Value of financial flexibility, investment efficiency and adjustment speed of working capital

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Abstract

We investigate effects of value of financial flexibility (VOFF) on efficiency of corporate investment in working capital (WC) and speed of adjustment of working capital (SOA of WC). Using a sample of 8204 non-financial US firms over the period 1978-2013 we find that firms with higher VOFF suffer from both overinvestment and underinvestment in WC, especially for overinvestment problem. Additionally, we show that firms managing WC on active basis have higher SOA of WC than those adopting a passive approach. Our investigation also reveals that SOA of WC is higher for firms with WC above target level and lower for firms whose level of WC is below optimal level. More importantly, we evidence that VOFF increases SOA of WC and the main channel in which VOFF increases firms' WC adjustment is via effects on the past deviation from target WC rather than changes in target WC. We also find that the SOA of WC is a decreasing function of level of financial constraint and that the positive effect of VOFF on SOA of WC is only significant for financially constrained firms. Furthermore, SOA of WC is highest for firms in specialized industries and lowest for standardized industries and positive effect of VOFF on SOA of WC is merely significant for standardized industries. These results indicate that maintaining and achieving financial flexibility is vital in order to avoid investment distortions in WC. The results also support the substituting role of WC and other source of internal liquidity like cash reserve and provide evidence regarding the first-order important role of financial flexibility in WC - related decisions.

Key words: *Value of financial flexibility, WC investment efficiency, WC speed of adjustment, financial constraint, product market competition, industry condition.*

1. Introduction

Value creating role of financial flexibility and its effects on financial corporate decision making has been widely discussed in literature in recent years. Contradict to arguments which undermine role of financial flexibility in the context of perfect capital markets, Gamba and Triantis (2008) suggest that financial flexibility enables firms to undertake profitable investments, to avoid underinvestment and attenuate threat of bankruptcy when facing negative shocks of cash flows. Gamba and Triantis (2013) also show that liquidity management is the key element in an integrated risk management system, given the limited availability of derivatives for a wide range of risks and high adjustment costs associated with operating flexibility. Many empirical studies provide evidences that financial flexibility can lead to superior stock performance as a result of reduced investment distortions (Marchica and Mura, 2010, Arslan-Ayaydin et al., 2014). Meanwhile, considerations of financial flexibility also influence on almost all important financial policies. Agha and Faff (2014) find that inflexible firms are more (less) sensitive to bad (good) new than flexible firms. Rapp et al. (2014) report evidence that firms with high VOFF will have lower dividend payment, prefer to opt share repurchase in lieu of dividend, tend to hold more cash and pursue a conservative debt policy. Financial flexibility also affects the way in which firms design their hybrid securities such as callable and convertible bonds (Tewari et al., 2015, Dong et al., 2013). Consequently, top US and Euro executives consider financial flexibility as the first - order important factor in financial – decision making (Graham and Harvey, 2001, Brounen et al., 2006) and perhaps being especially critical in recession, which is characterized by aggregate negative shocks to corporate income, reductions in equity values, and shortage of credit supply (Ang and Smedema, 2011, Campello et al., 2010). Until now, however, the empirical studies in this research area have been scarce (Rapp et al., 2014) and interesting and unsolved research questions have still remained relating to what extent flexibility considerations are first - order determinants of corporate financial policies (Denis, 2011).

Unlike studies on financial flexibility, many aspects of WC has long been investigated in finance literature since components of WC and net WC itself represent a significant portion of firm’s total assets[1]. Importantly, WC may compete with fixed investments for a limited pool

[1] According to Beauchamp et al. (2014) in 2012, total inventory value was at $375 billion, accounting for 6% total assets and 33% total equity; Accounts receivable represents around 18-21% of total assets among US public firms.

of financing sources (Fazzari and Petersen, 1993), implying that a lack of internal source of finance can lead to suboptimal investment in WC. Prior studies have showed that investment in WC is suboptimal and firms typically ignore the role of WC as a potential fund for growth (Buchmann et al., 2008) although there is much room for improving its efficiency (Ek and Guerin, 2011). A recent study of 1000 US companies by Ernst&Young (2015) show that in 2014 the value of overinvestment in WC is from $385 billion to $700 billion, equivalent 3% to 6% of sample firms' sales. Such overinvestment in WC reduces free cash flows which otherwise should be set aside for long term investment projects. Also, high level of WC may leads to high costs of debt and risk of bankruptcy (Aktas et al., 2015b) and decreases firm value (de Almeida and Eid Jr, 2014, Baños-Caballero et al., 2014). Partially because of this, given current level of investment of WC of US public firms shareholders evaluate each additional value of WC investment less than one dollar (Kieschnick et al., 2013).

However, WC can also serve as a source of liquidity and provides an avenue to avoid relying on other alternative internal financial reserves. Faced with fluctuations of cash flows used for fixed-capital investments, firms can smooth these fluctuations with WC (Fazzari and Petersen, 1993). Shifting between cash and inventories is also evidenced by many recent empirical studies (Almeida et al., 2014, Foley et al., 2007, Bates et al., 2009). Although level of liquidity being smaller than cash, account receivables can be utilized as an alternative of cash in providing financing to customers in order to boost sale and profitability or firms can also force early payment from customers to enhance WCM efficiency (Hill et al., 2012). Thus, it is logical to argue that there are natural inter-linkages between components of WC, NWC as a whole and internal financial flexibility level as well as value of financial flexibility.

Motivated by prior studies which provide evidence on routes to achieve financial flexibility, effects of financial flexibility and VOFF on other corporate decisions as well as the interrelations between components of WC, we combine two strands of literature via the lens of financial flexibility to comprehensively examine relations between VOFF and investment efficiency in WC and SOA of WCR. In particular, it is well evidenced that firm's effective investments in WC are valuable since they increase performance and reduce risk, which can in turn result in reduced cost of capital (Aktas et al., 2015b). However, we go a further step to argue that the firm ability and magnitude of these investments in WC largely depend the availability of internal flexibility (cash and cash flows) and how efficiently it is used for future growth. Since WC can compete with fixed capital investments for a limited pool of funds, shortage of internal funds can force firms to underinvest into elements of WC. That is, there is an implicit relation between VOFF and efficiency of investment in WC. From another perspective, like some previous studies (Bates et al., 2009, Harford et al., 2014) we argue that WC can serve as an internal flexibility in addition to cash holding. In particular, highly unnecessary levels of WC can be released to increase internal flexibility (cash reserves) for other capital investments. Meanwhile, firms can use cash along with take advantage of extended trade credit by suppliers and other short term credits. All these, while helping to reduce costs of financing in WC, they also present an interdependence between changes in WC and cash holding, and thus VOFF.

Toward the purpose of investigation these relations, we aim at providing empirical evidence on following research questions: (1) Is there a link between VOFF and investment efficiency in WC? (2) Whether or not the VOFF as perceived by shareholders affects the SOA of WC and (3) How does this relation, if any, change in accordance with firm's operating and financial conditions? To the best our knowledge, this is the first study investigating such questions in a formal way. To answer these questions, we rely on a sample of 8024 US public firms over the period of 1978-2013. We find the weak evidence that VOFF is negatively correlated with underinvestment in WC, partially supporting our conjecture on the valuable role of accumulation enough internal financial flexibility for investments in current assets. Meanwhile, we also find out a negative relation between VOFF and overinvestment, consistent with the recent empirical evidence that WC can be a substitution of cash and that overinvesting in WC is associated with lack of cash reserve, as the most liquid asset, due to a high portion of cash flows has been invested in WC.

We find that SOA of WCR is higher for firms which manage actively WC since these firms have lower adjustment costs and it also higher for firms with WCR level above the target level, consistent with the perception that adjustment costs associated with building WC being higher than depleting. Our analysis also shows that VOFF is positively associated with change in WCR. More importantly, on average a firm with higher VOFF also speeds up its WCR to optimal level via channels such as changes in target WCR and past deviation from target WCR, with the later channel is the main mechanism.

We also argue that if a firm commits to capital investment for future growth, difficulties in access external capital markets in absence of highly prohibited costs can force firm to rely more on WC apart from other sources of internal flexibility. Our results reveal that SOA of WC is lower for financially constrained firms and that VOFF positively affects SOA of WC for constrained firms, supporting the idea that consideration of financial flexibility in WC - related decisions is more important for firms with difficulties in obtaining external capital.

We also consider how type of industries in which firms are operating affects the SOA-VOFF relation. Studies show that firms buying or selling specialized goods take and extend more trade credit than those are in business of standardized materials and products due to deeply rooted relationship between firms in industries specializing in specialized goods. Switching costs of customers are also higher and it is also easier to reinforce payment from suppliers and seizure of goods supplied. We find that SOA of WC for firms operating in differentiated/specialized industries is higher than those of firms in service industries and standardized industries. With respect to effect of VOFF on SOA, although the coefficient of VOFFs x $TWCR_{i,t}$ (s=03,13,23) are positive across industries, they are only significant for standardized industries. This may indicate that consideration of financial flexibility is most relevant for firms with highest WC adjustment costs and less likely to be financed from partners in supply chain.

While we are the pioneer in investigating effect of VOFF on investments in WC, especially literature on SOA of WC and overinvestment in WC mentioned in recent studies (Aktas et al., 2015b), this study contributes to different strands of literature. Firstly, we provide the evidence of importance of financial flexibility considerations in investment in WC and reconfirm role of cash reserve as the most important firm flexibility. In this regard, this study adds more evidence on effect of VOFF on corporate financial decisions (Rapp et al., 2014). Secondly, it is also related to literature on liquidity management by providing evidence of substitution between WC and cash as alternative devices for corporate internal liquidity (Bates et al., 2009). Equally important, this study indirectly reconfirms value-creating role of WC in the sense that it can employed as internal liquid assets in addition to cash reserve as a precautionary motive. As such, it has vital implications for academics and top corporate executives.

The rest of the paper is organized as follows. The next section summarizes relevant literature and develops the testable hypotheses. Section 3 describes the research design. Section 4 and 5 present the main results and extended analysis, respectively. Section 6 reports some robust analyses and section 7 is conclusion.

2. Literature review and hypothesis development

2.1 Overview of literature on financial flexibility

Given the first-order important determinant in corporate financial decision making, firms can achieve financial flexibility by many routes. One of the most popular and effective avenues to meet firm's demand for capital is to reply more on internal source of capital such as cash flows and cash holding (Gamba and Triantis, 2013). Facing with limited access to external capital firms reply more internal cash flows for investment spending (Almeida et al., 2004). Also, high cash reserve is associated with less underinvestment problem, especially for firms with high growth opportunities, high volatility in cash flows and low correlation between investment opportunities and cash flows (Opler et al., 1999, Denis and Sibilkov, 2010). However, the flexibility via cash reserve, can be made at the discretion of managers and not aligned with shareholders' best interests due to agency costs of free cash flows and overinvestment (Harford, 1999). Furthermore, even with smaller cash holding diversified firms can benefit from their ability to switch funds from low efficient divisions to finance more promising divisions (Matvos and Seru, 2014).

In addition to cash reserves, financial flexibility can be achieved by changes in dividend policy. In particular, managers can retain cash from dividend reduction to improve firms' investment ability in long term profitable projects (Bliss et al., 2015). Compared with cash dividend, share repurchases is more flexible form of payout in that it can be adjusted depending on nature of earning streams, which is either permanent or non-recurring. As a result, firms which are more likely to face financing frictions, characterized by more volatile cash flows and higher non-operating cash flows, tend to distribute current excess cash via repurchase in lieu of cash dividends (Jagannathan et al., 2000). Bonaime et al. (2014) also argue that risk management (in terms of financial hedging via derivatives) are likely to affect level and form of pay out, favouring repurchase, to achieve financial flexibility, supporting the idea that pay-out flexibility can provide benefits of operational hedging.

A conservative debt policy also increases financial flexibility. DeAngelo and DeAngelo (2007) show that one optimal financial policy should combine high cash holdings and a low leverage in order to preserve accessibility to low-cost sources of external capital for future investments or growth opportunities. While using a low/or zero debt policy can be prevalent, its purpose can be different for different firms. Specifically, unconstrained firms use low debt level but accumulate cash to preserve borrowing capacity for future investments. Meanwhile, constrained firms avoid debt usage to eliminate conflicts between shareholders and debt holders and thus reducing debt overhang and the underinvestment issue (Dang, 2013).

Some recently studies also attempt to investigate how financial flexibility affects firm value and corporate financial decisions. In a theoretical study, Gamba and Triantis (2008) analyse dynamic relationships between financing, investment, cash and pay-out policies and show that VOFF depends on many factors such as cost of external financing, profitability, the firm's growth opportunities and maturity, the effective cost of cash holding and reversibility of capital. Following Gamba and Triantis (2008), there are some empirical studies show that financial flexibility indeed affects capital structure decision (Byoun, 2011, Clark, 2010), cash holding (Chen et al., 2013) and many other financial policies (Rapp et al., 2014). Agha and Faff (2014) also find that inflexible firms are more (less) sensitive to bad (good) new than flexible firms.

2.2 Working capital literature

The literature on WC[2] can be divided into some main following strands. The first one relating to determinants and effects of each elements of WC on firm performance and value. With regards to trade credit, an incomplete list of studies includes determinants of trade credit (Petersen and Rajan, 1997), trade credit and stock return (Jones and Tuzel, 2013), trade credit terms and bankruptcy risk (BARROT, 2015), trade credit as a defence of market (Singh, 2015). Similarly, some recent representative studies on inventory include inventory and firm performance (Belo and Lin, 2012), inventory investment and the cost of capital (Jones and Tuzel, 2013), inventory and asset price (Chen, 2016), inventory and corporate risk management (Bianco and Gamba, 2015). Another related literature strand is related to value of individual components of WC. For example, Hill et al. (2012) show a positive link between trade credit extended and excess return and equity investors discount value of accounts receivable for unconstrained firms, implying that investors view trade credit extended as a substitution for cash because if the account receivable is a substitute for cash, its value should increase with magnitude of financial constraint. Hill et al. (2013) provide evidence regarding marginal value of payable. Specifically, there is a positive relation between accounts payables and shareholder

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[2] In a broad sense, Fazzari and Petersen (1993) define WC as the difference between current assets (cash, account receivable and inventories) and current liability (account payable and short term debt). However, to be consistent with the general practice we adopt the concept of net operating WC (NWC) in empirical specifications. Shareholders are concerned about NWC in addition to its individual elements because it represents the net resource commitments to WC.

value but the marginal value of accounts payable is smaller than cash. Beauchamp et al. (2014) show that shareholders assign a positive value each additional value of inventory, but smaller than cash and/or account receivables and that the shareholder wealth effect of inventory strengthens with financial constraint, suggesting that accumulation of inventories by constrained firms is highly valuable.

The second strand of literature focuses on determinants of WC, with the especial focus on net operating working capital (NWC). NWC determinants are investigated in literature include operating conditions (sale growth, contribution margins, sale volatility, competition), ability to finance (operating cash flow, financial constraint and cost of external financing, market power and financial distress) (Hill et al., 2010). Also, the third stand is about effects of aggregated WC on profitability, risk and firm value. Kieschnick et al. (2013) show that there is a positive linkage between WC and shareholder value and given the current level of WC, additional WC can lead to reduction in firm value. They also show that while marginal value of additional WC is smaller than value of each additional cash reserves, which is consistent with the Faulkender and Wang (2006)'s findings, it is larger than that of inventory. Aktas et al. (2015b) also show that an aggressive WC strategy also increases firm risks for firms with negative excess NWC, not for firms with positive NWC.

In addition to studies on SOA of WC (Baños-Caballero et al., 2013), Baños-Caballero et al. (2014) present evidence of the inverted U-shaped relationship between investment in WC and firm performance and WC optimal level is lower for more financially constrained firms. Aktas et al. (2015b) show that operating and stock performance increase when level of WC are closer to optimal level and reduction in excess NWC in the this is utilized to finance fixed investments like cash acquisitions and capital expenditure in next year. Most recently, Filbeck et al. (2016) evidence that shareholders reward firms with superior WCM strategies with higher raw and risk-adjusted performance over longer holding periods across the economic cycle, especially in bear market cycles.

Motivated by these research, we aim at investigating the linkages between financial flexibility and WC. In particular, the focus of this research is on whether VOFF affects investment efficiency in WC and to what extent considerations of financial flexibility affect SOA of WC. We also investigate how this relation varies across financial and industry conditions. The unique feature of the paper is it investigates this relation from equity investors' perspectives.

