain market share relative to their young cash-poor rivals (upper panel). Quantitatively, a young firm in the 90th percentile of the relative cash distribution grows its market share by 12.6 percentage points more than a firm in the 10th percentile by 2014. We do not find a significant difference between cash-rich and cash-poor old firms. When we compare small and large firms (lower panel), we find a positive significant effect for both types of firms, but unlike in the investment regressions the cash–market share growth sensitivity is now significantly larger for small firms. A small firm in the 90th percentile of the relative cash distribution increases its market share with 16.3 percentage points more than a firm in the 10th percentile by 2014, while the difference is only 4.6 percentage points for large firms.

These findings reinforce our interpretation that the value of cash holdings increases during a financial crisis because financial conditions tighten. Cash reserves put firms at a clear strategic advantage when the credit cycle unexpectedly turns, not only during the crisis episode itself but also several years thereafter.

5.4   Results: Industry differences
To further uncover the drivers behind our findings, we now exploit the diversity in industries that is present in our dataset. This not only helps us to put aside any possible remaining endogeneity

concerns, but also furthers our understanding of the circumstances under which cash is particularly valuable for firms when a financial crisis hits.

We first differentiate between sectors where firms have likely become more financially constrained during the crisis. This enables us to further strengthen the causal interpretation of our findings. If cash holdings provide a firm with a strategic advantage, the impact of relative-to-rivals cash should be larger in industries where the firm's rivals face more difficulty obtaining external funds during the crisis. As argued previously firms that are small and young are more likely to become financially constrained during a financial crisis due to higher information asymmetries between borrower and lender. Similarly, firms that have a high share of intangible assets tend to become more financially constrained as they have less collateral to pledge with their bank. As such a firm's rivals are more likely financially constrained in industries that naturally have a larger share of firms that are either small or young or where firms tend to have more intangible relative to tangible assets on their balance sheet

To examine this prediction we measure the average rival's financial strength based on three industry characteristics: the average size, the average age and the average share of intangible assets in total fixed assets of the firms in the industry. We measure each of these industry characteristics by taking the average across all firms active in 2006. Each industry measure is calculated at the four-digit level. We then rank the industries along each of the three criteria and assign firms from industries in the bottom and top quartiles to the "low" and "high" category, respectively. For each industry characteristic we then estimate equation (2) for the two subgroups and compare the estimates of the cash-market share growth sensitivities for the longest horizon (2007-2014).

Panel A of Table 5 reports in which industries firms benefit most from being cash-rich relative to their rivals. The results are in line with our predictions and very consistent across the specifications. For each measure of rivals' financial strength we find that the effect of cash is larger when the firm's rivals are more likely to face tighter financial constraints. The cash parameter is positive and significant at the one percent level in industries where firms tend to be small or young and when the share of intangibles is high. The cash parameter is insignificant for industries where firms tend to be large or where the share of intangible assets is low. In industries where rivals are older we find that the cash effect is positive, but the coefficient on cash decreases from 0.04 and significant at the 1 percent level for industries with relative young firms to only

0.01 and significant at the 10 percent level for industries with relative old firms. A Wald test rejects the equality of the coefficients across all three subgroups.

While rivals' difficulties in accessing external funds is an obvious industry characteristic that puts a cash-rich firm at a long-term advantage, other industry characteristics might also play a role. We investigate these in panel B of Table 5. First we study the impact of competition. In industries where competition is high firms likely have much more strategic interactions and therefore having more cash might prove more beneficial. Using firm-level turnover data from the Office of National Statistics (ONS) we calculate the Herfindahl-Hirschman Index (HHI) for each industry at the two-digit level. The HHI is measured in 2006. High levels of the HHI imply that an industry is very concentrated and low levels indicate a competitive industry. We do not take a stand on how high or low the HHI should be for an industry to be concentrated or competitive, but we create two subgroups of firms analogous to the groups we created before and compare firms in the bottom quartile and those in the top quartile of the industry HHI distribution instead.

The results show that in highly competitive industries cash-rich firms grew their market shares relative to their cash-poor rivals. In highly concentrated industries we do not detect any differential effect. This shows that when there are more strategic interactions among firms, and as a result it is easier to capture market share from rivals, cash holdings present an important competitive advantage during a crisis and its recovery phase.

Finally we examine if the extent to which the industry was affected by the crisis affects the cash sensitivity of firms' market share growth. A priori it is not obvious under what conditions cash would be more beneficial. On the one hand, more opportunities to steal market share of failing or suffering rivals could arise in industries that were hit hard by the crisis. In addition, lenders are more likely to withdraw funding from these sectors, limiting access to finance of cash-poor rivals. On the other hand, investment opportunities of cash-rich firms in declining industries with weak demand might be limited and too risky. As such the strategic advantage that cash provides during a crisis might be low in these sectors and will only play up in industries that are less pro-cyclical.

To test which effect dominates, we measure the depth of the crisis at the industry level by the growth in value added between 2007 and 2010. The data are again from the ONS and are measured at the two-digit industry level. We rank industries and compare firms in industries in the bottom quartile with those in the top quartile of the industry distribution. The results show that

cash holdings only allowed firms to gain market share in industries that weathered the crisis relatively well. Cash buffers did not have a significant effect on the market share of firms in industries which suffered a severe downturn during the crisis. This indicates that the competition channel is only operative if there are investment opportunities in the first place

Overall these results support the view that cash holdings give firms a strategic advantage over their cash-poor (and hence more financially constrained) rivals. This especially benefits those firms that are active in industries where financial strength of their rivals has deteriorated, where it is easier to gain market share and where investment opportunities are still present. The ability to continue to invest during a crisis gives cash-rich firms a competitive edge that not only benefits them during a crisis but that lasts far beyond the crisis years.

6. Conclusions

This paper investigates to what extent a firm's cash holdings explain its long-term investment decisions and its competitive position in the aftermath of the global financial crisis. We find that firms with high initial levels of cash relative to their industry rivals invest more during the financial crisis and its aftermath. Importantly, the positive impact of relative cash not only persists over time, but is amplified during the recovery phase. This persistent and widening investment gap between cash-rich and cash-poor firms is not present during a tranquil period. Consistent with a causal effect of a shock to firms' ability to raise external funding, the positive impact of being cash-rich is greatest for young and small firms.

We posit that an underlying driver behind the amplification of the investment gap between cash-rich and cash-poor firms that we document is the ability of cash-rich firms to persistently outcompete their cash-poor and fragile rivals in the market. In line with this mechanism, we find that firms with high levels of cash before the onset of the crisis capture market share from their cash-poor industry rivals during the crisis and this effect is amplified during the recovery phase. The amplification effect is absent in the pre-crisis tranquil period. The impact is not homogeneous across industries however. In line with a deterioration of credit conditions that give cash-rich firms a strategic advantage, we find that the cash-performance sensitivity is stronger in industries where rivals are financially constrained. In addition, cash benefits firms most in industries which are less affected by the crisis and that are more competitive.

25

Our findings thus show that the ability to continue to invest during a crisis gives cash-rich firms a competitive edge that not only benefits them during a crisis, but that lasts far beyond the crisis years. Having access to liquid assets when the credit cycle turns is thus an important determinant of firms' long-term growth after a financial crisis.

References

Acharya, Viral, Heitor Almeida, and Murillo Campello, 2007, "Is Cash Negative Debt? A Hedging Perspective on Corporate Financial Policies," *Journal of Financial Intermediation,* 16, 515–554.

Almeida, Heitor, Murillo Campello, Bruno Laranjeira, and Scott Weisbenner, 2012, "Corporate Debt Maturity and the Real Effects of the 2007 Credit Crisis," *Critical Finance Review*, 1, 3-58.

Almeida, Heitor, Murillo Campello, and Michael S. Weisbach, 2004, "The Cash Flow Sensitivity of Cash," *Journal of Finance,* 59, 1777–1804.

Arslan, Ozgur, Chrisostomos Florackis, and Aydin Ozkan, 2006, "The Role of Cash Holdings in Reducing Investment-Cash Flow Sensitivity: Evidence from a Financial Crisis Period in an Emerging Market," *Emerging Markets Review*, 7(4), 320–338.

Bahaj, Saleem, Angus Foulis and Gabor Pinter, 2017, "Home Values and Firm Behavior," Bank of England Staff Working Paper No. 679.

Benoit, Jean-Pierre, 1984, "Financially Constrained Entry in a Game with Incomplete Information," *Rand Journal of Economics,* 15, 490–499.

Boutin, Xavier, Giacinta Cestone, Chiara Fumagalli, Giovanni Pica, and Nicolas Serrano-Velarde, 2013, "The Deep-Pocket Effect of Internal Capital Markets," *Journal of Financial Economics*, 109, 122-145.

Campello, Murillo, 2006, "Debt financing: Does it Boost or Hurt Firm Performance in Product Markets?" *Journal of Financial Economics,* 82, 135–172.

Campello, Murillo, John R. Graham, and Campbell R. Harvey, 2010, "The Real Effects of Financial Constraints: Evidence from a Financial Crisis" *Journal of Financial Economics,* 97, 470–487.

Chang, Yanhao, Karen Benson, and Robert Faff, 2017, "Are Excess Cash Holdings More Valuable to Firms in Times of Crisis? Financial Constraints and Governance Matters, *Pacific-Basin Finance Journal*, 45(C), 157-173.

Chodorow-Reich, Gabriel, 2014, "The Employment Effects of Credit Market Disruptions: Firm-level Evidence from the 2008-9 Financial Crisis," *Quarterly Journal of Economics*, 129(1), 1-59.

Cingano, Federico, Francesco Manaresi, and Enrico Sette, 2016, "Does Credit Crunch Investment Down? New Evidence of the Real Effects of the Bank Lending Channel," *Review of Financial Studies*, 29, 2737-2773.

Cloyne, James, Clodomiro Ferreira, Maren Froemel, and Paolo Surico, 2016, "Monetary Policy, Corporate Finance and Investment," NBER Working Paper No. 25366.

Cloyne, James, and Paolo Surico, 2016, "Household Debt and the Dynamic Effects of Income Tax Changes," *Review of Economic Studies,* 84(1), 45–81.

Denis, David J., and Valeriy Sibilkov, 2010, "Financial Constraints, Investment, and the Value of Cash Holdings," *Review of Financial Studies*, 23(1), 247-269.

Dittmar, Amy, and Jan Mahrt-Smith, 2007, "Corporate Governance and the Value of Cash Holdings," *Journal of Financial Economics*, 83, 599–634.

Duchin, Ran, Oguzhan Ozbas, and Berk Sensoy, 2010, "Costly External Finance, Corporate Investment, and the Subprime Mortgage Credit Crisis, *Journal of Financial Economics*, 97, 418-435.

Duval, Romain, Gee Hee Hong, and Yannick Timmer, 2017, "Financial Frictions and the Great Productivity Slowdown," IMF Working Paper No. 17129.

Favara, Giovanni, and Jean Imbs, 2015, "Credit Supply and the Price of Housing," *American Economic Review*, 105, 958-992.

Fazzari, Steven M., R. Glenn Hubbard, and Bruce C. Petersen, 1988, "Financing Constraints and Corporate Investment, *Brookings Papers on Economic Activity,* 141-206.

Faulkender, Michael, and Ron Wang, 2006, "Corporate Financial Policy and the Value of Cash," *Journal of Finance,* 61, 1957–90.

Fresard, Laurent, 2010, "Financial Strength and Product Market Behavior: The Real Effects of Corporate Cash Holdings," *Journal of Finance*, 65(3), 1097-1122.

Froot, Kenneth, David Scharfstein, and Jeremy Stein, 1993, "Risk Management: Coordinating Corporate Investment and Financing Policies," Journal of Finance, 48(5), 1629-1658.

Gilchrist, Simon, Raphael Schoenle, Jae Sim and Egon Zakrajsek, 2017, "Inflation Dynamics during the Financial Crisis, *American Economic Review*, 107(3), 785-823.