By this way, we eliminate endogeneity between financial decisions and WC. To our best understanding, this is the first study investigating such associations in a formal way.

2.3 Hypothesis development

Investments in WC come with it both costs (financing costs, opportunities costs) and benefits (boosting sales, risk of inventory shortage, providing financing for long term assets) (Ding et al., 2013) and have significant impacts on a firm profitability, risk and hence firm value (de Almeida and Eid Jr, 2014). While it is necessary to invest into WC for growth and reducing risks, firm's ability to adjust WC investment is determined by its financial flexibility. For instance, to extend trade credit for customers firms need to have sufficient internal funds and/or enable to access to alternative sources such as supplier's finance, especially when faced with shortage of cash flows (Harris, 2015). Operational literature also shows that uncertainties in demand and costs associated with shortage of inventories make holding a reasonable level of inventory valuable. Moreover, while inventories can be financed from many sources, firms prefer using internal capital of finance to trade credit taken and bank loans and this perking order pattern of inventory financing depends magnitude of financing need (Yang and Birge, 2013, Kouvelis and Zhao, 2012). Importantly, Fazzari and Petersen (1993) show that faced with negative shocks in cash flows, firms react by cutting rate of investment but this reduction rate is lower for fixed capital because WC is more liquid with lower adjustment costs and lower losses attributable to perishability of projects. As a consequence, WC can compete with fixed investment for a limited pool of financing sources. When the pool of financing resources becomes more constrained, firms switch to investments with shorter payback period, less risky and utilization of more tangible assets (Almeida et al., 2011).

The aforementioned analysis suggests that lack of internal source of finance like cash can lead to suboptimal investment in WC. Value of each incremental investment in cash as a device for financial flexibility depends on many factors: growth opportunities, profitability, costs of external finance, effective cost of cash holding, reversibility of assets (relative flexibility of production technology) (Gamba and Triantis, 2008). By our empirical construction, VOFF is perceived as equity investors' evaluation of firm's internally financial flexibility. Higher VOFF means that the firm is in high need of being internally financial flexible, which becomes more valuable when internal liquidity level is inefficient for value - creating activities low due to external - financing frictions. Furthermore, VOFF via cash holding is ultimately determined by how the market expects that cash to be used, changes in value of cash should be reflected in the ex-post use of cash resources (Alimov, 2014) and whether or not firms have enough cash for value increasing activities. This motivates us to impose the first hypothesis.

H1. VOFF is negatively related to efficiency of investment in net working capital, ceteris paribus

As a strategic investment, WC is often managed based on a target level because investment in WC is involved in both costs and benefits, contingent on whether conservative or aggressive WC strategies are employed. For an conservative strategy, maintaining a high level of inventory helps reducing interruptions in production process, avoiding inventory shortage and hedging against adverse fluctuations in input prices (Blinder and Maccini, 1991). Also, by extending trade credit to customers firms can boost sale, encourage customers to buy at the time of low demand (Emery, 1987) and strengthen long-term customer relationship (Ng et al., 1999). However, a positive WCR needs to be financed by free cash flow or external sources, which is inevitably involved in opportunity costs and costly financing costs (Hill et al., 2010). For an aggressive strategy, by minimizing level of capital investment firms expect to increase sales and reduce holding costs. However, low levels of inventory and trade credit impose firms to be at risk of inventory shortage and sale reduction. Similarly, an increase in suppliers' financing can result in losing discounts for early payments (Wang, 2002).

In addition, WC is also perceived as an internal source of finance and this help to explain why firms also manage WC in a dynamic pattern. For example, shifting between cash and inventory is evidenced by many previous empirical studies. One of the determinants for increasing cash reserve is reduction in inventories (Almeida et al., 2014, Foley et al., 2007, Bates et al., 2009). Although such reductions in inventory can be attributed to firm adoption of just-in-time inventory management system and innovations in supply chain management, firms are actually holding more cash after adjustments for such practices (Chen et al., 2005, Gao and Chou, 2015), possibly indicating an underlying substituting relation between cash and inventory. Indeed, Kulchania and Thomas (2014) show that reduced inventory increases the likelihood of higher expected costs associated with disruptions in supply chain, which in turn motivates firms to holding more cash.

Apart from that, Aktas et al. (2015b) show that financial flexibility increases, both in the short term and long term, when an average firm releases cash from reducing unnecessary portion of WC and reduce needs to finance WC. Accordingly, excessive WC can be deployed to undertake value increasing projects, leading to increase firm performance. Since there exists an interrelationship between cash, as a main source of financial flexibility, and other elements of net WC, we argue that if firms aim at an optimal NWC policy by reducing overinvested elements and increase underinvested portion we should observe a corresponding reduction and increase in the need for financial flexibility via cash policy, implying an expected positive relationship between VOFF and NWC. Stated differently, considerations of financial flexibility should be an important factor and have a bearing effect on rebalancing WC. Therefore, we put the following hypothesis.

Hypothesis 2: VOFF is positively associated with SOA of WC, ceteris paribus.

Financial economists have long argued that for normal firms, like cash flows, high (low) magnitude of WC can correspondingly shift the demand for investment to right (left) and that changes in WC, which is positively related to sale, growth and business cycle, are positively correlated with fixed investment level. For financially constrained firm, due to limited ability to access to external capital to finance for growth, if internal sources of funds (cash flows and cash) is insufficient to meet investment needs, firms must rely on other internal capital such as WC when firms commit to a constant rate of fixed investment. In the face of shocks in cash flows firms can adjust WC level, even setting WC level at negative level as a solution to smooth the fixed-investment (Fazzari and Petersen, 1993). WC can be also used to build up cash in a precautionary manner (Opler et al., 1999, Almeida et al., 2004, Bates et al., 2009, Aktas et al., 2015a).

However, mechanisms by which firms should take to overcome financial constraint differ cross sectionally and are not the same across specific individual elements of WC. From buyers' side, taking trade credit from suppliers helps buyers to alleviate financing frictions, which otherwise will suffer from underinvestment (Almeida et al., 2004, Nadiri, 1969), and even threats of survival (Cunat, 2007). Likewise, Ding et al. (2013) find that in presence of the limited access to long-term capital markets firms can use WC as an additional internal fund by take advantage of trade credit provided by suppliers or reduce extended trade credit to customers. Furthermore, trade credit taken signals customer's creditworthy and future prospects, reducing future costs of financing. This role of signalling device also explains why constrained firms extensively use trade credit (Petersen and Rajan, 1997, Atanasova, 2007, Biais and Gollier, 1997). When macroeconomic conditions are uncertain firms, especially the large and high growth ones, tend to take more credit from suppliers (Baum et al., 2003). Bastos and Pindado (2013) also find that firms facing with credit constraint tend to delay payments to suppliers in order to avoid insolvency risk and this is especially popular for high-risk firms. However, the nontrivial costs of extending trade credit make it more difficult for constrained downstream firms to strategically use supplier financing to increase market share and firm value. That means, financially constrained suppliers might forgo sales that are contingent upon the customer's receipt of selling financing (Nadiri, 1969). Consistent with this intuition, some previous studies find that firms substitute commercial papers or/and credit lines with trade credit (Calomiris et al., 1995, Petersen and Rajan, 1997, Kling et al., 2014). From the sellers' side, Meltzer (1960) suggests that an unconstrained upstream firm can extend trade credits for constrained downstream firms to maintain its prospect of sale growth and customer relationships but constrained firms are less likely to do so (Molina and Preve, 2009). Given constrained firms' higher marginal financing costs and limited ability to externally finance, equity markets may prefer sellers to preserve funds for R&D opportunities, instead of funding inventory and receivables. As a result, equity investors discount value of receivables for constrained firms (Hill et al., 2012). Since unconstrained firms can access capital markets for speculative or precautionary purposes, the liquidity value for unconstrained firms can be lower, consistent with perception that value of one dollar in cash holding is significant lower for unconstrained firms relative to constrained firms (Faulkender and Wang, 2006, Denis and Sibilkov, 2010).

For other components, Caglayan et al. (2012) show that in the face of sale uncertainty - demand shocks, constrained firms increase inventory build-up, holding more liquid assets and more trade credit granted from suppliers. Beauchamp et al. (2014) find that the shareholder wealth effect of inventory strengthens with financial constraint because a constrained firm find it is more difficult to hedge input price risk and stock-outs. Moreover, Mateut (2014) and Daripa and Nilsen (2011) also show that prepayment made by customers to suppliers is needed to create incentive for the later to supply necessary inputs for the former, which lead to increase in inventories of financially constrained suppliers. Furthermore, the ability to make such larger prepayments is more likely for firms with better access to bank loans (Mateut, 2014).

At the aggregated level, the firm's level of NWC at a particular point of time can deviate from optimal level because it is challenging to forecast exactly such factors as sales, changes in monetary policy, rates of customer defaults and purchases (Nadiri, 1969), changes in costs of production inputs and technological advancement (Peles and Schneller, 1989), among others. Moreover, changes in inventory, receivables and account payables introduce costs of financing. Accordingly, Hill et al. (2010) show that the higher costs of external finance contribute to the lower the SOA of WC and that firms with costly external financing and higher likelihood of financial distress use an aggressive WC strategy which is opposed their counterparts. Moreover, Baños-Caballero et al. (2014) also argue that for financial constrained firms the additional value of cash and WC can be higher because internal cash flow helps to avoid higher external financing costs. This is opposed to unconstrained firms that easily raise capitals to buy inventories in the face of demand shocks. Consequently, wealth effect should be stronger for constrained firms.

The above analyses indicate that firm's ability to adjust individual components of WC and aggregated WC varies with firm's level of financial flexibility (i.e., cash level) and firms' ability to access external capital. Since the firm's current NWC may not be always equal to its optimal WCR and SOA depends on firm's characteristics and accessibility to external capital markets and internal financial flexibility. We argue that the SOA of WC should be higher for unconstrained firms and VOFF should have more bearing effects on constrained firms.

H3. SOA of WC is higher for unconstrained than constrained firms and the positive relationship between VOFF and SOA of WCR is stronger for financial constrained firms versus unconstrained firms.

Industries in which firms is operating also affects SOA of WC via elements of WC. Diversion theory, proposed by Burkart and Ellingsen (2004), indicates that firms with large proportion of differentiated or service inputs take more trade credit than standardized inputs. The rationale is that standardized products are easily diverted for other purposes and their associated switching costs are also smaller. While this makes customer-seller relationships become weaker it also discourages suppliers to use trade credit for price discrimination. Therefore, manufacturers that sell or buy differenced products use more trade credit, both extended and taken, than those with standardized goods, or those from other industrial sectors (Giannetti et al., 2011). Molina and Preve (2009) also argue that the nature of the products (service, differentiated, standardised goods) determines the time needed to assess its quality and costs of switching suppliers and the liquidation value, which influence buyers' default risk. As shown by Giannetti et al. (2011), credit terms vary by industry, implying the benefits and value of trade credit are conditional on industry type. Meanwhile, suppliers extend less trade credit to firms purchasing more deployable inputs (retailers) because these items are easier to liquid, yielding cash that is easy to divert, influencing the collateral value, hence default risk of the loan (Burkart and Ellingsen, 2004).

Meanwhile, according to theory of liquidating collateral developed by Longhofer et al. (2003), since services and processed goods have no and/or less liquidation when customers go to bankruptcy sellers in standardized industry are less likely to resell at a higher price because standardized products have a reference price, which is in contradiction to differentiated goods that are often tailored to a small number of customers (Giannetti et al., 2011). Also, when goods are specialized, switching costs of suppliers are typically be higher and suppliers are also easier in credit enforcement than creditors like financial intermediaries and sellers in other types of industry. As a result, firms with higher proportion of service inputs and processed goods receive less trade credit from suppliers. Additionally, since it is also more difficult for buyers to transform or resell specialized goods, suppliers in differentiated industries become more advantageous over other creditors and suppliers in other type of industries in seizing and reclaiming goods provided to customers[3] (Petersen and Rajan, 1997).

Fabbri and Menichini (2010) also argue that the lower transaction costs in repossession induce a seller to offer the goods on trade credit. This advantage is more pronounced for differentiated goods because they are tailored to needs of fewer customers, and it harder to identify suitable buyers to obtained reference prices. Therefore, trade credit should be greater if the sellers have capacity to reinforce payments via the threat of termination of the specialized goods or seizure of good supplied, and buyers should have less incentive to renege on payments of trade credit when it is offered. As a result, when the specialized goods is transacted, trade credit volume increases (Cunat, 2007). Mateut et al. (2015) also show that the relationship between trade credit extended and inventory composition is stronger in sectors trading specific goods. With the argument that SOA of WC is higher for firms with higher ability to access to many sources of finance and that, in the context of working capital management, consideration of financial flexibility is most relevant for firms in the industry where firms are less likely to get finance from their partners in supply chain, we put the following hypothesis.

H4. SOA of WC is higher for differentiated and service industries than standardized industries and the positive relationship between VOFF with SOA of WCR is most relevant for standardized industries.

[3] The liquidation motive can be limited by legal system. For example, in US legal system sellers can only repossess the goods sold within 10 days from delivery while in EU, there is no limitation on repossession (Giannetti et al., 2011, Mateut et al., 2015) .

3. Research design

3.1 Estimating value of financial flexibility

Different from most of other studies in this research area which use level of financial flexibility, we, instead of, adopt and modify the newly developed measure of value of financial flexibility. According to Gamba and Triantis (2008), VOFF is determined by five factors including growth opportunities, profitability, cost of cash holding, cost of external financing and liquidation value of capital. They argue that firms with an optimal liquidity policy can compensate for low exogenous financial flexibility. Following this theoretical argument and methodology of Faulkender and Wang (2006), Rapp et al. (2014) build a measure for VOFF based on five dimensions with weights based on marginal value of unexpected changes in cash holding. By doing so, this measure reflects market (forward – looking) perspective on the most predominant means to ensure financial flexibility (Almeida et al., 2014), dependent on firm business model and not affected by previous financial decisions (Rapp et al., 2014). The rationale for measuring weights of five factors based on market view on cash holding is that cash reserve can be seen as precautionary means, shielding firms from adverse cash flow shocks and cash policy is more important for constrained firms (Almeida et al., 2004, Duchin, 2010). Thus the measure for VOFF is superior to other individual traditional proxies (cash, leverage, dividend pay-out, age and size) and it also very much better off than sensitivity-based measures (investment-cash flow sensitivity (Fazzari et al., 1987), cash-cash flow sensitivity (Almeida et al., 2004) and index-based measures (KZ index (Kaplan and Zingales, 1997), WW index (Whited and Wu, 2006)). These traditional measures, though just to measure financial constraint which is one aspect of financial flexibility, been widely used and have received many critics in literature.

To calculate the final VOFF we conduct following steps:

Step 1: Estimating marginal value of cash holding

$$r_{i,t} - r_{i,t}^{B} = \gamma_0 + \gamma_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_2 SGR_{i,t} + \gamma_3 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_4 T_{i,t} + \gamma_5 Spread_{i,t} + \gamma_6 Tang_{i,t}$$

$$+\gamma_7 SGR_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_8 \frac{\Delta E_{i,t}}{M_{i,t-1}} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_9 T_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{10} Spread_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{11} Tang_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}}$$

$$+\gamma_{12} \frac{C_{i,t-1}}{M_{i,t-1}} + \gamma_{13} \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_{14} \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \gamma_{15} \frac{\Delta I_{i,t}}{M_{i,t-1}} + \gamma_{16} \frac{\Delta D_{i,t}}{M_{i,t-1}} + \gamma_{17} ML_{i,t} + \gamma_{18} \frac{NF_{i,t}}{M_{i,t-1}} + \gamma_{19} Z_{i,t} + \varepsilon_{i,t} \quad (1)$$

Rapp et al. (2014) and some prior studies (Faulkender and Wang, 2006) use returns on 25 Fama and French portfolios formed on Size and Book to Market (BM) as the benchmark returns.