Giroud, Xavier, and Holger M. Mueller, 2017, Firm Leverage, Consumer Demand, and Employment Losses during the Great Recession, *Quarterly Journal of Economics,* 132, 271-316.

Haltiwanger, John, Ron Jarmin, and Javier Miranda, 2013, " Who Creates Jobs? Small versus Large versus Young," *Review of Economics and Statistics,* 95(2), 347-361.

Han, Seungjin, and Jiaping Qiu, 2007, "Corporate Precautionary Cash Holdings," *Journal of Corporate Finance,* 13, 43-57.

28

Harford, Jarrad, 1999, "Corporate Cash Reserves and Acquisitions," *Journal of Finance*, 54(6), 1969–1997.

Harford, Jarrad, Sattar A. Mansi, and William F. Maxwell, 2008, "Corporate Governance and Firm Cash Holdings in the US," *Journal of Financial Economics*, 87, 535–555.

Iyer, Rajkamal, Jose-Luis Peydro, Samuel da-Rocha-Lopes, and Antionette Schoar, 2014, "Interbank Liquidity Crunch and the Firm Credit Crunch: Evidence from the 2007-2009 Crisis," *Review of Financial Studies*, 27(1), 347-372.

Ivashina, Victoria, and David Scharfstein, 2010, "Bank Lending during the Financial Crisis of 2008," *Journal of Financial Economics,* 97, 319-338.

Jeenas, Priit, 2018, "Firm Balance Sheet Liquidity, Monetary Policy Shocks, and Investment Dynamics," Mimeo New York University.

Jorda, Oscar, 2005, "Estimation and Inference of Impulse Responses by Local Projections," *American Economic Review,* 95, 161-182.

Jorda, Oscar, Moritz Schularick, and Alan M. Taylor, 2013, "When Credit Bites Back," *Journal of Money, Credit, and Banking*, 45, 3-28.

Jensen, Michael C., 1986, "Agency Costs of Free Cash Flow, Corporate Finance and Takeovers," *American Economic Review*, 76, 323–329.

Jensen, Michael C., and William H. Meckling, 1976, "Theory of the Firm: Managerial Behavior, Agency Costs and Ownership Structure," *Journal of Financial Economics*, 3(4), 305-360.

Kalemli-Ozcan, Sebnem, Bent Sorensen, Carolina Villegas-Sanchez, Vadym Volosovych, and Sevcan Yesiltas, 2015, "How to Construct Nationally Representative Firm Level data from the ORBIS Global Database," NBER Working Papers No. 21558.

Kalemli-Ozcan, Sebnem, Luc Laeven and David Moreno, 2018, "Debt Overhang, Rollover Risk, and Corporate Investment: Evidence from the European Crisis," CEPR Discussion Paper No. 12881.

Kaplan, Greg, Benjamin Moll, and Giovanni. L. Violante, 2018, "Monetary Policy According to HANK," *American Economic Review,* 108(3), 697-743.

Keynes, John M., 1936, "The General Theory of Employment, Interest and Money," Harcourt Brace, London.

MacKay, Peter, and Gordon M. Phillips, 2005, "How Does Industry Affect Firm Financial Structure? *Review of Financial Studies,* 18, 1433–1466.

Myers, Stewart C., and Nicholas S. Majluf, 1984, "Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have," *Journal of Financial Economics*, 13, 187-221.

Mian, Atif, Amir Sufi, and Emil Verner, 2017, "Household Debt and Business Cycles Worldwide," *Quarterly Journal of Economics,* 132(4), 1755-1817.

Mikkelson, Wayne, and Megan Partch, 2003, "Do Persistent Large Cash Reserves Hinder Performance?" *Journal of Financial and Quantitative Analysis,* 38, 275–94.

Modigliani, Franco, and Merton H. Miller, 1958, "The Cost of Capital, Corporation Finance and the Theory of Investment," *American Economic Review,* 53, 261–97.

Ongena, Steven, Jose Luis Peydro, and Neeltje van Horen, 2015, "Shocks Abroad, Pain at Home? Bank-Firm-Level Evidence on the International Transmission of Financial Shocks," *IMF Economic Review*, 63(4), 698-750.

Opler, Tim, Lee Pinkowitz, Rene Stulz, and Rohan Williamson, 1999, "The Determinants and Implications of Corporate Cash Holdings," *Journal of Financial Economics,* 52, 3–46.

Pinkowitz, Lee, Rene Stulz, and Rohan Williamson, 2006, "Does the Contribution of Corporate Cash Holdings and Dividends to Firm Value Depend on Governance? A Cross-Country Analysis," *Journal of Finance*, 61, 2725–2751.

Santos, Joao, 2011, "Bank Loan Pricing Following the Subprime Crisis," *Review of Financial Studies*, 24(6), 1916-1943.

Song, Kyojik and Youngjoo Lee, 2012, "Long-Term Effects of a Financial Crisis: Evidence from Cash Holdings of East Asian Firms, *Journal of Financial and Quantitative Analysis*, 47(3), 617-641.

Stiglitz, Joseph E., and Andrew Weiss, 1981, "Credit Rationing in Markets with Imperfect Information," A*merican Economic Review* 71(3), 393–410.

Wix, Carlo, 2017, "The Long-Run Real Effects of Banking Crises: Firm-Level Investment Dynamics and the Role of Wage Rigidity," SAFE Working Paper No. 189.