Under this method, every stock is grouped into one of 25 portfolios based on Size and B/M. Benchmark return of stock i at every year t is the return of portfolio to which stock i belongs to at the year t-1. Excess return of stock i is the difference between stock i's return and its benchmark return. However, we suggest that the weakness of this method is that it just accounts for size and BM characteristics but ignores the market returns. This can make excess return be biased which then distorts value of financial flexibility, VOFF. To overcome this limitation and to get more accurate figures of stocks' excess returns, we determine the abnormal return $(r_{i,t} - r_{i,t}^{B})$ in equation (1) as the difference between monthly returns of stock i relative to fitted value OLS regression equation of stock i's return against returns three-factor Fama and French portfolio (Fama and French, 1993). We then compound these excess returns for each stock i to get its corresponding annualized excess returns.

Whilst, ΔX (the independent variables) represents unexpected annual changes in variable X. We assume that expected change in X is equal to zero with the exception of cash. As such, expected and unexpected changes in cash are the fitted and residual values of equation (2), respectively. The equation (2), suggested by Almeida et al. (2004), represents the firm's propensity of cash out of cash flows.

$$\frac{C_{i,t}-C_{i,t-1}}{M_{i,t-1}} = \alpha_0 + \alpha_1 Q_{i,t-1} + \alpha_2 \frac{CFAL_{i,t-1}}{M_{i,t-1}} + \alpha_3 Size_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

Equation (1) is used to examine the market reaction to changes in cash holding. Given the potentially econometric issues regarding estimating of equation (2) and its extended version[4], We also calculated unexpected changes as the difference between cash reserve value in financial report in year t and year t-1. We focus on independent variables used to study the capital market reactions with respect to five determinants of VOFF suggested by Gamba and Triantis (2008), operationalized by Rapp et al. (2014). In particular, interaction variables reflect unexpected changes in cash with five determinants of financial flexibility, based on the assumption that unexpected changes in cash vary in accordance with five factors. Equation (1) also includes firm-specific factors controlling for factors affecting abnormal returns other than changes in cash, and also to make sure that the regression coefficients on interaction terms reflect the interactions but other factors. These factors can be divided in to some groups (i) investment policy represented by past cash holding ($C_{i,t-1}$), changes in asset net of cash ($NA_{i,t}$)

[4] Extended version is specified as follow: $\frac{C_{i,t}-C_{i,t-1}}{M_{i,t-1}} = \alpha_0 + \alpha_1 Q_{i,t-1} + \alpha_2 \frac{CFAL_{i,t-1}}{M_{i,t-1}} + \alpha_3 Size_{i,t-1} + \alpha_4 ACQ_{i,t-1} + \alpha_5 \Delta NWC_{i,t-1} + \alpha_5 \Delta STD_{i,t-1} + \varepsilon_{i,t}$

and research and development ($RD_{i,t}$); (ii) variables controlling for financial policy[5] such as interest expense ($I_{i,t}$), common dividend ($D_{i,t}$) market leverage ($ML_{i,t}$) and net financing (NF_{it}). Finally, we also control for effects of industry and year in regression. It is worth noticing that because variables in equation (1) are standardized by lagged market value of equity, the regression coefficients can be explained as dollar changes in shareholder value caused by one dollar change in the amount of cash reserve (Faulkender and Wang, 2006, Rapp et al., 2014).

Step 2: Computing value of financial flexibility.

Based on estimated regression coefficients for changes in cash and the interaction effects in equation (1), we calculate the VOFF of firm i in year t, as follows:

$$VOFF_{i,t} = \gamma_1 + \gamma_7 SGR_{i,t} + \gamma_8 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_9 T_{i,t} + \gamma_{10} Spread_{i,t} + \gamma_{11} Tang_{i,t} \quad (3)$$

Thus, in comparison to other proxies for financial flexibility used in prior studies, we directly estimate VOFF, which concurrently accounts for many firm characteristics. More importantly, VOFF reflects value that shareholders assign to a firm's financial flexibility, via estimated weights; hence, it is a market-based measure of financial flexibility and forward-looking in nature, not the level of financial flexibility used by many previous studies.

3.2 Determinants of net working capital

Following previous studies (Hill et al., 2010, Aktas et al., 2015b), we estimate inefficient parts of investments in WC as the residuals of equation (4). Net working capital (NWC) is a function of its determinants as follows.

$$NWC_{i,t} = \alpha_0 + \alpha_1 SGR_{i,t-1} + \alpha_2 SVOL_{i,t-1} + \alpha_3 CF_{i,t-1} + \alpha_4 DIFF_{i,t-1} + \alpha_5 AGE_{i,t-1} + \alpha_6 \mathrm{GPM}_{i,t-1} + \alpha_7 MP_{i,t-1} + \alpha_7 Q_{i,t-1} + \alpha_8 SIZE_{i,t-1} + \eta_j + v_t + \varepsilon_{i,t} \quad (4)$$

Where, NWC is the value of net operating WC scaled by firm's assets. Independent variables comprise of a set of proxies to control for firms' operating conditions (Sale volatility (SVOL), profit margin (GPM) and sale growth rate (SGR)) and their ability to finance operating WC, Cash flow (CF), information asymmetry and cost of external financing (Q), capital market access(SIZE), market power (MP), life cycle (AGE) and financial distress (DIFF)). The

[5] These variables represent different aspects of financing policy. Costs of debt is measured by interest expense, firm's overall debt load is represented by market leverage and net financing captures the net impact of debt/equity issuances and repurchases.

detailed definitions of these variables are given in Appendix B.3. η_j and ν_t are the industry and year fixed effects, respectively. ε_{it} is the random residuals, indicating the deviation from desired level of NWC. A negative (positive) deviation from expected investment is considered as underinvestment (overinvestment).

We initially estimate equation (4) using two - dimension fixed effects (industry/or firm and year) to control for industry-specific shocks and aggregate shocks of the economy to firm investments. We then classify firms into two groups based on the signs of residuals. To present the intuition that the investment efficiency is an increasing function of higher values of residuals of equation (4) we multiple the absolute value of deviations by -1. Hence, the higher value of resulting deviations means higher WC investment efficiency. To make sure the estimating results are robust to different types of regression estimators we also estimate determinants of NWC using system GMM estimator in robustness check.

Hill et al. (2010) expect a negative relation between NWC and sale growth rate (SGR). Firms with high sale growth rate in previous periods are less likely to grant credit to their customers since they can already meet expected sale level. Suppliers also tend to grant more credit to customers with higher sale growth rate as a result of expectations regarding potential source of funds from sale growth. Contribution margin is positively related to NWC because each unit of goods sold increases NWC. Meanwhile, effects of sale volatility on operating WC is ambiguous. A rational reaction of firms to increased sale volatility is to increase inventory. However, firms with cost advantages in financing receivables can increase extended credit to customers in an attempt to avoid inventory build-up when demand is reduced. At the same time, firms are more likely to postpone payments to suppliers because sale volatility makes firms more difficult to predict revenue and liquidity needs.

Because higher operating cash flows facilitate firms to finance a positive NWC, a positive relation between NWC and cash flow can be expected. By contrast, firms with high information asymmetry often reduce NWC because the market will extract a higher premium as a results of difficulties in evaluating their cash flows and prospects.

Compared to small ones, large firms are more capable to finance WC gap externally (commercial papers and bank debts) and they can do so with fewer borrowing constraints since they are less likely prone to information risk. Moreover, receivable is positively related to firm size while this relation for payable is insignificant.

Regarding market power, customers with more market power can negotiate more generous credit terms and strong relationships with vendors offer firms with greater market power to hold less inventory. Moreover, suppliers with high market power relative to customer can negotiate shorter terms of credit granted with lower risk of losing customers as a results of lower threat of competition associated with high market power. Firms with higher market power is also more likely to have longer relationship with customers and thus higher costs of switching suppliers. Consequently, firms with greater negotiating power have more payable, fewer receivable and less inventory and thus reduced WCR. Finally, financial distress is expected to be related to limited financial slack and cash generating ability, hence reducing WCR.

3.3 VOFF and WC investment efficiency

To test the hypothesis H1, we regress the measure of NWC efficiency, $\text{WCEff}_{i,t}$, against VOFF and a sets of control variables as represented in equation (5). Hypothesis H1 conjectures the negative relation between VOFF and investment efficiency, indicating that β_1 in equation (5) should be negative. X is a vector of control variables, including those affecting WCR level as indicated by WC literature. Similar to previous section, we estimate equation (5) using two - dimension industry and year fixed effects with standard errors are clustering at firm level. Furthermore, to investigate the effects of consideration of financial flexibility on direction of WC investment efficiency we extend the equation (5) for cases of underinvestment (UNNWC) and overinvestment (OVNWC).

$$\text{XWCEff}_{i,t}=\beta_0+\beta_1 VOFF_{i,t}+\beta_k \sum_{\text{k}=2}^{n} X_{k,t} + \eta_j+\nu_t + \varepsilon_{it} \quad (5)$$

Where $\text{XWCEff}_{i,t} \in \{\text{WCEFF}_{i,t}; \text{OVNWC}i,t; \text{UNNWC}i,t\}$

3.4 VOFF and speed of working capital adjustment

The idea of investigating the dynamic behaviour of one financial variable overtime is inspired by recent research in many areas in corporate finance such as financing polices (debt policy (DeAngelo and Roll, 2015, An et al., 2015), dividend policy (Leary and Michaely, 2011, Javakhadze et al., 2014)) and investing policies (cash holding (Jiang and Lie, 2016), working capital (Baños-Caballero et al., 2013), fixed-capital investment (Brown and Petersen, 2015)). For working capital, which is the main object of this article, the application of such an empirical strategy requires one important identifying assumption: there exists one optimal level of WC investment at the firm level. We argue that any deviations, as often be observed, from this level are of inefficiency and this inefficiency can be adjusted gradually due to the influence of associated transaction costs, firms' ability to make such adjustments and level of managerial entrenchment.

Following the recently developed empirical techniques used in literature to estimate adjustment speeds of leverage and cash holding (Faulkender et al., 2012, Jiang and Lie, 2016, An et al., 2015), we use the conventional partial adjustment model (PAM) to investigate such adjustment dynamics in WC[6].

$$NWC_{i,t} - NWC_{i,t-1} = \Delta NWC_{it} = \lambda_0 + \lambda_1(NWC^*_{it} - NWC_{it-1}) + \eta_i + \nu_t + \varepsilon_{it} \ (6)$$

Where *i* and *t* are firm and time subscripts, respectively. $NWC_{i,t}$ and $NWC_{i,t-1}$ are the contemporaneous and lagged NWC of firm i. $\Delta NWC_{i,t}$ is the adjustment in WC during period t. NWC^*_{it} is the target value of NWC and we use fitted values of the equation representing contemporaneous determinant of NWC as a proxy for this variable based on the assumption that the optimal WCR can be completely explained by its determinants as indicated by equation (4) ($NWC^*_{it} = \beta X_{i,t}$, where $X_{i,t}$ represents factors affecting WC level, including lagged value of NWC). $NWC^*_{it} - NWC_{it-1}$ is the deviation from the target NWC. λ_1 is the adjustment speed, which measures the speed of actual NWC adjusted to the desired NWC (e.i., it captures the fraction of the NWC deviation that is removed in year t) and lies between 0 and 1. When λ_1 = 1, the adjustment is complete. According to Liao et al. (2015), Jiang and Lie (2016) and Brisker and Wang (2016), the advantage of this method lies in that it allows us to use interaction terms to investigate factors affecting SOA.

We modify equation (6) to allow for VOFF and other factors affecting SOA of WC as follow:

$$\Delta NWC_{it} = \left(\gamma_0 + \gamma_1 VOFF_{i,t-1} + \gamma_2 X_{i,t-1}\right) * TWCR_{i,t} + \eta_j + \nu_t + \varepsilon_{it} \ (7)$$

Where, $TWCR_{i,t} = NWC^*_{it} - NWC_{it-1}$. γ_1 is the primary variable of interest, measuring the effect of VOFF on SOA of WC. γ_2 is the vector of coefficients on the interactions terms between control variables and firm WC deviation. Equation (7) can be estimated using many estimators such as ordinary least squared with bootstrapped standard errors (Faulkender et al., 2012), fixed effects (Jiang and Lie, 2016) and GMM estimator (Dang et al., 2014).

[6] Equation (6) can be rewritten as $NWC_{i,t} = (1-\lambda)NWC_{i,t-1} + \lambda\beta X_{i,t} + \varepsilon_{i,t}$

To investigate possible effects of VOFF on SOA of WC, we isolate possible influences of other factors. Based on spirit of Hill et al. (2012), we use market share to measure product quality and annual sale volatility as a proxies for demand volatility. Sale volatility is calculated as the standard deviation of sale growth rate over a rolling five-year period[7]. With regard to bargaining power, we use the ratio of price-cost margin, calculated as the ratio of SALE minus COGS over SALE[8] (Beauchamp et al., 2014).

To control the effects of product market competition on relation between SOA of WC and VOFF, we use a newly-developed measure of predation risk, known as fluidity, proposed by Hoberg et al. (2014). It is the dot product between the words used in a firm's business description from 10-K filings and the change in the words used by its rivals. When rivals change their business descriptions to be more similar to the firm's descriptions, the overlap in word usage increases, and thus fluidity increases. Because fluidity captures the "change" in rivals' word usage relative to the firm's word usage, it is a dynamic measure of product similarity. Accordingly, the higher the fluidity implies the higher the competition in product markets due to higher product similarity and lower costs of predation. To account for the possible uncertainty associated with fluidity we also used two other text – based proxies for market competition. Specifically, the first measure of HHI bases on Fixed Industry Classifications (FIC-300) developed by Hoberg and Phillips (2015). The second proxy for market competition proposed by Hoberg and Phillips (2010b), called fitted HHI. The advantage of fitted HHI is that it captures the influence of both public and private firms.

To control for possible effect of corporate governance we use G- index developed by Gompers et al. (2003b). Additionally, to account for possible measurement errors of GINDEX we also employ E - index proposed by Bebchuk et al. (2009). To avoid substantial reduction in sample size due to missing governance data, following standard practice in literature (Biddle et al., 2009, García Lara et al., 2016), we let G-index equal to zero if missing and add an indicator

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[7] In a robustness check, we also use coefficient of variation of sale in which the value of sale standard deviation and mean is calculated over a rolling five-year period to reduce the possible measurement error of sale volatility proxy. The results are qualitatively similar.

[8] According to Sharma (2010) one drawback of this measure is that it does not isolate the firm-specific factors that influence product market pricing power from industry-wide factors. Therefore, to capture the firm-specific product market power we use Industry-adjusted Lerner index[8]. This modified measure captures purely the intra-industry market power of a firm, therefore purging the effects of industry-wide factors common to all firms in a specific industry. It also addresses the fact that different industries have structurally different profit margins due to factors unrelated to intra-industry difference in market power.

variable, GDUM, that takes value of 1 if G-INDEX is missing, 0 otherwise. The same technique is applied for E-INDEX.

With the assumption that the costs of adjusting NWC can be reduced partly when there is a movement towards target level of NWC, we extend the PAM by modelling changes in NWC in response to changes in target level of NWC. By doing that we are able to investigate effects of VOFF on the dynamic NWC adjustment process via changes in target level of NWC and past deviation from optimal level of NWC.

Modifying equation (6) yields:

$$\Delta NWC_{it} = c_1(NWC_{it}^{*} - NWC_{it-1}^{*}) + c_2(NWC_{it-1}^{*} - NWC_{it-1}) + \eta_j + \nu_t + \varepsilon_{it} \quad (8)$$

$$\Delta NWC_{it} = c_1\big(DTWCR_{i,t}\big) + c_2\big(LDWCR_{it}\big) + \eta_j + \nu_t + \varepsilon_{it} \quad (9)$$

Where c_1 and c_2 are the speeds of WCR adjustment toward the target. $DTWCR_{i,t} = NWC_{it}^{*} - NWC_{it-1}^{*}$ represents the changes in target WCR overtime and $LDWCR_{it} = NWC_{it-1}^{*} - NWC_{it-1}$ is the deviation of actual NWC from target level in the previous fiscal year. This model controls for the changes in target NWC caused by shocks to its determinants and its effects on NWC adjustment costs and adjustment process.

To allow for VOFF and other controlling factors affecting SOA of NWC, we use the same methodology aforementioned to modify equation (9) as follow:

$$\Delta NWC_{it} = \big(\varphi_0 + \varphi_1 VOFF_{i,t-1} + \varphi_2 X_{i,t-1}\big) * DTWCR_{i,t} + \big(\theta_0 + \theta_1 VOFF_{i,t-1} + \theta_2 X_{i,t-1}\big) * LDWCR_{it} + \eta_j + \nu_t + \varepsilon_{it} \quad (10)$$

Where, φ_1 and φ_1 are the primary variables of interest, measuring the effect of VOFF on SOA of WC with regards to the changes in target NWC overtime and the deviation of actual NWC from target level in the previous fiscal year, respectively.

In a recent study, Jiang and Lie (2016) provide evidence that speed of adjustment of cash is higher for firms with positive excess cash reserve since it is cheaper for firms to spend than to raise cash. Following this spirit, we argue that the adjustment cost associated with building WC is higher than depleting, suggesting that the SOA of WC is higher for firms with positive excess NWC than those with negative excess NWC. To test for this argument, we divide sample into two sub - samples based on signs of residuals of equation (4). Firms are assigned to positive excess NWC portfolio if the residuals are positive and assigned to negative excess NWC portfolio if the residuals are negative. We then use PAM (e.g., equation 7) to test this argument.

Guariglia and Yang (2016) also provide evidence that when firms have low costs of adjustment, they tend to actively adjust cash holding. To test if this argument is true in context of WC we decompose the unexpected changes of NWC into two components: the real changes in NWC and the changes in target level of NWC. Specifically,

$$(ENWC_{i,t} - ENWC^{*}_{i,t-1}) = \Delta ENWC_{i,t} = (NWC_{i,t} - NWC^{*}_{i,t}) - (NWC_{i,t-1} - NWC^{*}_{i,t-1})$$

Equivalent to, $\Delta ENWC_{i,t} = (NWC_{i,t} - NWC_{i,t-1}) - (NWC^{*}_{i,t} - NWC^{*}_{i,t-1})$ (11)

Where, $EWCR_{i,t}$ is the unexpected (excess) NWC. $\Delta EWCR_{i,t}$ is the unexpected (excess) changes in WCR. We then define two proxies for active and passive WC as follow.

$$Active = \left|\frac{(NWC_{i,t} - NWC_{i,t-1})}{\Delta ENWC_{i,t}}\right|, \text{ and}$$

$$Passive = \left|\frac{(NWC^{*}_{i,t} - NWC^{*}_{i,t-1})}{\Delta ENWC_{i,t}}\right|$$

Where, active is proxy measuring the proportion of unexpected changes in NWC associated with changes in real NWC level and passive is the portion of unexpected changes in WCR in response to change in target NWC level. Based on these variables, we create a dummy variable representing whether firms manage WC on active basis, called AP. AP takes value of 1 if Active > Passive; 0 otherwise. We then investigate the possible existence of differentiated effects of VOFF on SOA between firms with active versus passive WC management.

To test hypothesis 3 (H3), following Farre-Mensa and Ljungqvist (2016) we use many proxies for financial constraints. In particular, for each measure of financial constraint (KZ index, size, commercial paper rating, bond rating and pay-out ratio) we run regressions (e.g., equation 7) for each pair of covariate of financial constraint to examine if SOA of WC differ and whether effects of VOFF on SOA of WC differ between constrained and unconstrained firms.

To test effects of type of industry on association between SOA-VOFF, following previous studies (Giannetti et al., 2011, Hill et al., 2012) we classify industries based on the first two digits of standard industrial classification (SIC) code. Accordingly, industries with SIC codes of 41, 42, 44, 45, 47-57, 59, 61, 64, 65, 73, 75, 78, and 79 are grouped into service industries. Differentiated industries include SIC codes of 25, 27, 30, 32, 34-39. Standardized industries includes firms with SIC codes of 12, 14, 20, 22-24, 26, 28, 29, 31, 33 and unclassified firms. We use PAM (equation 7) to examine the VOFF-SOA for each types of industry[9].

4. Main empirical results

4.1 Sample and descriptive statistics

In this study, we use a large sample of non-financial US firms during 1978-2013 period. We obtain accounting data from COMPUSTAT, capital market data from CRSP, ownership data from Thompson Financial F13 and governance data from ISS (formerly RiskMetrics). Following the standard practice in literature we only retain all firms with ordinary common shares (share codes 10 and 11 in CRSP) traded on the NYSE, AMEX and NASDAQ with available accounting and stock data (Rapp et al., 2014). Then we exclude firms in financial sector (SIC code 6000-6999) and regulated utilities (SIC codes 4900-4999) because their financial policies are considerably different from other industries. These firms also have different nature of their investments relative to the other firms in the sample (Biddle et al., 2009) and are subject to heavy regulation (Faulkender and Wang, 2006, Palazzo, 2012). Similarly, we also exclude firms with non-positive book assets, book equity or market equity and negative debt or total liabilities (Palazzo, 2012). To eliminate effects of the outliers, we winsorize all continuous variables at the 1st and 99th percentiles. After merging all databases together, we have a sample containing 8204 firms over 1987-2013 period. Table 1 provides summary statistics and table 2 provides correlation matrix of all relevant variables used for analyses of all hypotheses in this paper.

<Insert table 1 and 2 about here>

4.2 Value of financial flexibility

The table 1 shows that the mean and median of annual excess return are 0.0545 and -0.0409, respectively. Given that the mean is dragged in the direction of skew, such numbers represent the right-skewed distribution of annual excess return. Similar, cash holding have similar distribution with the mean at 0.1628 and median at 0.0928. The mean and median of changes

[9] Giannetti et al. (2011) classify industries into three classes based on characteristics of products. Standardized goods are ones with clear reference price listed in trade publications. Differentiated goods are goods with multidimensional characteristics and thus highly heterogeneous prices. All remaining industries are considered as service industry.

in cash are quite similar and distributed around zero, representing that this variable is systematically distributed. It is important to emphasize that descriptive statistics of variables in this study are not directly comparable to those of many other studies because these papers have samples that are different in size and time period compared with this study and independent variables are scaled by using either net or book assets (Opler et al., 1999, Bates et al., 2009). Meanwhile, we use lagged market equity to scale the variables, consistent with our modelling intention. We, however, note that these numbers are quite similar to those in Rapp et al. (2014) but not identical to Faulkender and Wang (2006).

On average, there are increases in profitability and assets of net cash and they are right-skewed because all values of mean, median and skewness of change in earnings are of positive. Likewise, there are also increases in values of other variables such as interest, research and development expense. Although these results are consistent with Faulkender and Wang (2006) they are inconsistent with Rapp et al. (2014). Common dividend shows a relatively stable pattern over the period. Meanwhile, the mean and median value for market leverage ratio are 0.2196 and 0.1658. The corresponding figures for net financing are 0.0444 and 0.0008, respectively. All these are consistent with the findings of Rapp et al. (2014). We also find out that values of mean and median of effective tax rate, fixed assets and spread all are higher than those in Rapp et al. (2014)'s study.

The first step in our analysis is to estimate the marginal value of cash holding for an average firm. The obtained results from estimation equation (1) are represented in Table 3. Column (1) is the results of regression excess returns against unexpected changes in cash holding which is determined as the difference between cash reserve in year t and year t-1 (or naive method). In column (2) and column (3) we report the results of regression excess returns against unexpected changes in cash holding, which are computed based on baseline and full specifications of cash holding models proposed by Almeida et al. (2004). We estimate these equations by using OLS estimation, accounting for industry-fixed effects and year fixed effects. Standard errors of estimation coefficients are clustered at firm level to adjust for correlation structure of residuals within the firm.

Overall, the regression results are quite consistent with theoretical predictions of Gamba and Triantis (2008) and some prior empirical studies (Faulkender and Wang, 2006, Rapp et al., 2014). Specifically, the coefficient on $\Delta C_{i,t}$ suggests that on average from shareholder's view value of one extra dollar is more valuable than one physical dollar hold by firms. However, the marginal value of cash (MVOC) changes significantly when examining the interactions between $\Delta C_{i,t}$ and other firm characteristics. In particular, the coefficient of $SGR_{i,t}*\Delta C_{i,t}$ is positive and significant in model 1, which is consistent with theoretical argument that shareholders assigned a higher value for holding one extra dollar for firms with higher growth opportunities consistent with the predicted expectations that VOFF is higher for firms with higher investment opportunities. Among four remaining determinants of value of financial flexibility, signs of three coefficients are consistent with the prediction. In particular, although insignificant in all three specifications, the negative of coefficient on $T*\Delta C_{i,t}$ indicates that the lower VOFF is associated with higher effective costs of cash holding. Similarly, negative coefficient on $TANG_{i,t}*\Delta C_{i,t}$ implies that shareholders put a smaller value for each additional dollar for firms with higher reversibility of capital. Likewise, consistent with the argument that agency problem can increase cost of external financing, the positive coefficient of $SPREAD_{i,t}*\Delta C_{i,t}$ suggests that higher cost of external finance is associated with higher VOFF. However, the coefficient of $\Delta E_{i,t}*\Delta C_{i,t}$ is positive and significant, which indicates that firms with higher profitability, indicating higher internal cash flows, have higher VOFF. This is inconsistent the theoretical arguments and result of Rapp et al. (2014)'s study.

<Insert table 3 about here>

Based on equation (1), we use coefficients of unexpected changes in cash and those of interaction terms, which is considered as determinants of financial flexibility, to calculate VOFF. To account for possible large difference in calculating unexpected value of cash, we use three proxies for VOFF, namely VOFF03, VOFF13 and VOFF23. Their values are determined based on different specifications of cash holding models and thus different proxies for unexpected changes in cash. More specifically, unexpected changes in cash used to calculate VOFF03 is the difference between value of cash in year t and in year t-1. Unexpected changes in cash used to calculated VOFF13 and VOFF23 are the residuals of baseline and full specifications of models of cash holding proposed by Almeida et al. (2004), respectively. The summary statistics for these resulting measures of VOFF are reported in table 1. We also report their correlation coefficients with other relevant variable used in our analysis in table 2.

4.3 Value of financial flexibility and investment efficiency in working capital

4.3.1 Mean-reversing property of NWC

The first step in our analysis is to check if there exists one optimal WCR. We start investigating for mean-reversing property of WCR by estimating the fixed effect model based on spirit of literature in cash holding (Venkiteshwaran, 2011, Opler et al., 1999).

$$\Delta NWC_{i,t} = \propto \ + \beta \Delta NWC_{i,t-1} + \varepsilon_{i,t} \ (12)$$

We actually find out NWC displays mean - reversing property when the coefficient β of equation (12) is significantly negative (see Table A2-1, appendix A2). Moreover, we also check for the existence of non-linear relationship between firm performance and NWC following the spirit of previous studies (Aktas et al., 2015b, Baños-Caballero et al., 2014).

$$ROA_{i,t} = \alpha_0 + \alpha_1 NWC_{i,t-1} + \alpha_2 NWC_{i,t-1}^2 + \alpha_3 SIZE2_{i,t-1} + \alpha_4 BLEV_{i,t-1} + \alpha_5 SGR_{i,t-1} + \alpha_6 AGE_{i,t-1} + \alpha_7 RETVOL_{i,t-1} + \ \alpha_8 CF_{i,t-1} + + \alpha_9 AGR_{i,t-1} + \ \alpha_{10} DIFF_{i,t-1} + \ \alpha_{11} CASH_{i,t-1} + \ \lambda_t + \eta_j + \varepsilon_{i,t} \ (13)$$

If the relation between firm performance and WCR is concave (convex) we should observe $\alpha_1 > 0$ (< 0) and $\alpha_2 < 0$ (> 0). The regression results show that there exits an inverted U-shape relation between WCR level and return on assets (ROA) and results are also robust across regression techniques (see Table A2-2, appendix A2). This implies that firm performance is a decreasing function of increased investment in WC beyond the optimal level (i.e., overinvestment).

4.3.2 Determinants of working capital requirement

From descriptive statistics for determinants of WC in table 1 we note that mean, median and standard deviation figures of NWC are approximately 21.63, 19.32 and 17.15 percent, respectively. There values are quite comparable to those of Aktas et al. (2015b). All other statistics of remaining variables have been discussed in the previous sections and are also similar. Information from table 2, which provides the matrix of Pearson correlation coefficients for variables, suggests that most of correlation coefficients are significant at normal statistical levels. Overall, although there are some significant correlations between variables, their magnitudes are not sufficiently large to introduce collinearity issue in our study. In addition, signs of coefficients are in line with our predictions. In particular, NWC is negatively correlated with sale volatility, growth opportunities, firm size, sale growth rate and firm financial difficulty. Likewise, NWC has a positive correlation with market share, profit margin, cash flow and firm age.

Table 4 reports fixed effect regression results of NWC against its determinants. The purpose is to identify the optimal NWC level. Overall, the results are quite similar to previous studies (Hill et al., 2010, Baños-Caballero et al., 2013). The regression coefficient of sale growth rate (SGR) is statistically significant at 1% level. This is consistent with the intuition that that higher sale can stimulate firms to have higher WCR by holding more inventories and relaxing credit (Hill et al., 2010). However, it is contradict with the idea that sale in previous period can serve as a source of financing for WCR and that firms with better sale growth are more likely to get more trade credit from suppliers (Petersen and Rajan, 1997). The coefficient of gross profit margin, GPM, is also positively related to NWC, consistent with the intuition that greater GPM increases account receivables and thus increased NWC (Hill et al., 2010). Similar to previous studies (Ng et al., 1999, Deloof and Jegers, 1996), we find a negative relation between NWC and sale volatility, consistent to the idea that demand volatility makes firms to reduce investment in WC and rely more on payables. The estimated coefficients between cash flows (CF) and NWC is positive and significant at 1% level. This relation indicates that firms with greater operating cash flows manage WC more conservatively that is characterised by looser inventory and customer credit policies in order to boost sale and profits. In addition, firms with stronger operating cash flows also enjoy more the benefits of a less restrictive WC policy than firms with weaker cash flows, as these firms must finance its positive NWC. Conversely, firms with weaker position in cash flow appear to adopt a more aggressive strategy of WC management. Similarly, we also find a positive relation between firm age and NWC.

With regard to growth opportunities, we note a significantly statistical negative association between WCR and growth opportunity (Q1). This is consistent with theoretical prediction that firms with more growth opportunities often adopt an aggressive WCM strategy because they strive to reduce their net investments in WC in favour of profitable projects. Additionally, since market to book ratio can be used as a proxy for degree of information asymmetry, the estimated inverse relationship between NWC and Q1 might indicate that firms facing with higher costs of external finance seek to reduce investments in WC (Baños-Caballero et al., 2013).

<Insert table 4 about here>

The results show that WCR inversely varies with firm size and the relation is significant at 1% level. This is consistent with asymmetric information-based prediction that small (large) firms tend to experience more (less) information asymmetry because of their lower (higher) reputations. Because it is more difficult (favourable) for them to finance a positive WCR, small (large) firms seek to extend (tighten) more credit to customers, leading to higher (lower) WCR. This result is opposite to findings of some studies (Petersen and Rajan, 1997, Hill et al., 2010) which indicate a direct relation between NWC (and its elements) and firm size, which is consistent with the argument that compared to small ones larger firms have more superior advantage in accessing capital markets when they are more able to issues commercial paper and negotiate lines of credit to finance WCR.

Contradict to our prediction, although insignificant, NWC is negatively associated with the market share. Since market share can proxy for bargaining power and negotiating ability. Hill et al. (2010) suggest that one possible reason for this is that effect of negotiating power is absorbed by unobservable firm-specific heterogeneity. However, this is not the case when regression results using firms and year fixed effects indicate a negative relation as well. We also note that WCR has negative relation with likelihood of financial distress. This is consistent with theoretical prediction and results of previous studies (Molina and Preve, 2009, Molina and Preve, 2012) that firms with higher risk of financial distress have more difficulties in get funds to finance investments and thus lower WCR. Such firms often adopt an aggressive (restrictive) WC strategy which is characterised by low level of inventories, shorter credit terms and higher supplier credit (Hill et al., 2010).

4.3.3 VOFF- investment efficiency of working capital

Columns (1), (2) and (3) in table 5 represent fixed effect regression results on association between investment efficiency in WC (WCEFF) and each measure of VOFF (VOFF03, VOFF13 and VOFF23, s=03, 13, 23) as indicated by equation (5). When using VOFF03 as a measure of financial flexibility (column 1) which is determined based on annual change in cash reported in financial statement between year t and year t-1, the estimated regression coefficient on VOFF is negative and statistically significant. This suggests that for firms whose shareholders assign a higher VOFF in this year suffer from WC investment distortions in next year. In addition, the results are also robust when we employ other proxies such as VOFF13 and VOFF23. In economic sense, for one standard deviation increase in VOFF03, VOFF13 and VOFF23, investment efficiency, WCEFF, is expected to decrease by -0.0039, -0.0037 and -0.0042, respectively.