Figure 1
Variations in cash holdings by industry (2006)
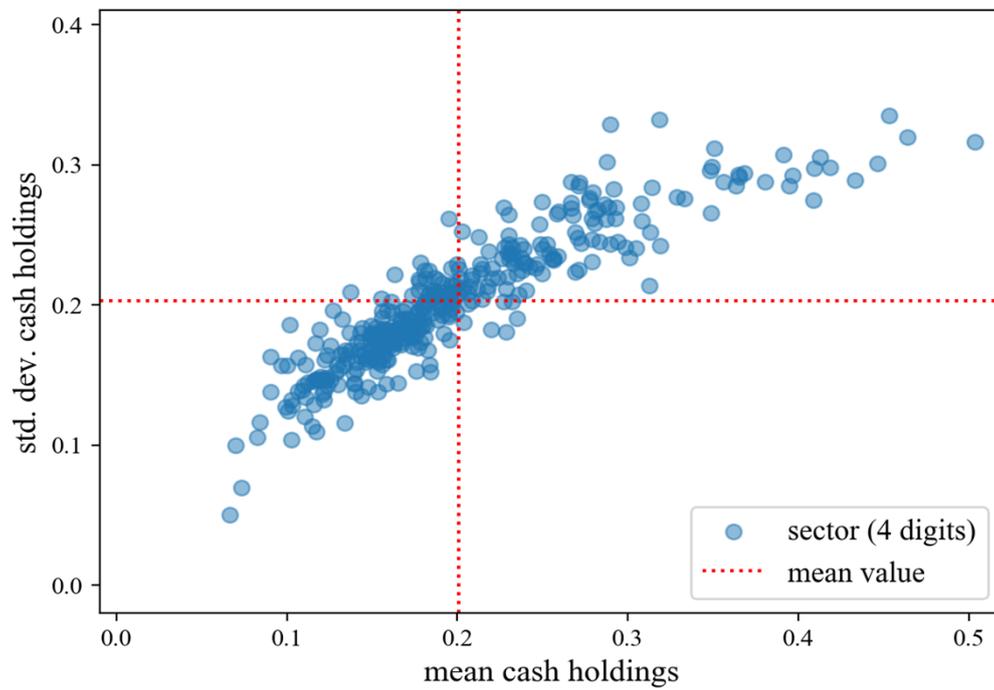
Notes: This figure plots the correlation between the mean and st deviation of the cash holdings of UK firms at the 4-digit industry level. Cash holdings are defined as deposits over total assets and measured in 2006.

Figure 2
Investment high vs low cash firms: crisis vs tranquil period, short-term

Crisis period:
FA growth 2007-2009

Tranquil period:
FA growth 2001-2003
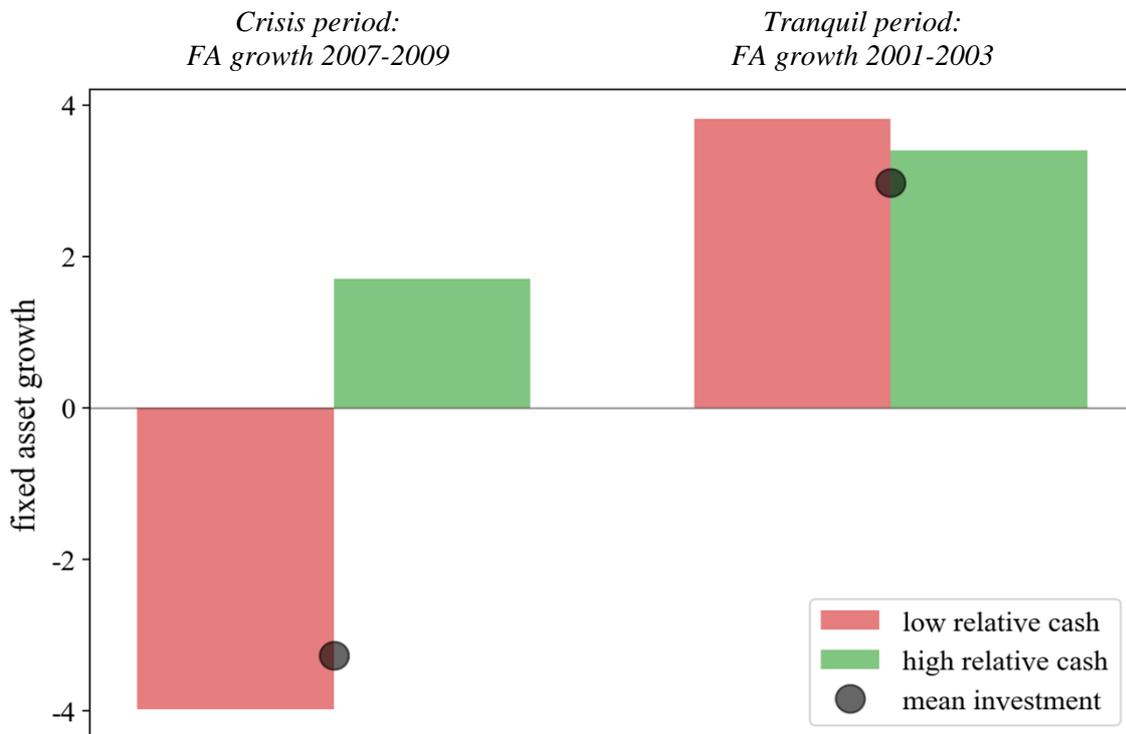
Notes: This figure plots the average fixed asset growth over 2007-2009 (crisis period) and 2001-2003 (tranquil period) for firms with low and high relative-to-rivals cash. Fixed asset growth is defined as teh log difference of fixed assets between 2007 and 2009 (crisis period) and between 2001 and 2003 (tranquil period) *Relative cash* is calculated by subtracting from the firm's cash holdings its industry mean and divide the difference by the industry standard deviation and is measured in 2006 for the crisis period and in 2000 for the tranquil period. Industry mean and standard deviation are determined at the 4-digit level. High relative cash firms are those firms in the top decile of relative-to-rivals cash holding distribution and low relative cash firms are those in the bottom decile of the distribution.