With regard to main control variables, we find that such variables like cash flows (CF), firm size (SIZE) and predatory threat (FLUID) positively related with investment efficiency in WC. The positive relation between lagged cash flows and WCEFF is consistent with the argument that firms with strong previous internally generated cash flows are more capable of meeting WCR in the current period. Likewise, larger firms appear to invest more efficiently due to its ability to access to external capital markets. It can also be consistent with the argument that large firms have a strong internal capital market which enables them to allocate resource more efficiently. The positive coefficient of predatory threat[10] (FLUID) and WCEFF supports the intuition that predatory threat can serve as an external market discipline. Accordingly, the higher market competition forces firms to manage WC more efficiently higher pressure from competition that can help mitigating inefficient usage of resources. Relative to the internal corporate governance structure, competition in the product market can be an even more effective force for mitigating managerial agency problems (Alimov, 2014). Hart (1983) also suggests that higher competition forces managers to work harder, resulting lesser WCR. Additionally, since a high level of competition also force inefficient firms out of the market (Shleifer and Vishny, 1997), a more efficient WCM is also expected in firms operating in high competition markets. Nalebuff and Stiglitz (1983) also argue that increased competition also provides owners with more information that can mitigate moral hazard problem.

With regard to demand uncertainty, Emery (1987) suggests that suppliers can reduce the costs of uncertain sales by relaxing credit policy. Optimal strategy for volatile demand is to ease lending to customers rather than keeping high level of inventories or changing production capacity. As a result, higher market value of trade receivables is found for producers facing less certain demand. However, Beauchamp et al. (2014) suggest that effects of demand uncertainty is ambiguous as it makes firms either increase (to reduce out-stock risk) or reduce inventory (shareholder's concerns over excess inventory). Meanwhile, according to Daripa and Nilsen (2011), if a buyer faces stochastic demand it must decide whether to hold inventory to meet sales or to order inputs only when final demand materialise. This decision is determined by costs of holding inventories. Trade credit arises then whenever upstream firms find it optimal to offer their buyers and incentive to purchase inventories and continue production. In this study, the negative coefficient of sale volatility (SVOL) is supportive the argument that

[10] Such predatory threats can take the forms of extremely low pricing, saturating advertisement, controlling supply chains associated with prey's inputs. The ultimate purpose of such strategies is to drive the competitors out markets.

higher demand volatility reduces efficiency of investment in NWC although such relation is insignificant.

We also find that profit margin and market share are negatively related to WCEFF. To the extent that these two proxies stand for firm bargaining power, this negative relation introduces the idea that a higher negotiating power do not necessarily lead to a higher efficiency in NWC. This contradicts to the argument that firms with weaker negotiating power are less likely to receive favourable purchasing terms without ordering in bulk and that these firms also receives less favourable delivery schedules and have a greater stock-out risk. For example, suppliers allow more powerful buyers to take discount despite of paying after the discount date (Smith, 1987). Larger downstream firms are also more likely to have dependent suppliers, which may avail the buyers of the potentially high cost of using trade credit (Wilner, 2000).

In addition, growth opportunity is negatively significant related to WCEFF which is supportive the idea that firms with high growth opportunities can reduce investment in WC to set aside funds for fixed investments. Also, because firms with high growth opportunities are more likely to raise external funds with higher costs due to higher information asymmetry they proactively react with these by cutting WC in a suboptimal way.

<Insert table 5 about here>

While these results are sensitive to proxies for VOFF to some extent, they are possibly misleading since they can be distorted by type of investment distortions. To overcome this limitation, we further investigate directional association between VOFF and investment distortion, namely underinvestment and overinvestment. Table 3 - 6 presents regression results for association between over/underinvestment in NWC and VOFF. In case of underinvestment (UNNWC), the estimated coefficient on VOFF are negative and significant and this negative relation is unchanged under there different proxies of VOFF. In economic sense, on average, for each dollar increase in VOFF, investment efficiency in the form of underinvestment is estimated to decrease from -0.0012 to -0.0018 dollar. This evidence might suggest that the underlying driver of negative relation between VOFF and investment distortion is lack of financial flexibility. Therefore, from shareholders' perspective, each of extra dollar, conditional on five determinants of VOFF, are more valuable for firms with underinvestment than their counterparts, implying that firms' contemporary insufficiency of internal funds can lead to underinvestment in the future.

In addition, we also find evidence that VOFF is also negatively significant related to overinvestment in WC (OVNWC). In economic sense, investment efficiency under the form of overinvestment is projected to reduce from -0.0055 to -0.0058 dollar when VOFF increases by one standard deviation. We note that the effect of VOFF on investment efficiency in case of overinvestment is economically higher than underinvestment case. In particular, for each of dollar increase in VOFF, investment efficiency in terms of underinvestment reduce by around from -0.003 to -0.005 dollar while the corresponding figure for overinvestment case is from -0.016 to -0.019 dollar. According to Aktas et al. (2015b), current levels of investment WC of US public firms are suboptimal (overinvestment), which ranges from equivalent 3% to 6% of their sales (Ernst&Young, 2015). Such overinvestment in WC reduces free cash flows which otherwise should be set aside for long term investment projects. In other words, there is a substantial portion of cash stuck in WC that otherwise should have been released to increase liquidity in terms of cash to finance for growth. The results are also indirectly consistent with those of Ek and Guerin (2011) who argue that there is much room for improving WC efficiency and companies typically ignore the role of WC as a potential fund for growth (Buchmann et al., 2008). Partially because of this, given current level of investment of WC equity shareholders evaluate each additional value of WC investment is less than one dollar (Kieschnick et al., 2013).

< *Insert table 6 about here* >

4.4 VOFF and speed of adjustment of working capital

Table 7 shows the regression of SOA of WCR, modelled by using PAM to test hypothesis 2. Following methodology of recent studies (Jiang and Lie (2016) and Brisker and Wang (2016)) we estimate equation (7) using the OLS with industry and year fixed effects. Our main purpose is to investigate how considerations of financial flexibility (VOFF) facilitate WC adjustment. It is, hence, important to control for other firm characteristics that are known to have a bearing effect on SOA of WC. Such control variables includes competition in product market, corporate governance, motivation of product warranty, sale volatility, bargaining power and level of WC deviation from target level.

Column (1) in table 7 presents the a baseline result of SOA of WC toward the target level before taking into account effects of VOFF and other determinants. The baseline SOA of WC, the coefficient on WC deviation (TWCR), is about 39.3%. This figure is quite higher than SOA of cash, which is about 31.4% (Jiang and Lie, 2016) and SOA of leverage, around 23-26% (Faulkender et al., 2012). One possible reason for this inflated coefficient is that it might include possible effects of VOFF and other factors. To get an initial insight on how VOFF affects SOA of WC, we interact VOFF03 with initial WC deviation (TWCR) in column (2). After including VOFF in specification, SOA of WC reduces to 26.3% from 39.3% in column (1). The coefficient of interaction term (VOFF03 x $TWCR_{i,t}$) loads positively, around 9.6%, and statistically significant, consistent with the hypothesis 2 that VOFF can accelerate SOA of WCR.

From columns (3) to (5) we interact initial deviation with many proxies of VOFF to investigate possible uncertainty in results associated with measurement errors of VOFF. We also interact $TWCR_{i,t}$ with other control variables that are proposed to affect SOA of WC to eliminate omitted – variable issue. Depending on specific proxies for VOFF, SOA of WC ranges from 20.9% to 22.7%. Meanwhile, the coefficient on VOFFs and $TWCR_{i,t}$ are positively and significant at normal level in all specifications. In terms of economic significant, coefficients of interaction terms suggest that the adjustment speed increases from 6.5% to 8.1% for each dollar increase in VOFF. Overall, results in table 7 implies that consideration of financial flexibility do have a bearing on WC adjustments toward the optimal level.

<Insert table 7 about here>

With regard to other control variables, the coefficient of interaction between predatory threat in product market and initial deviation is positively significant and around 1.1%. This is in line with the intuition that product market competition can serve as a monitoring role in mitigating managerial agency problems. Consequently, firms with high predatory risk manage WC more efficiently and thus have a positive effect on SOA of WCR. This results is also consistent with study's Fabbri and Klapper (2013) who, based on the survey' results of Chinese firms, show that firms operating in a higher competition output market, implying weaker bargaining power, tend to extend more trade credit and offer better credit terms. Our result is also in line with Hoberg et al. (2014) and Chi and Su (2015)'s study. According to whom, pressure from predatory risk motivates firms to increase their financial flexibility in the form of cash reserve to reduce the competition-induced underinvestment problem. This study suggests that faced with increasing competition firms tend to speed up its WCR rebalance. It is worth noticing that besides using a measure for predatory risk, we also use two HHI index based on text-based industry classification, namely TINC-300 and TINC-300 and empirical results on effects of these measure of competition are qualitatively similar.

We use G-Index as a measure for external corporate governance because it is widely used as a measure of entrenchment. The interaction between initial deviation with G-Index loads positively for one average firm with a value of 0.6%. Contradict to our expectation, the result suggests that a poor quality of corporate governance, (i.e., low external pressure), do not reduce SOA of WC. Neither does better quality of corporate governance accelerates SOA of WC. Instead, we find that higher G – index strengthens the SOA of WC across specifications from column (3) to (5) [11]. We interpret this as evidence that there is no evidence indicating self-interest managers have less incentive to rebalance WCR on time. These results are also inconsistent with agency theory perspective (Jensen, 1986), in that poor external governance can be associated with accumulation of the unnecessary portion of WC because it may facilitate manager's consumption of perks on value-destroying investments that capital markets would be unwilling to finance. This overinvestment in WC can be a result of risk-seeking behaviour of managers who often like over-flexibility. It is also inconsistent with the intuition that firms with poor governance often spend swiftly liquid assets (Dittmar and Mahrt-Smith, 2007, Harford et al., 2012), without considerations of rebalance WC on time. However, we also recognize the possibility that there are some problems with governance measures like G index and E-index which are mentioned in some recent studies (Jiang and Lie, 2016).

With respect to other remaining variables, interaction coefficients of these variables with initial deviation of WC are insignificant. However, we note some following findings. Firstly, consistent with our expectation higher market share, as a measure for inventive of product warranty, reduces SOA of WCR. According to Long et al. (1993) and Mateut (2014) trade credit can serve as a device for guaranteeing the product quality. Thus, it is reasonable to argue that if product quality is high, it is less likely for firms to use trade credit and thus reducing need for investment in WC. Alternatively, high market share, because firms with higher market share is often more reputed, can be a substitute for using trade credit for product warranty purpose, which contributes to lower SOA of WC. The results are consistent with the finding of Hill et al. (2015). Secondly, to the extent that profit margin ratio[12] can be used as a measure for

[11] When using the E –index as a measure for corporate governance quality, we also find out a similar results as in case of G index. This index is calculated based on 6 out of the 24 provisions followed by the Investor Responsibility research centre (IRRC). These six provision include: staggered boards, limits to shareholder bylaw amendments, poison pills, golden parachutes and supermajority requirement for mergers and charter amendments. The first four provisions involve constitutional limitations on shareholder's voting power and the last two can be regarded as takeover readiness provisions.

[12] The results are qualitatively similar when we industry-adjusted LI (operating profit ratio) to measure the bargaining power.

bargaining power at firm level we find the coefficient of GPM x $TWCR_{i,t}$ is negative, indicating that higher bargaining power decelerates SOA of WC. In a related study, Dass et al. (2014) also show that upstream firms with higher bargaining power are more capable of extracting a larger profit from transactions and hence having less motive to invest into customer - relationship via extended trade credit. Thirdly, with regards to demand volatility, we recognize that higher uncertainty in demand increases SOA of WC. While the coefficient is insignificant, it supports the theoretical argument that higher fluctuations in demand for products can force the firms to accumulate more inventories, which can deplete cash reserve for other purposes, and thus accelerating SOA of WC.

5. Extended analysis

5.1 Which mechanisms by which VOFF affects SOA of WCR.

In order to investigate specific mechanisms by which VOFF affects SOA of WCR not addressed by using the PAM, we attempt to investigate the effects of VOFF on SOA of WCR by using error correction model (ECM). As with case of PAM, we adopt some specifying strategies and results are reported in table 8.

In column (1), both coefficients of changes in WCR target (DTWCR) and the past deviation from target level (LDWCR) are statistically at 1% level in explaining the real firm's WCR rebalancing. Their effects are also economically significant in the sense that both DTWCR and LEWCR substantially influences changes on WCR. More specifically, firms adjust toward their target NWC in response to past deviation from target level in the previous period (LDWCR) is quite high, at around 36%. By contrast, firms undertake WC adjustment at a lower speed in response to changes in WCR target. The SOA is estimated at around 22.3%.

In specification with VOFF (column 3 to 5), the results indicate that firms also undertake dynamic but asymmetric adjustments toward target WCR. In particular, the coefficient of DTWCR is no significantly different from zero, suggesting no evidence that firms adjust WCR toward the target level in response to any changes in target WCR. By contrast, the SOA of WC corresponding to any past deviation from the target is more strongly. The SOA is in the range of 19.4% to 20.2% in specification with VOFFs (s=03, 13, 23). With regard to the effect of VOFF, we find that both interaction terms between VOFF and changes in WCR target (VOFFs x DTWCR) and the past deviation from target level (VOFF x LDWCR) are positively significant with the former larger than the latter. Depending on proxies for VOFF, the coefficient of VOFF x DTWCR varies from 13.6% to 14.1% and corresponding figures for VOFFs x LDWCR range from 7.4% to 8.1%. However, it is worth noticing that under ECM, the coefficient on changes in target level of WCR is indistinguishable from zero. This leads us to the conclusion that consideration of financial flexibility has a stronger effect on past deviation from target level than changes in target level of WCR.

Finally, similar to effects of VOFF under PAM, the coefficient of VOFFs in ECM is insignificant, suggesting that rather than impacting directly on changes in WCR, VOFF affects the such changes mainly via past deviations from target WCR. Putting all above analysis together, the empirical results support our conjecture that considerations of financial flexibility contribute to accelerate dynamic adjustment in WC toward optimal level.

<Insert table 8 about here>

5.2 Effect of VOFF on SOA under active and passive approach of WCM

By definition, active WCM measures the proportion of the change in the unexpected NWC due to the changes in real NWC while passive WCM is the ratio of change in unexpected NWC pertaining to change in target NWC. Table 9 reports regression results on SOA of WC and effects of VOFF on SOA of WCR conditional on active and passive WCM. Under two dimensional fixed effect estimator, SOA of WC of firms that manage WC actively is approximately three time higher than that of firms managing WC on passive basis. The SOA of WC of active WCM firms ranges from 26.2% to 29.4% (column (1), (2) and (3)) and the corresponding figures for passive WCM firms are from 9% to 10 % (column (4), (5) and (6)), conditional on proxies for VOFF used.

With regard to the effect of VOFF, we find positive effect of VOFF on SOA of WC is only significant when firms manage WC actively. In particular, positively significant coefficient of interaction between VOFFs and initial deviation from target level ranges from 12.3% to 15.1% when WC is managed on active basis. By contrast, corresponding coefficients are negatively insignificant and indistinguishable from zero for firms managing WC passively, suggesting that VOFF does not influence on SOA of these firms. These results are consistent with the idea that due to having lower adjustment costs, active - WCM firms can rebalance their WC swifter than passive – WCM firms. This result is also consistent with result from error correction model which suggests that changes in target NWC is not contributable to firms’ NWC rebalance toward the target. Indeed, in context of cash adjustment studies, Dittmar and Duchin (2010) show that cash adjustment speed of firms manage cash actively is higher than firms manage cash passively. The rationale for this is because passively-managing - cash firms actually do not have a target level of cash. In other words, cash in passive firms does not have the same mean-reversing property as active firms. Recently, Guariglia and Yang (2016) using a sample of Chinese firm and provide similar evidence. Specifically, firms' cash rebalancing is largely explained by changes in real cash ratios than changes in in implied target ratios. Firms with active actions of cash management is characterized by pay higher cash dividends, make more investments, and issue significant debt finance, due to lower adjustment costs, compared to firms with passive cash management.