Figure 3
Investment high vs low cash firms: crisis vs tranquil period, long-term

Panel A: Crisis period: 2007-2014
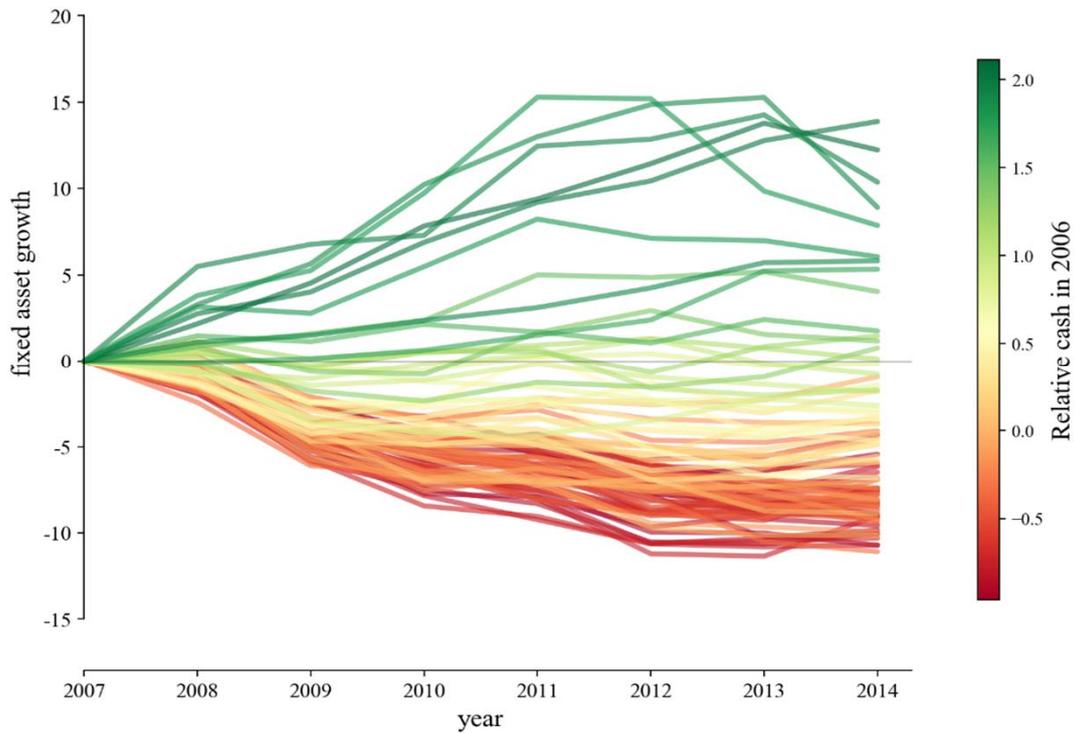
Panel B: Tranquil period: 2001-2007
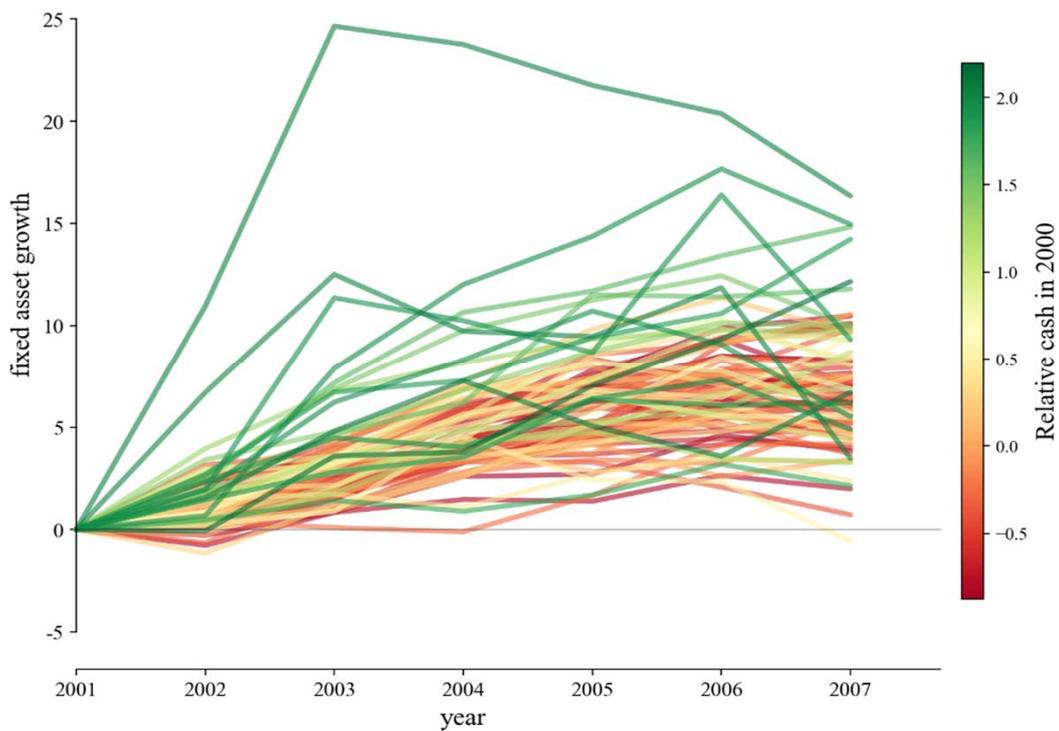
Notes: These figures plot the average fixed asset growth for firms in each percentile of relative-to-rivals cash within the 90 percent interquartile range. In panel A average fixed asset growth is tracked over the period 2007-2014 and in panel B over the period 2001-2007. Fixed asset growth is defined as the log difference between 2007 and year 2007+j (crisis period) and between 2001 and 2001+j (tranquil period). *Relative cash* is calculated by subtracting from the firm's cash holdings its industry mean and divide the difference by the industry standard deviationand is measured in 2006 for the crisis period (panel A) and in 2000 for the tranquil period (panel B). Industry mean and standard deviation are determined at the 4-digit level.