<Insert table 9 about here>

It is worth noticing that coefficients of interaction terms between initial deviation from the WC target with predatory risk (FLUID x TWCR) and G-index (GINDEX x TWCR) is positively significant for active-WCM firms. In economic sense, higher fluidity and higher managerial entrenchment increase SOA of WC by 2.3% and 1.1%, respectively. By contrast, these interaction terms' coefficients is not different from zero for passive firms**.**

5.3 Effect of VOFF on SOA and excessive level of WC

Table 10 provides the differentiated results regarding SOA of WC and the effects of VOFF on SOA of WC for firms overinvesting and underinvesting in WC. We find out that SOA of WCR for overinvesting firms is higher those of their counterparts, from 55.5% to 61.8% compared to 48.4% to 52.6%, depending the proxies for VOFF. These results are consistent with the perspective of the adjustment cost in the sense that the adjustment cost associated with building up WC is higher than those associated with depleting WC, hence SOA is higher for firms with positive excess NWC. We note that such asymmetric adjustment is quite similar to other studies in related areas. In a recent study, Jiang and Lie (2016) also evidence that the speed of cash adjustment for firms with cash holding exceeding target level is about 33% compared to 29% of firms whose cash level is below the target, implying that operating at sub-optimal levels of most liquid assets is more costly for firms. Using the same technique, Faulkender et al. (2012) find that there are asymmetric adjustments in leverage between over-levered and under-levered firms with 56.4% for the former and 29.8% for the latter.

Equally important, we find that positive effect of VOFF on SOA of WC is only significant when level of NWC is below optimal level. In economic sense, one dollar increase in VOFF contributes to increase SOA of WC from 35.4% to 37.3%. This results indicate that consideration of financial flexibility is especially important for firms with negative excessive NWC since these firms are less flexible and inadequately accumulate financial resource to invest into WC at a necessary level (i.e., optimal level) to maximize shareholder value. We find out no such evidence in case of positive excessive NWC when all coefficients on interaction terms between VOFF and initial deviation WCR are indifferent from zero. In fact, we find the negative coefficient of two among three proxies for VOFF.

Surprisingly, there are also asymmetric effects for some control variables. The coefficient of FLUID x TWCR is positively significant for firms with positive excessive NWC and negatively significant for firms with negative excessive NWC. The intuition behind these results is that for firms with suboptimal investment in WC, higher competition in product market decelerates SOA of WC because these firms are inflexible and suffer from higher adjustment costs. Whereas, SOA of WC is an increasing function of competition for firms with WC above optimal level because such firms have lower adjustment costs and more flexible. With regards to bargaining power, the coefficients of GPM x TWCR is positively significant for firms that underinvest and negatively significant for firms overinvesting. Because higher bargaining power can increase trade credit which in turn contributes to close the gap between actual NWC and target WC, while overinvesting might have less incentive to invest more into trade credit, underinvestment firms have more incentive to do so in order to achieve optimal level.

<Insert table 10 about here>

5.4 Effect of VOFF on SOA and financial constraint

Following standard empirical approach in literature we use ex-ante financial constraint proxies to divide firms into constrained and unconstrained portfolios. Subsequently, we perform separate estimations for each portfolio based on each constraint measure. In particular, we use following five proxies[13] for constraint namely KZ index, firm size, commercial paper rating, bond rating and dividend payment.

[13] We acknowledge the weaknesses of non-index classification methods. Hadlock and Pierce (2010) suggest that dividend pay-out are unlikely to be a good predictor for financial constraints. Bond and paper rating are more likely to capture firm size and age rather than constraint status.

- Proxy #1: We employ the widely used Kaplan-Zingle index as firm-specific and time-varying measure of financial constraint. In every year, we define a constrained (unconstrained) firm as a firm with KZ index value in the top (bottom) three deciles of annual KZ distribution.
- Proxy #2: In every year over the sample period, we rank firms based on size, defined as total assets. Firms are assigned to the financially constrained (unconstrained) group are those in the bottom (top) three decides of the annual asset distribution.
- Proxy #3: In every year over the sample period, we use data on commercial paper rating provided by Standard & Poor's retried from Compustat (spsticrm). We assign firms with debt outstanding but without commercial paper rating as constrained firms and firms with commercial papers rated as unconstrained firms.
- Proxy #4: In every year over the sample period, we use data on bond rating provided by Standard & Poor's retried from Compustat (splticrm). We consider firms with debt outstanding but without bond rating as constrained and firms with bond rating as unconstrained firms.
- Proxy #5: In every year over the sample period, using pay-out ratio we assign firms to financially constrained and unconstrained groups. Accordingly, firms with no dividend are grouped in constrained and firms with positive pay-out ratio are assigned to unconstrained group. Pay-out ratio is calculated as the ratio of total dividend over operating income.

Table 11 reports the regression results for testing hypothesis 3 (H3). We draw some important conclusions. Firstly, firms with more financial binding have lower SOA of WC. More specifically, depending on proxies for financial constraints, SOA of WC varies from 23.8% to 53% for unconstrained firms (i.e., low KZ, large size, with commercial paper and bond rated, dividend payers) and the corresponding figures for constrained firms are from 11.7% to 31%. One possible rationale for this is that constrained firms have more difficulties in accessing capital markets and/or are only capable of getting funds from capital markets with significantly high costs. Since adjustment costs of WC rebalance toward optimal level are higher, constrained firms suffer from lower SOA. The result is consistent with evidence provided by Baños-Caballero et al. (2013) who use a sample non-financial Spanish firms and find that SOA of WC for unconstrained firm range from 43% to 44% compared to 14% to 26% for constrained firms.

<Insert table 11 about here>

With respect to the effects of VOFF of SOA, the results are mixed. Inconsistent to our conjecture there is no evidence regarding the effects of financial constraint on relation between SOA and VOFF when KZ and firm size are used as proxies for financial constraint. For three remaining proxies for financial constraints, there is evidences that coefficient of TWCR*VOFF23 is negative for unconstrained firms and positive for constrained ones. Positive coefficient of TWCR*VOFF23 for constrained firms can be explained by the fact that firms facing with financial binding can have more incentive to manage internal source of capital more efficiently due to their difficulties in getting external capital. Compared to firms with low VOFF, firms with high VOFF are less flexible and thus they strive to increase SOA of WC toward optimal level. Since unconstrained firm can access to financial markets without prohibited costs to substitute internal source of finance like cash, they are less incentive to speed up SOA, resulting a lower coefficient of interaction term or even negative coefficient. However, we note that this results should be explained with caution, given that proxies of financial constraints used widely in literature as those in this paper have received many criticism in recent literature (Farre-Mensa and Ljungqvist, 2016).

5.5 Effect of VOFF on SOA and type of industries

Table 12 represents the regression results for testing hypothesis on effects of industrial conditions on VOFF-SOA relation. The regression results show that SOA of WCR for firms operating in differentiated industries is higher than those of firms in service industries. More specifically, the SOA of WCR of firms in differentiated industry is approximately 26.9% to 46.9%, although insignificant. These figures are larger than their corresponding figures for firms in service industries, which is in range from 38% to 40.3%. We explain this as one indication that firms in specialized industries, due to the higher switching costs (Cunat, 2007), find it more optimal to maintain the existing trading relationship and financially support to their counterparts than firms in other industries. Furthermore, the deeply-rooted relationships among firms in differentiated industries make the businesses to have better information about their trading partners, resulting in an increase in informational advantage and thus more flows of transactions and more trade credit (extended and taken) and prepayments provided among firms (Biais and Gollier, 1997, Wilner, 2000, Mateut, 2014, Giannetti et al., 2011). In the same vein, Dass et al. (2014) show that suppliers can use trade credit as a device to invest into specific-relationship, which is often more prevalent when information friction is higher and when the economic linkage between the upstream and downstream firms is higher.

<Insert table 12 about here>

While firms of specialized goods have incentive to extend trade credit, Mateut et al. (2015) provide evidence that to reduce costs of inventories and stimulate sale firms with large portion of raw material tend to sell off finished goods on credit. Consequently, firms in specialized industry can easily adjust their WC due to lower costs of adjustment. Surprisingly, the SOA of WCR in service industries, after accounting for effect of VOFF, is quite high among three types of industries. This is logical given the absence of adjustment costs associated with inventories as one element of WC. However, it is not attributed to trade credit policies. According to Burkart and Ellingsen (2004) it is the illiquid nature of inputs that motives suppliers extend credit to customers. Due to intangible nature of services, to get more trade credit, service firms may be subject to higher adjustment costs, hence reducing SOA. In addition, the results is inconsistent with the theory of collateral liquidation advantage (Longhofer et al., 2003). Accordingly, a supplier benefitting from an existing sales network may have an advantage relative to banks in repossessing its own goods sold on credit if the customer defaults. For firms in industries services, it is impossible to firms to repossess their own goods sold and thus firms in this kind of industry might suffer from high adjustment costs when rebalancing WC.

Regarding the effect of VOFF on SOA, we find that although the coefficient of VOFFs x $TWCR_{i,t}$ (s=03,13,23) are positive across industries, they are only significant for standardized industries, which can be explained by some factors. Firstly, according to switching cost hypothesis suppliers of differentiated goods and service industry are more costly to replace than suppliers in standardized off-the-shelf goods (Johnson et al., 2002). Firms in specialized and service also have deeper business relationships and buyers are less likely to buy goods at higher prices, even for constrained buyers (Giannetti et al., 2011). As a result, VOFF for investments in WC can be less important form these firms compared to firms in standardized industries. Secondly, under the collateral hypothesis, sellers of standardized products and service do not have advantage of providers of differentiated good in terms of reprocessed goods, reversing product specialization cheaper and reselling with higher price. Therefore, trade credit in standardized industries is less popular than differentiated industries. This, in turn, makes VOFF of internal source of capital more valuable and more important for standardized firms. Thirdly, diversion hypothesis states that it is more difficult to divert differentiated products (such as technology) and services (such as energy and transportation) than standardized products (basic materials, and retailers and wholesalers). This leads to less trade credit provided in standardized industries. Consequently, financial flexibility is more valuable in finance NWC for standardized firms. Finally, based on argument of informational advantage, because the suppliers and the entrepreneurs operating in closely related lines of business suppliers of differentiated goods and service can access to superior information, relative to banks and/or suppliers of standardized goods, to assess the creditworthiness of potential borrowers (Giannetti et al., 2011), it can be difficult to get external finance from suppliers in standardized industries and thus financial flexibility can be more valuable for standardized firms.

6. Robustness checks

6.1 Estimation value of financial flexibility

In order to eliminate the possibility that the resulting value of VOFF are sensitive to proxies of changes in abnormal cash holding, we attempt to estimate different measures of VOFF based on all three models of cash holding, namely naive model, baseline and extended model proposed by Almeida et al. (2004). Besides cash, the financial flexibility can be achieved via a conservative debt policy. To account for the possibility that internal financially flexibility via cash is not a negative debt (Acharya et al., 2007), we use adjusted unexpected cash holding, which is the difference between unexpected changes in cash and changes in abnormal leverage. We compute the abnormal change in leverage as the change in the residuals of model of determinants of financial leverage proposed by Frank and Goyal (2009). Subsequently, we recalculate the VOFF which is, in turn, used to re-estimate other equations of interest. Resulting results are almost unchanged in terms of signs and magnitude of VOFF-investment association.

The results are possible sensitive to identifying excess return. Specifically, excess returns in LHS of equation (1) depend on the benchmark return. To test if the results robust to this possibility, we replace benchmark returns based on three-factor with benchmark returns based on four-factor portfolio proposed by Carhart (1997) and re-estimate equation (1), which then used to calculate VOFF. Again, the conclusions on association between VOFF and investment in WC are quite similar.

6.2 Different proxies for investment efficiency

In order to reduce uncertainties relating to measurement error of dependent variable, WCEFF, we also use some alternative for investment efficiency. Firstly, following literature (Aktas et al., 2015b) we take the median value of NWC is defined at three-digit SIC code, as the optimal level. We then subtract median value of NWC from firm's NWC value to calculate NWC deviation from industry. Similar to previous section, we multiple the absolute value of industry-adjusted NWC by -1. Furthermore, to account for the possibility that NWC is persistent overtime we also estimate the equation (4) using system GMM estimator which includes lagged dependent variable as one extra explanatory covariate. We then apply same procedure aforementioned for the residual values to achieve one alternative measure of investment efficiency in WC.

As reported in table 13, VOFF is negatively associated with WCEFF with the coefficients on VOFFs (s=03, 13, 23) are statistically significant. Regarding effect of VOFF on types of investment distortion, the results in table 14 are comparable to the results in the main analysis. In particular, we find there is a negative relation between VOFF and both types of investment distortion. However, for the case of underinvestment the negative relation is insignificant when we use absolute value of industry-adjusted NWC as a proxy for investment efficiency. While this reconfirms the weak evidence of negative relation between VOFF and underinvestment, it also casts doubts on the use of median industry NWC as an optimal level of NWC. We also find out the all above negative relationships are qualitative the same under the empirical identification with contemporaneous determinants of WC (see table A2-4 and table A2-5, appendix A.2).

<Insert table 13 and 14 about here>

6.3 Different estimation methods for determinants of working capital.

In our main analysis, before investigating possible effects of VOFF on SOA of WC we estimate the optimal level of NWC using GMM estimator in the first stage. To test if the results are sensitive to estimation method we use the fixed effect instead of system GMM estimator in the first stage. Following spirit of Jiang and Lie (2016) we allow standard errors in the fixed effect regression are robust to heterokedasticity, autocorrelation to some lags and correlated across firms. The results for the second stage correspond to PAM and ECM are reported in table 15 and 16 respectively. Overall, the results are consistent to previous findings which reconfirm robustness of results to different estimation methods. We also note that under this specifying strategy, effect of VOFF on SOA of WC is significant via both mechanisms - changes in target level of WCR and past deviation from target level - with comparable magnitudes.

<Insert table 15 and 16 about here>

7. Conclusion

In this paper, we provide the empirical evidence about the consideration of financial flexibility, VOFF, on firms' investment policies in working capital. With regards to effects of VOFF on investment efficiency in WC. Some significant conclusions emerge from the findings. On the one hand, the negative relation between VOFF and underinvestment in WC implies that firms with higher VOFF in this period can suffer from underinvestment in the next period. On the other hand, the negative relation between VOFF and overinvestment indicates that firms without enough flexible and in high need for flexible in this period tend to invest too much into WC beyond the optimal level in the following period, because or measure of VOFF is based on cash holding policy, this result implies a substitution between and WC. However, we note the weak empirical evidence for underinvestment case. The identification of VOFF as explanations for both underinvestment and overinvestment in WC suggests that it is vital for firms to maintain a optimal level of internal resource like cash to avoid investment distortions, given that firm performance is a decreasing function of overinvestment in WC and that lack of WC can lead to increased liquidity risk, destroying relations in supply chains and possibly detrimental effects on long term investments.

In addition, we find that firms close about 39.3% the gap between actual and target level of NWC each year. Yet, this adjustment is affected by considerations of financial flexibility. Using different proxies for VOFF, we estimate that an increase in VOFF accelerates adjustment speed of WC, implying that VOFF is actually an important consideration in WC management. It also implicitly represents the role of WC as an alternative source flexibility apart from cash reserve.

We also find that the main mechanism by which VOFF affects speed of WC adjustment is via deviation of WC from optimal level in the previous year. This is also consistent with another our finding that SOA of WC is higher for firms managing WC on active basis. In one other related finding, SOA of WC is evidenced to be higher for firms that overinvest in WC compared to firms underinvesting in WC. In this regard, our results are similar to findings of studies on cash and leverage policies and consistent with the perception that firms with high WC have lower adjustment cost and thus resulting in higher SOA of WC. By contrast, consideration of VOFF is increasingly vital when there is an underinvestment in WC, representing by positive effect of VOFF on SOA of WC when level of WC is under optimal level.

Furthermore, we find that SOA of WC of unconstrained firms is higher compared to that of constrained firms, suggesting that strong ability and/or low costs to access external capital to finance WC can facilitate SOA of WC. With respect to effect of VOFF, we find that coefficient of interaction term loads positively for constrained firms and negatively for unconstrained firms, indicating that consideration of financial flexibility is more important for firms with difficulties in getting capital without prohibitedly high costs. Finally, we find that SOA of WC is highest for firms in differentiated industries and lowest for firms in standardized industries. Moreover, the positive effects of VOFF is most significant for standardized industry, possibly because trade credit are less popular firms in standardized industries and higher adjustment costs for firms in this industry category. This result may also signify that the greatest effects of VOFF on SOA of WC is for firms that are subject to information asymmetry and lack collaborative relation with partnerships and thus less likely to get finance from partners in supply chain.