Figure 4
Long-term impact of cash on investment
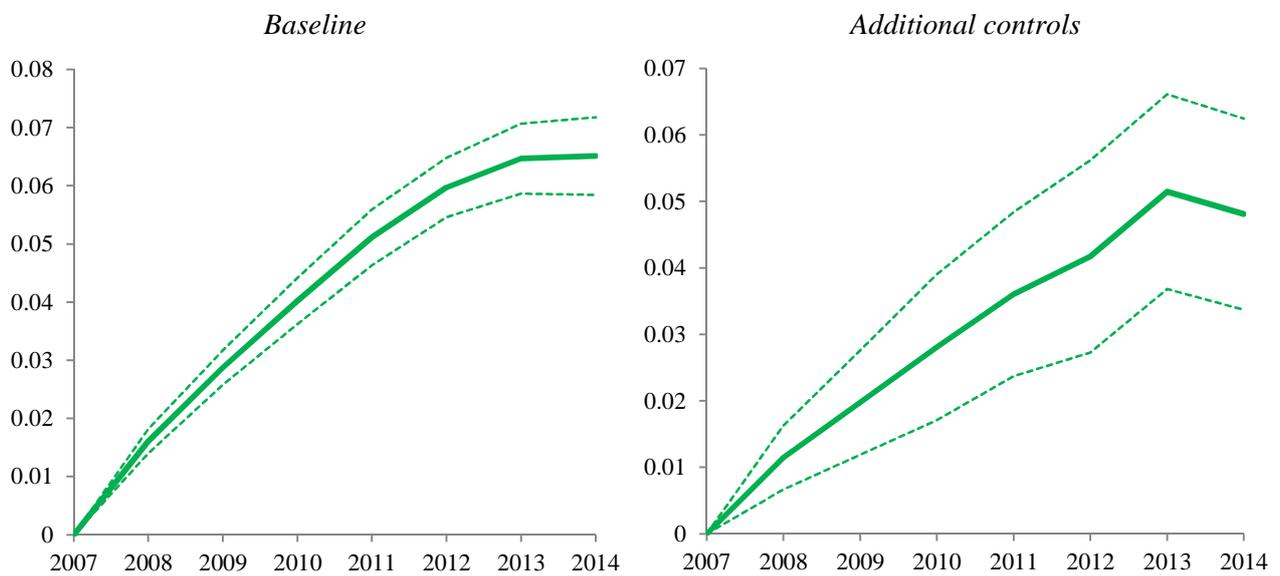
Baseline

Additional controls

Notes: These figures plot the impact of relative-to-rivals cash on investment over different horizons using local projections. The dependent variable is the cumulative fixed asset growth between 2007 and 2007+j, where j ranges from 1 to 7. The model specification used in the left-hand side panel includes controls for leverage, size, age category and investment growth. The model specification used in the right-hand side panel also includes controls for turnover growth and profits. All variables are measured in 2006, except investment growth, turnover growth and profits which are measured over 2005-2006 and 2006-2007. Both specifications include region and 4-digit industry fixed effects. Standard errors allow for corrrelation at the 4-digit industry level. The lines correspond to the estimated parameter of *Relative cash* and the dashed lines show the 90 percent confidence intervals .

Figure 5

Long-term impact of cash on investment - crisis vs tranquil period
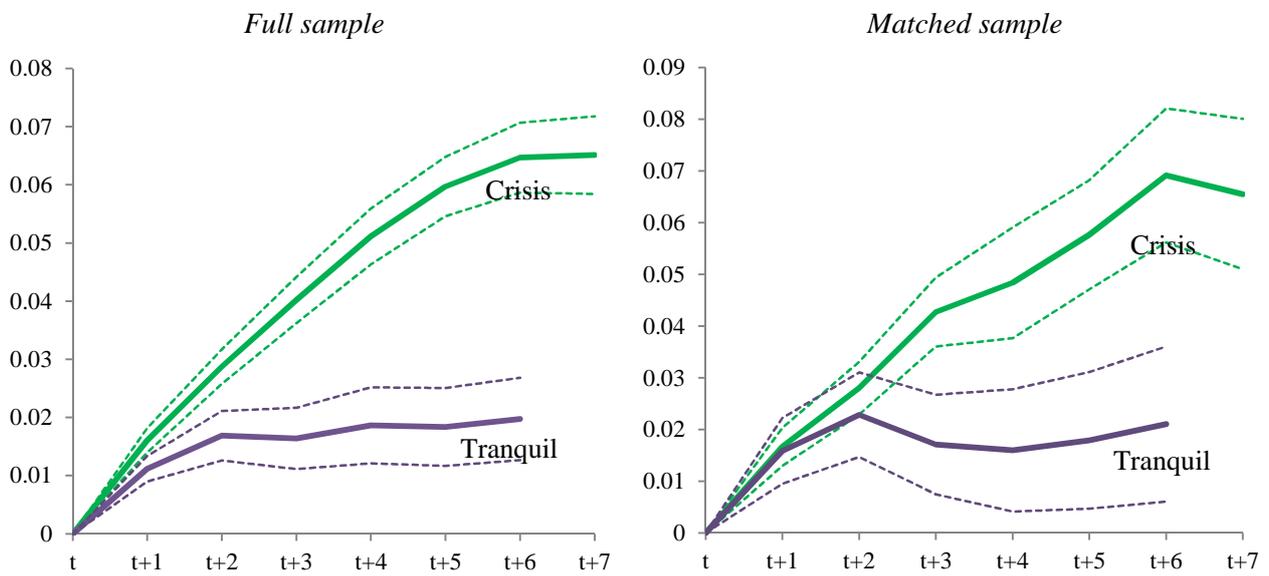
Full sample

Matched sample

Notes: These figures plot the impact of relative-to-rivals cash on investment over different horizons using local projections. The dependent variable is the cumulative fixed asset growth between 2007 and 2007+*j*, where *j* ranges from 1 to 7 for the crisis sample and between 2001 and 2001+*j*, where *j* ranges from 1 to 6 for the tranquil sample. The full sample includes all firms for which information is available. The matched sample includes the subset of firms that are exactly matched on 4-digit industry, region, age category and deciles of size, relative cash, and market share growth with all variables measured in 2006 for the crisis sample and in 2000 for the tranquil sample. All regressions include the standard control variables and region and 4-digit industry fixed effects. Standard errors allow for corrrelation at the 4-digit industry level. The lines correspond to the estimated parameter of *Relative cash* for the two periods and the dashed lines show the 90 percent confidence intervals.