Overall, our findings have several implications. For practitioners, this article highlights the importance of financial flexibility for non-financial US firms. Particularly, role of financial flexibility is well perceived by investors. Holding all else unchanged, higher VOFF implies higher investment distortions in WC, especially overinvestment issue. The results in the paper also propose that VOFF is one key factor which facilitates the SOA of WC. On average, higher VOFF can accelerate SOA of WC toward its optimal level. For researchers, this study demonstrate that further investigation into different aspects of consideration of financial flexibility in corporate decisions is highly needed. Potential fruitful research could include an expansion for an international sample across different institutional contexts and market conditions.

Appendix

A.1 List of main tables

Table 1 Descriptive statistics

Variable	N	Mean	Sd	Min	P25	P50	P75	Max
Marginal value of cash holding								
$r_{i,t} - R^B_{i,t}$	76,116	0.0545	0.6213	-0.9868	-0.2569	-0.0409	0.2168	23.3177
ΔC(naive)	76,434	0.0205	0.1431	-0.6902	-0.0250	0.0034	0.0449	1.1488
ΔC(m1)	60,336	-0.0000	0.1175	-0.7872	-0.0449	-0.0042	0.0343	1.2536
ΔC(m2)	55,179	0.0000	0.1162	-0.7972	-0.0453	-0.0040	0.0349	1.2474
CFAL	76,322	0.0987	0.1713	-1.2340	0.0390	0.0894	0.1580	1.2370
Q1	79,201	1.7959	1.1607	0.4387	1.0834	1.4112	2.0449	8.4297
SIZE2	79,201	5.6687	2.0880	0.3605	4.1320	5.5736	7.0644	11.8405
CAPEX	75,744	0.1124	0.1599	0.0002	0.0230	0.0582	0.1330	1.6419
AQCS	72,873	0.0365	0.1157	-0.0194	0.0000	0.0000	0.0121	1.3330
ΔNWC	74,559	0.0106	0.1398	-0.9702	-0.0263	0.0060	0.0466	0.9084
ΔSTD	76,444	0.0023	0.0750	-0.7412	-0.0029	0.0000	0.0074	0.5260
LSGR	59,755	-1.8315	1.2744	-6.6763	-2.5387	-1.8069	-1.0768	2.4747
ΔE	71,110	0.0274	0.2026	-1.1630	-0.0193	0.0129	0.0510	3.8288
T	79,201	1.0216	1.4064	0.0000	0.0000	0.1953	1.8361	8.3333
SPREAD	61,137	0.2304	0.2666	-0.0083	0.0325	0.1458	0.3542	2.6875
TANG	79,100	0.3142	0.2335	0.0031	0.1244	0.2592	0.4562	0.9261
$C_{i,t-1}$	69,268	0.1628	0.2123	0.0000	0.0341	0.0928	0.2066	2.5192
ΔRD	69,273	0.0018	0.0168	-0.2426	0.0000	0.0000	0.0022	0.1114
ΔNA	76,137	0.1180	0.4511	-3.0338	-0.0153	0.0562	0.1894	3.6651
ΔI	71,110	0.0025	0.0254	-0.1843	-0.0022	0.0000	0.0052	0.2065
ΔD	76,147	0.0006	0.0130	-0.2017	0.0000	0.0000	0.0011	0.1983
ML	79,201	0.2196	0.2138	0.0000	0.0270	0.1658	0.3491	0.9140
NF	66,530	0.0444	0.2327	-1.3522	-0.0320	0.0008	0.0645	1.8665
Value of financial flexibility								
VOFF03	54,116	1.2464	0.3450	-0.4153	1.0503	1.2762	1.4369	5.2814
VOFF13	54,116	1.2345	0.3383	-0.4992	1.0557	1.2726	1.4145	5.6828
VOFF23	54,116	1.2849	0.3781	-0.5526	1.0733	1.3395	1.5131	5.7208
Determinant of working capital								
NWC	76,310	0.2163	0.1715	-0.0977	0.0749	0.1932	0.3349	0.7489
SGR	79,201	0.2284	0.6138	-0.7363	0.0024	0.1054	0.2606	9.1792
GPM	79,201	0.2905	0.9621	-31.3565	0.2289	0.3471	0.5040	0.9429
SVOL	54,423	0.2665	0.3544	0.0085	0.0841	0.1561	0.2926	3.0359
CF	79,075	0.0681	0.1348	-1.1530	0.0467	0.0894	0.1312	0.3493
MP	79,201	0.0990	0.1970	0.0000	0.0019	0.0146	0.0889	1.0000
DIFF	79,201	0.0234	0.1510	0.0000	0.0000	0.0000	0.0000	1.0000
AGE	79,200	26.1161	17.7177	0.7342	13.8108	21.7863	34.2391	89.0000
Investment efficiency and speed of adjustment								
WCEFF	43,972	-0.0812	0.0682	-0.6317	-0.1140	-0.0642	-0.0299	-0.0000

OVNWC	20,742	-0.0861	0.0753	-0.6211	-0.1223	-0.0650	-0.0291	-0.0000
UNNWC	23,230	-0.0768	0.0609	-0.6317	-0.1083	-0.0637	-0.0305	-0.0000
GINDEX	79,201	0.8048	2.7079	0.0000	0.0000	0.0000	0.0000	17.0000
FLUID	38,655	6.6972	3.5210	0.0000	4.1226	6.0114	8.5644	27.5900
ROA	79,200	0.0174	0.1817	-6.6396	0.0050	0.0461	0.0839	4.8719
BLEV	79,201	0.2184	0.1845	0.0000	0.0460	0.2005	0.3392	0.9512
R&D	79,201	0.0377	0.0740	0.0000	0.0000	0.0000	0.0434	0.6209
RETVOL	70,210	0.1349	0.0768	0.0169	0.0867	0.1180	0.1620	2.7545
AGR	65,037	0.1491	0.3958	-0.6510	-0.0358	0.0565	0.2079	3.2690
CR	79,194	0.1663	0.1952	0.0000	0.0267	0.0867	0.2347	0.9264
∆NWC	62,536	-0.0027	0.0511	-0.5738	-0.0219	-0.0008	0.0183	0.5874
TWCR	52,310	-0.0068	0.0385	-0.1642	-0.0320	-0.0039	0.0203	0.1698
DTWCR	43,844	-0.0029	0.0366	-0.4266	-0.0173	-0.0014	0.0129	0.4688
LDWCR	43,855	-0.0037	0.0546	-0.5754	-0.0342	0.0013	0.0300	0.4913
TNIC3HHI	41,673	0.2387	0.2093	0.0155	0.0969	0.1629	0.3044	1.0000
FIC300HHI	41,313	0.2063	0.1717	0.0148	0.1013	0.1537	0.2432	1.0000
EINDEX	79,201	0.2022	0.7652	0.0000	0.0000	0.0000	0.0000	6.0000
SALECV	38,782	0.2247	0.1635	0.0198	0.1092	0.1810	0.2914	0.9578
INDLI	79,157	-5.4456	2.5051	-41.6870	-6.6888	-4.9776	-3.8857	-1.0518

Note: This table shows the descriptive statistics for all variables used in the paper. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Ratios are winsorized at the 1% on two tails to eliminate potential effects of outliers.

Table 2 Correlation matrix

Panel A: Correlation matrix of main variables used to calculate VOFF

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1	$R_{i,t}-R_{i,t}$ (3f)	1																
2	$R_{i,t}-R_{i,t}$ (4f)	**1**	1															
3	ΔC (naive)	**0.25**	**0.25**	1														
4	LSGR	**0.13**	**0.13**	**0.12**	1													
5	ΔE	**0.31**	**0.3**	**0.15**	**0.17**	1												
6	T	**-0.01**	**-0.02**	**-0.02**	**-0.13**	**-0.02**	1											
7	SPREAD	-0.01	0.01	0	0.01	**-0.02**	**0.04**	1										
8	TANG	**-0.04**	**-0.03**	**-0.07**	**-0.08**	0	**-0.09**	**0.11**	1									
9	ΔC (Baseline)	**0.22**	**0.22**	**0.91**	**0.04**	**0.11**	-0.01	0	**-0.05**	1								
10	ΔC (Full)	**0.23**	**0.23**	**0.91**	**0.04**	**0.11**	0	0	**-0.05**	**0.99**	1							
11	C	**0.15**	**0.14**	**-0.14**	**0.03**	**0.15**	**-0.1**	**-0.11**	**-0.19**	**-0.15**	**-0.15**	1						
12	ΔRD	**-0.03**	**-0.02**	**0.03**	**0.12**	**-0.16**	0	**0.04**	**-0.04**	**0.02**	**0.02**	**-0.11**	1					
13	ΔNA	**0.09**	**0.1**	**0.03**	**0.34**	**0.14**	**0.02**	**0.08**	**0.05**	**-0.05**	**-0.06**	**-0.05**	**0.12**	1				
14	ΔI	**-0.06**	**-0.05**	**0.01**	**0.22**	**0.06**	**-0.04**	**0.04**	**0.07**	**0.02**	0.01	**-0.03**	**0.05**	**0.46**	1			
15	ΔD	**0.03**	**0.03**	0	**0.02**	**0.01**	**0.01**	**-0.01**	0	**-0.01**	**-0.01**	**-0.02**	**0.02**	**0.1**	**0.03**	1		
16	ML	**-0.14**	**-0.14**	**-0.04**	**-0.14**	0.01	**-0.09**	**0.03**	**0.33**	**-0.02**	**-0.03**	**0.02**	**-0.05**	**0.08**	**0.19**	**-0.07**	1	
17	NF	**0.07**	**0.08**	**0.26**	**0.27**	**0.03**	**-0.07**	**0.03**	**0.06**	**0.21**	**0.21**	**-0.04**	**0.06**	**0.58**	**0.4**	**0.04**	**0.13**	1

Panel B: Correlation matrix of variables used to investigating working capital – VOFF relation

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
1	VOFF03	1																
2	VOFF13	**0.96**	1															
3	VOFF23	**0.96**	**0.99**	1														
4	NWC	**0.26**	**0.26**	**0.29**	1													
5	SGR	**0.29**	**0.21**	**0.17**	**-0.07**	1												
6	GPM	**-0.03**	**-0.01**	**-0.02**	**0.09**	**-0.01**	1											
7	SVOL	**0.1**	**0.06**	**0.06**	**-0.16**	**0.29**	**-0.15**	1										
8	CF	**-0.05**	**0.03**	**-0.01**	**0.14**	**-0.05**	**0.37**	**-0.28**	1									
9	MP	**-0.04**	**-0.01**	**-0.01**	**0.05**	**-0.07**	**0.01**	**-0.12**	**0.1**	1								
10	DIFF	0	**-0.03**	**-0.02**	**-0.04**	**0.02**	**-0.08**	**0.12**	**-0.25**	**-0.06**	1							
11	AGE	**-0.06**	**-0.03**	**-0.03**	**0.15**	**-0.14**	**0.03**	**-0.19**	**0.15**	**0.28**	**-0.05**	1						
12	WCEFF	**-0.17**	**-0.15**	**-0.17**	**-0.28**	0	0	**-0.03**	**0.06**	**0.07**	**-0.02**	**0.04**	1					
13	GINDEX	**-0.03**	**-0.02**	**-0.02**	**-0.02**	**-0.04**	**0.02**	**-0.04**	**0.05**	**0.09**	**-0.01**	**0.16**	**0.06**	1				
14	FLUID	**0.06**	**0.01**	**0.01**	**-0.37**	**0.17**	**-0.17**	**0.31**	**-0.28**	**-0.2**	**0.14**	**-0.28**	**0.08**	**-0.1**	1			
15	ROA	**0.03**	**0.1**	**0.07**	**0.16**	**-0.04**	**0.3**	**-0.25**	**0.86**	**0.09**	**-0.21**	**0.13**	**0.02**	**0.04**	**-0.24**	1		
16	BLEV	**-0.22**	**-0.21**	**-0.25**	**-0.09**	**-0.02**	**0.03**	0	**-0.02**	**0.11**	**0.23**	**0.03**	**0.08**	**0.03**	**-0.02**	**-0.03**	1	
17	R&D	**0.25**	**0.19**	**0.23**	**-0.06**	**0.09**	**-0.27**	**0.23**	**-0.51**	**-0.18**	**0.1**	**-0.15**	**-0.04**	**-0.03**	**0.37**	**-0.44**	**-0.28**	1
18	RETVOL	**0.21**	**0.18**	**0.18**	**-0.06**	**0.12**	**-0.11**	**0.28**	**-0.32**	**-0.2**	**0.13**	**-0.27**	**-0.08**	**-0.1**	**0.23**	**-0.29**	**-0.05**	**0.28**
19	AGR	**0.04**	**0.02**	0	**-0.05**	**0.38**	0.01	**0.11**	**0.06**	**-0.05**	**-0.01**	**-0.1**	0	**-0.04**	**0.11**	**0.09**	**0.02**	**-0.02**
20	CR	**0.33**	**0.28**	**0.32**	**-0.27**	**0.12**	**-0.21**	**0.24**	**-0.3**	**-0.2**	**0.04**	**-0.21**	**-0.06**	**-0.07**	**0.36**	**-0.22**	**-0.46**	**0.54**
21	ΔNWC	0.01	0	-0.01	**0.11**	**0.13**	0	**0.02**	**-0.02**	**-0.02**	**-0.01**	**-0.03**	**-0.05**	0	**0.02**	**-0.02**	0.01	**0.03**
22	TWCR	**-0.27**	**-0.28**	**-0.32**	**-0.86**	**0.19**	0	**0.06**	**-0.03**	**-0.01**	**-0.01**	**-0.06**	**0.22**	**-0.03**	**0.24**	**-0.09**	**0.1**	**-0.02**
23	DTWCR	**0.04**	**0.04**	**0.03**	**0.06**	**0.13**	**0.02**	**0.01**	**0.01**	-0.01	**-0.03**	**-0.03**	**-0.02**	**-0.01**	**0.01**	**0.01**	0	**0.02**
24	LDWCR	**-0.22**	**-0.23**	**-0.25**	**-0.64**	**0.04**	**-0.01**	**0.04**	**-0.02**	0	0.01	**-0.01**	**0.17**	-0.01	**0.16**	**-0.07**	**0.07**	**-0.04**
25	TNIC3HHI	**0.06**	**0.08**	**0.09**	**0.16**	**-0.05**	**0.03**	**-0.06**	**0.03**	**0.06**	**-0.02**	**0.06**	**-0.11**	**-0.04**	**-0.29**	**0.03**	**-0.02**	**-0.13**
26	FIC300HHI	**0.08**	**0.09**	**0.1**	**0.1**	**-0.04**	**0.04**	**-0.04**	**0.02**	**-0.02**	**-0.02**	**0.03**	**-0.06**	**-0.02**	**-0.13**	**0.02**	**-0.08**	**0.01**

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)
27	EINDEX	**-0.04**	**-0.02**	**-0.02**	**-0.02**	**-0.04**	**0.01**	**-0.05**	**0.04**	**0.07**	**-0.01**	**0.13**	**0.06**	**0.89**	**-0.09**	**0.03**	**0.03**	**-0.03**
28	SALECV	**0.1**	**0.05**	**0.04**	**-0.13**	**0.42**	**-0.12**	**0.6**	**-0.14**	**-0.12**	**0.1**	**-0.21**	**-0.04**	**-0.04**	**0.32**	**-0.13**	**0.03**	**0.17**
29	INDLI	**0.06**	**0.09**	**0.1**	**0.42**	**-0.1**	**0.43**	**-0.23**	**0.3**	**0.21**	**-0.1**	**0.14**	**-0.12**	**0.04**	**-0.46**	**0.29**	0	**-0.35**

		(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
18	RETVOL	1											
19	AGR	**0.02**	1										
20	CR	**0.27**	**0.01**	1									
21	ΔNWC	0	**-0.03**	**-0.08**	1								
22	TWCR	**0.05**	**0.05**	**0.17**	**0.22**	1							
23	DTWCR	0	**-0.02**	**-0.03**	**-0.12**	**-0.07**	1						
24	LDWCR	**0.03**	**0.04**	**0.13**	**0.23**	**0.74**	**-0.72**	1					
25	TNIC3HHI	**-0.04**	**-0.06**	**-0.09**	0	**-0.08**	0	**-0.06**	1				
26	FIC300HHI	**-0.03**	**-0.02**	0.01	0	**-0.07**	-0.01	**-0.05**	**0.26**	1			
27	EINDEX	**-0.09**	**-0.03**	**-0.07**	0	-0.02	-0.01	**-0.01**	**-0.03**	**-0.02**	1		
28	SALECV	**0.24**	**0.27**	**0.18**	**0.02**	**0.1**	0	**0.07**	**-0.1**	**-0.07**	**-0.04**	1	
29	INDLI	**-0.16**	**-0.03**	**-0.3**	**-0.02**	**-0.33**	**-0.01**	**-0.22**	**0.11**	**0.05**	**0.03**	**-0.19**	1

Note: This table presents correlation matrix for all variables used in the paper. Bolded numbers indicate the correlation coefficients which are significant at 5% level. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Ratios are winsorized at the 1% on two tails to eliminate potential effects of outliers.