Figure 6
Long-term impact of cash on market shares - crisis vs tranquil period

Full sample

Matched sample
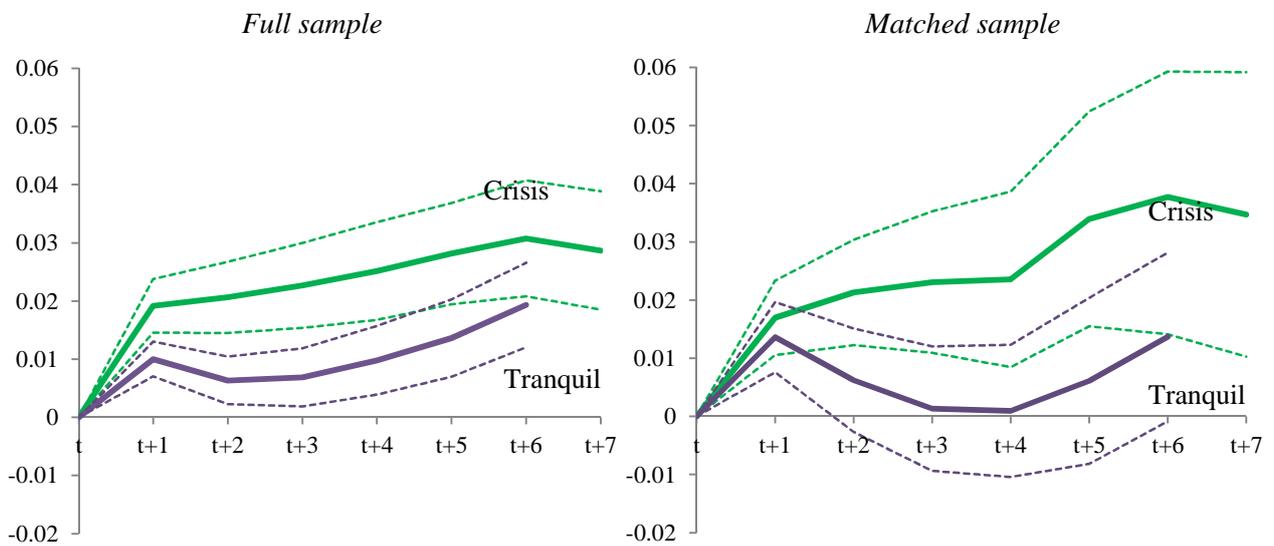
Notes: These figures plot the impact of relative-to-rivals cash on market share growth over different horizons using local projections. The dependent variable is the cumulative market share growth betwen 2007 2007+j, where j ranges from 1 to 7 for the crisis sample and between 2001 and 2001+j, where j ranges from 1 to 6 for the tranquil sample. Market share growth is defined as the percentage change of the firm's assets relative to its total industry assets (at the 4-digit industry level). The full sample includes all firms for which information is available. The matched sample includes the subset of firms that are exactly matched on 4-digit industry, region, age category and deciles of size, relative cash, and market share growth with all variables measured in 2006 for the crisis sample and in 2000 for the tranquil sample. All regressions include the standard control variables and region fixed effects. Standard errors allow for corrrelation at the 4-digit industry level. The lines correspond to the estimated parameter of *Relative cash* for the two periods and the dashed lines show the 90 percent confidence intervals.

Table 1
Summary statistics

Variable	Obs	Mean	Median	St. Dev.	Min	Max
Crisis sample						
ΔlnFA (2007-2014)	236,700	-0.06	-0.02	0.99	-3.45	4.09
Relative Cash	236,700	-0.15	-0.43	0.86	-1.82	2.89
Mature	236,700	0.23	0.00	0.42	0	1
Old	236,700	0.28	0.00	0.45	0	1
Group	236,700	0.10	0.00	0.30	0	1
Public	236,700	0.00	0.00	0.01	0	1
Size	236,700	5.70	5.65	1.77	1.10	17.91
Leverage	236,700	0.59	0.59	0.32	0.00	1.64
Pre-Investment (1st lag)	236,700	0.03	0.00	0.38	-1.35	2.20
Pre-Turnover (1st lag)	39,597	0.06	0.05	0.43	-7.23	7.38
Pre-Profit (1st lag)	196,126	0.09	0.08	0.65	-7.56	7.49
%ΔMshare (2007-2014)	227,142	0.15	-0.08	0.93	-0.95	9.03
Pre-Market share (1st lag)	227,142	0.00	-0.06	0.32	-0.70	2.54
Tranquil sample						
ΔlnFA (2001-2007)	159,326	0.07	0.00	0.96	-3.40	3.87
Relative Cash	159,326	-0.13	-0.45	0.85	-1.88	3.11
Mature	159,326	0.29	0.00	0.45	0	1
Old	159,326	0.36	0.00	0.48	0	1
Group	159,326	0.14	0.00	0.35	0	1
Public	159,326	0.00	0.00	0.01	0	1
Size	159,326	5.85	5.84	1.73	0.92	17.16
Leverage	159,326	0.60	0.61	0.32	0.00	1.67
Pre-Investment (1st lag)	159,326	0.03	0.00	0.39	-1.50	2.14
%ΔMshare (2001-2007)	153,642	0.01	-0.21	0.82	-0.96	7.64
Pre-Market share (1st lag)	153,642	0.02	-0.04	0.34	-0.73	2.81

Notes: This table shows the summary statistics of the key variables used in the analysis.

Table 2
Pre-crisis characteristics high cash and low cash firms

Variable	High relative cash	Low relative cash	Difference
Cash holdings	0.56	0.03	0.53***
Size	935	10,386	-9,451***
Young (< 10y)	0.51	0.48	0.03***
Fixed assets	0.22	0.42	-0.21***
Leverage	0.47	0.72	-0.25***
Investment rate	0.05	0.02	0.03***

Notes: This table presents difference-in-differences estimate from a Mann-Whitney two-sided *t*-test on selected pre-crisis balance sheet characteristics of firms with high and low cash relative to their industry rivals. High relative cash firms are those firms in the top quartile of relative-to-rivals cash holding distribution and low relative cash firms are those in the bottom quartile of the distribution. *Cash holdings* denotes the firm's deposits over total assets. *Size* denotes the firms' total assets. *Young* is a dummy which is one if the firm is 10 years or younger. *Fixed assets* denotes the firms' share of fixed assets over total assets. *Leverage* denotes the share of total liabilities over total assets. *Investment rate* denotes the log difference of the firm's fixed asssets in 2006 and 2007. All variables are measured in 2006 unless otherwise specified. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 3
Cross-firm impact cash on investment - 2007-2014

Financial constraints criteria	Constrained	Unconstrained	Difference (p-value)
Age	*Young*	*Old*	
	0.0891***	0.0387***	0.00***
	(0.006)	(0.009)	
	114,327	*67,210*	
Size	*Small*	*Large*	
	0.095***	0.085***	0.25
	(0.007)	(0.010)	
	59,406	*59,203*	

Notes: This table presents the estimates of relative-to-rivals cash on cumulative investment growth from 2007-2014 across different groups of firms. Firms are classified on the basis of proxies for financial constraints based on their age and size. Constrained firms in terms of age are firms that are 10 years or younger and unconstrained firms are firms older than 20 years. Constrained firms in terms of size are firms in the bottom quartile of the total asset distribution and unconstrained firms are those in the top quartile. All variables are measured in 2006 unless otherwise specified. All regressions include the control variables as specified in model (1) and include 4-digit industry and region fixed effects. Standard errors allow for corrrelation at the 4-digit industry level. The last column presents the p-value associated with the F-tests that compare the coefficients between the constrained and unconstrained subgroups. The number of firms in each group is in italics. Standard errors are in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 4
Cross-firm impact cash on market share - 2007-2014

Financial constraints criteria	Constrained	Unconstrained	Difference (p-value)
Age	*Young*	*Old*	
	0.052***	-0.004	0.00***
	(0.010)	(0.008)	
	108,351	*65,772*	
Size	*Small*	*Large*	
	0.067***	0.019***	0.00***
	(0.006)	(0.009)	
	54,952	*57,905*	

Notes: This table presents the estimates of relative-to-rivals cash on cumulative investment growth from 2007-2014 across different groups of firms. Firms are classified on the basis of proxies for financial constraints based on their age and size. Constrained firms in terms of age are firms that are 10 years or younger and unconstrained firms are firms older than 20 years. Constrained firms in terms of size are firms in the bottom quartile of the total asset distribution and unconstrained firms are those in the top quartile. All variables are measured in 2006 unless otherwise specified. All regressions include the control variables as specified in model (1) and include 4-digit industry and region fixed effects. Standard errors allow for corrrelation at the 4-digit industry level. The last column presents the p-value associated with the F-tests that compared the coefficients between the constrained and unconstrained subgroups. The number of firms in each group is in italics. Standard errors are in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Table 5
Cross-industry impact cash on market share growth - 2007-2014

Industry criteria	Low	High	Difference (p-value)
Panel A			
Rivals' size	0.036***	0.011	0.00***
	(0.007)	(0.016)	
	94,088	*48,445*	
Rivals' age	0.038***	0.012*	0.00***
	(0.009)	(0.007)	
	88,508	*40,072*	
Rivals' intangibles	0.007	0.032***	0.00***
	(0.013)	(0.009)	
	47,322	*90,322*	
Panel B			
Concentration	0.037***	-0.002	0.00***
	(0.010)	(0.010)	
	94,701	*14,391*	
Depth crisis	0.035***	0.011	0.00***
	(0.010)	(0.013)	
	36,867	*58,253*	

Notes: This table presents the estimates of relative-to-rivals cash on market share growth between 2007-2014 across different industries. Market share growth is defined as the percentage change of the firm's assets relative to its total industry assets (at 4-digit industry level). Industries are classified on the basis of different criteria. *Rivals' size* captures the industry average firm size and *Rivals' age* the industry average firm age. *Rivals' intangibles* captures the industry average of the share of intangible assets in fixed assets. *Concentration* equals the industry's Herfindahl index based on turnover. *Depth crisis* is captured by the growth in value added between 2007 and 2010. All measures are calculated at the 4-digit industry level except concentration and depth crisis which are calculated at the 2-digit industry level. *Low* industries are those ranked in the bottom quartile of the respective distribution and *High* industries are those ranked in the top queartile of the same distribution. All industry characteristics, except depth crisis, are measured in 2006. All regressions include the control variables as specified in model (2) and include region fixed effects. Standard errors allow for corrrelation at the 4-digit industry level. The last column presents the p-value associated with the F-tests that compared the coefficients between the high and low subgroups. The number of firms in each group is in italics. Standard errors are in parentheses. *** indicates significance at the 1% level, ** at the 5% level, and * at the 10% level.

Appendix Table A1
Variable Definitions and Sources

Variable	Definition	Source
ΔlnFA	Log difference of fixed assets between 2007 and year 2007+ j (crisis period) or between 2001 and 2001 + j (tranquil period)	FAME
Relative cash	Cash holdings of the firm minus the (4-digit) industry mean cash holdings and divided by the (4-digit) industry standard deviation. Cash holdings equal deposits divided by total assets.	FAME
Mature	Dummy equal to one if the firm is between 10 and 20 years old	FAME
Old	Dummy equal to one if the firm is older than 20 years	FAME
Group	Dummy equal to one if the firm has a parent or is part of a group, which we define as a firm that reports an ultimate owner in FAME	FAME
Public	Dummy equal to one if the firm is publicly listed	FAME
Size	Log of total assets	
Leverage	Total liabilities over total assets	
Pre-Investment	Log difference of fixed assets between 2005 and 2006 and between 2006 and 2007 (crisis period) or between 1999 and 2000 and between 2000 and 2001 (tranquil period)	FAME
Pre-Turnover	Log difference of turnover between 2005 and 2006 and between 2006 and 2007 (crisis period) or between 1999 and 2000 and between 2000 and 2001 (tranquil period)	FAME
Pre-Profit	Profit growth between 2005 and 2006 and between 2006 and 2007 (crisis period) or between 1999 and 2000 and between 2000 and 2001 (tranquil period)	FAME
%ΔMShare	Growth rate of the firm's market share between 2007 and year 2007+ j (crisis period) or between 2001 and 2001 + j (tranquil period), where market share is defined as the ratio of the firm's assets over the total industry assets (at 4-digit level).	FAME

This table shows variables definitions and data sources for all the variables used in the empirical analysis.