Table 3 Regression results of marginal value of cash holding

Variables	$r_{i,t} - R^B_{i,t}$ Naive (1)	$r_{i,t} - R^B_{i,t}$ _CH1 (2)	$r_{i,t} - R^B_{i,t}$ _CH2 (3)
ΔC_{it}	1.533***	1.464***	1.606***
	(10.74)	(8.32)	(8.48)
$SGR_{i,t}$	0.032***	0.040***	0.040***
	(9.20)	(10.92)	(10.64)
$\Delta E_{i,t}$	0.927***	0.929***	0.924***
	(16.61)	(14.73)	(14.03)
$T_{i,t}$	-0.010***	-0.014***	-0.015***
	(-4.03)	(-5.80)	(-5.77)
$Spread_{i,t}$	0.021	0.019	0.022
	(1.05)	(0.94)	(0.94)
$Tang_{i,t}$	0.150***	0.148***	0.154***
	(5.41)	(4.99)	(4.80)
$Sgr_{i,t} * \Delta C_{i,t}$	0.099**	0.057	0.046
	(2.21)	(1.06)	(0.79)
$\Delta E_{i,t} * \Delta C_{i,t}$	0.986***	1.102***	1.079***
	(3.02)	(3.24)	(3.03)
$T_{i,t} * \Delta C_{i,t}$	-0.045	0.011	0.007
	(-0.91)	(0.19)	(0.11)
$Spread_{i,t} * \Delta C_{it}$	0.189	0.062	0.038
	(0.83)	(0.23)	(0.13)
$Tang_{i,t} * \Delta C_{it}$	-1.062***	-0.979***	-1.233***
	(-3.34)	(-3.00)	(-3.58)
$C_{i,t-1}$	0.489***	0.479***	0.491***
	(11.22)	(10.11)	(9.37)
$\Delta RD_{i,t}$	0.550	0.397	0.354
	(0.91)	(0.57)	(0.48)
$\Delta NA_{i,t}$	0.229***	0.231***	0.250***
	(7.34)	(6.86)	(6.74)
$\Delta I_{i,t}$	-2.458***	-2.619***	-2.640***
	(-6.74)	(-6.78)	(-6.19)
$\Delta D_{i,t}$	1.076***	1.129***	1.128***
	(4.19)	(3.89)	(3.59)
$ML_{i,t}$	-0.538***	-0.546***	-0.524***
	(-23.13)	(-21.76)	(-19.76)
$NF_{i,t}$	-0.092*	-0.108**	-0.128**
	(-1.94)	(-2.08)	(-2.23)
Adj_Rsquared	.3099	.3081	.3086
N	29029	26361	24128
Fixed effects	Industry/year	Industry/year	Industry/year

Notes: This table presents the results of estimating equation (1) in the text. The dependent variable is annual excess return ($r_{i,t} - R^B_{i,t}$ *). Column (1) reports the regression results when the unexpected changes in cash holding (ΔCi,t) is defined as the difference between value of cash and marketable securities in year t and t-1. Column (2) and column (3) are the regression results when ΔCi,t is calculated based on baseline and full (extended) specifications of cash holding determinants proposed by Almeida et al. (2004). All variables except MLi,t, SGRi,t, Ti,t, SPREADi,t, TANGi,t and excess stock returns are deflated by lagged market value of equity (* $ME_{i,t-1}$ *). All variables used as interaction terms are balanced at their means. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT and CRSP. The sample includes 8024 firms over 1987-2013 period. Ratios are winsorized at the 1% on two tails to eliminate potential effects of outliers. Standard errors are clustered at the firm level. Estimation accounts for industry fixed effects and year fixed effects. Statistical significances are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 4 Determinants of NWC

	(1) NWC	(2) NWC
$SGR_{i,t-1}$	0.006***	0.009***
	(3.50)	(6.48)
$GPM_{i,t-1}$	0.007***	0.000
	(5.01)	(0.18)
$SVOL_{i,t-1}$	-0.034***	-0.017***
	(-10.70)	(-5.81)
$CF_{i,t-1}$	0.112***	0.030***
	(10.55)	(4.01)
$Q1_{i,t-1}$	-0.005***	0.005***
	(-3.30)	(5.02)
$SIZE_{i,t-1}$	-0.016***	-0.012***
	(-14.57)	(-7.64)
$MP_{i,t-1}$	-0.010	-0.013
	(-1.10)	(-1.43)
$DIFF_{i,t-1}$	-0.005	-0.008**
	(-0.82)	(-2.04)
$AGE_{i,t-1}$	0.000***	0.001**
	(4.73)	(2.37)
N	4.40e+04	4.33e+04
Adj_Rsquared	.581	.8663
Fixed effects	Firm/Year	Industry/Year

*Notes: This table presents the results of estimating equation (4) in the text. The dependent variable is Net WC scaled by total assets. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT and CRSP. Final sample includes 8024 non-financial firms over 1987-2013 period (unbalanced panel data). Ratio variables are winsorized at the 1% on two tails to eliminate potential effects of outliers. Standard errors are clustered at the firm-level. Estimation accounts for industry fixed effects and year fixed effects. Statistical significances are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively and the associated t-statistics are presented in parentheses.*

Table 5 Effect of VOFF on investment efficiency in NWC

	(1) WCEFF	(2) WCEFF	(3) WCEFF
$VOFF03_{i,t-1}$	-0.011***		
	(-4.80)		
$VOFF13_{i,t-1}$		-0.011***	
		(-4.96)	
$VOFF23_{i,t-1}$			-0.012***
			(-5.33)
$SGR_{i,t-1}$	-0.000	-0.001	-0.001
	(-0.35)	(-0.74)	(-0.69)
$GPM_{i,t-1}$	-0.002**	-0.002**	-0.002**
	(-1.99)	(-2.02)	(-2.04)
$SVOL_{i,t-1}$	-0.002	-0.002	-0.001
	(-0.73)	(-0.74)	(-0.66)
$CF_{i,t-1}$	0.024***	0.026***	0.026***
	(3.40)	(3.61)	(3.68)
$Q1_{i,t-1}$	-0.003***	-0.003***	-0.003***
	(-3.06)	(-3.15)	(-3.13)
$SIZE2_{i,t-1}$	0.004***	0.004***	0.004***
	(5.98)	(6.08)	(6.05)
$MP_{i,t-1}$	-0.003	-0.003	-0.003
	(-0.42)	(-0.43)	(-0.40)
$DIFF_{i,t-1}$	0.003	0.003	0.003
	(0.81)	(0.77)	(0.74)
$AGE_{i,t-1}$	0.000	0.000	0.000
	(0.07)	(0.06)	(0.09)
$GINDEX_{i,t-1}$	-0.000	-0.000	-0.000
	(-0.27)	(-0.30)	(-0.29)
$GDUM_{i,t-1}$	-0.005	-0.005	-0.005
	(-0.95)	(-0.98)	(-0.97)
$FLUID_{i,t-1}$	0.001*	0.001*	0.001*
	(1.82)	(1.78)	(1.77)
$R\&D_{i,t-1}$	0.046***	0.046***	0.047***
	(2.80)	(2.80)	(2.86)
N	2.02e+04	2.02e+04	2.02e+04
Adj_Rsq	.2824	.2824	.2832
Fixed effects	Industry/Year	Industry/Year	Industry/Year

*Notes: This table reports the regression results on association between investment efficiency in WC and VOFF (equation (5) in the text). Dependent variable, WCEFFi,t, is the absolute value of residuals of NWC equation (equation (4) in the text), multiplied by -1. VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All other variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 6 Over/under investment in WC and VOFF

	(1) UNNWC	(2) OVNWC	(3) UNNWC	(4) OVNWC	(5) UNNWC	(6) OVNWC
$VOFF03_{i,t-1}$	-0.005**	-0.016***				
	(-2.22)	(-4.64)				
$VOFF13_{i,t-1}$			-0.003	-0.017***		
			(-1.61)	(-5.30)		
$VOFF23_{i,t-1}$					-0.004*	-0.019***
					(-1.70)	(-5.71)
$SGR_{i,t-1}$	-0.000	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.17)	(-0.22)	(-0.50)	(-0.40)	(-0.51)	(-0.32)
$GPM_{i,t-1}$	-0.003***	-0.001	-0.002***	-0.001	-0.002***	-0.001
	(-3.10)	(-0.66)	(-3.09)	(-0.70)	(-3.09)	(-0.74)
$SVOL_{i,t-1}$	0.007***	-0.008***	0.006***	-0.008***	0.006***	-0.008***
	(2.82)	(-2.76)	(2.75)	(-2.74)	(2.78)	(-2.66)
$CF_{i,t-1}$	-0.001	0.048***	-0.001	0.052***	-0.001	0.052***
	(-0.15)	(4.64)	(-0.15)	(4.94)	(-0.15)	(5.02)
$Q1_{i,t-1}$	0.001	-0.006***	0.001	-0.007***	0.001	-0.007***
	(1.03)	(-4.45)	(0.99)	(-4.55)	(0.99)	(-4.55)
$SIZE2_{i,t-1}$	0.005***	0.004***	0.005***	0.004***	0.005***	0.004***
	(6.26)	(4.07)	(6.34)	(4.15)	(6.33)	(4.11)
$MP_{i,t-1}$	-0.005	-0.003	-0.005	-0.003	-0.005	-0.003
	(-0.63)	(-0.28)	(-0.65)	(-0.27)	(-0.65)	(-0.25)
$DIFF_{i,t-1}$	0.004	0.000	0.004	0.000	0.004	0.000
	(0.93)	(0.07)	(0.92)	(0.04)	(0.91)	(0.04)
$AGE_{i,t-1}$	0.000	-0.000	0.000	-0.000	0.000	-0.000
	(0.03)	(-0.16)	(0.02)	(-0.14)	(0.02)	(-0.12)
$GINDEX_{i,t-1}$	0.000	-0.001	0.000	-0.001	0.000	-0.001
	(0.93)	(-1.05)	(0.91)	(-1.08)	(0.91)	(-1.08)
$GDUM_{i,t-1}$	-0.000	-0.009	-0.000	-0.010	-0.000	-0.010
	(-0.06)	(-1.23)	(-0.08)	(-1.25)	(-0.08)	(-1.25)
$FLUID_{i,t-1}$	-0.001**	0.002***	-0.001**	0.002***	-0.001**	0.002***
	(-2.22)	(4.02)	(-2.25)	(3.99)	(-2.24)	(3.96)
$R\&D_{i,t-1}$	-0.010	0.124***	-0.011	0.125***	-0.010	0.127***
	(-0.52)	(4.50)	(-0.56)	(4.53)	(-0.55)	(4.60)
N	1.05e+04	9627	1.05e+04	9627	1.05e+04	9627
Adj_Rsq	.3242	.3542	.3238	.355	.3239	.3565
Fixed effects	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year

*Notes: This table shows the results of regression investigating VOFF and under/over investment in WC. Dependent variables are overinvestment (OVNWCi,t) and underinvestment (UNNWCi,t). OVNWCi,t is computed as the positive value of residuals of investment model (i.e., equation (4)), multiplied by -1. UNNWCi,t is the negative value of residuals of investment model (i.e., equation (4)). VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 7 Effects of VOFF on SOA of working capital, Partial adjustment model

	ΔNWC(1)	ΔNWC(2)	ΔNWC(3)	ΔNWC(4)	ΔNWC(5)
$TWCR_i$	0.393***	0.263***	0.209***	0.227***	0.217***
	(38.75)	(6.45)	(3.74)	(4.25)	(4.20)
VOFF03 x $TWCR_{i,t}$		0.096***	0.081**		
		(2.89)	(2.01)		
VOFF13 x $TWCR_{i,t}$				0.065*	
				(1.74)	
VOFF23 x $TWCR_{i,t}$					0.070**
					(2.04)
FLUID x $TWCR_{i,t}$			0.011***	0.011***	0.011***
			(2.76)	(2.78)	(2.81)
GINDEX x $TWCR_{i,t}$			0.006**	0.006**	0.006**
			(2.13)	(2.13)	(2.13)
GPM x $TWCR_{i,t}$			-0.009	-0.010	-0.009
			(-0.29)	(-0.32)	(-0.30)
SVOL x $TWCR_{i,t}$			0.047	0.050	0.049
			(1.36)	(1.43)	(1.39)
MP x $TWCR_{i,t}$			-0.055	-0.056	-0.057
			(-0.99)	(-1.00)	(-1.02)
$FLUID_{i,t-1}$			-0.001***	-0.001***	-0.001***
			(-5.95)	(-5.94)	(-5.96)
$GINDEX_{i,t-1}$			0.000	0.000	0.000
			(0.30)	(0.29)	(0.29)
$GDUM_{i,t-1}$			-0.003	-0.003	-0.003
			(-1.07)	(-1.08)	(-1.07)
$GPM_{i,t-1}$			0.000	0.000	0.000
			(0.65)	(0.66)	(0.65)
$SVOL_{i,t-1}$			0.003***	0.003***	0.003***
			(2.89)	(2.95)	(2.88)
$MP_{i,t-1}$			-0.006***	-0.006***	-0.006***
			(-4.57)	(-4.55)	(-4.61)
$VOFF03_{i,t-1}$		0.001	0.000		
		(0.63)	(0.27)		
$VOFF13_{i,t-1}$				0.000	
				(0.30)	
$VOFF23_{i,t-1}$					0.001
					(0.72)
N	5.21e+04	3.72e+04	2.03e+04	2.03e+04	2.03e+04
Adj_Rsquared	.0765	.07512	.08314	.083	.08316
Fixed effects	Industry/year	Industry/year	Industry/year	Industry/year	Industry/year

*Notes: This table reports regression results for SOA of WC and effects of VOFF on SOA of WC using the partial adjustment model (equation 7 in the text). ΔNWCi,t is the annual change in NWC, calculated as the difference between NWC in year t and the year t-1. TWCR is the deviation from target NWC, calculated as the difference between the fitted value of regression NWCi,t against its determinants and lagged value of NWC (NWCi,t-1). VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 8 Effects of VOFF on SOA of working capital, Error correction model

	ΔNWC(1)	ΔNWC(2)	ΔNWC(3)	ΔNWC(4)	ΔNWC(5)
$DTWCR_{i,t}$	0.223***	0.070	0.003	0.006	-0.011
	(15.14)	(1.10)	(0.04)	(0.07)	(-0.13)
$LDWCR_{i,t}$	0.360***	0.237***	0.196***	0.202***	0.194***
	(34.19)	(5.62)	(3.55)	(3.79)	(3.75)
VOFF03 x $DTWCR_{i,t}$		0.122**	0.141**		
		(2.43)	(2.40)		
VOFF03 x $LDWCR_{i,t}$		0.095***	0.081**		
		(2.74)	(2.11)		
VOFF13 x $DTWCR_{i,t}$				0.136**	
				(2.32)	
VOFF13 x $LDWCR_{i,t}$				0.074**	
				(2.04)	
VOFF23 x $DTWCR_{i,t}$					0.141***
					(2.67)
VOFF23 x $LDWCR_{i,t}$					0.077**
					(2.32)
FLUID x $DTWCR_{i,t}$			0.008	0.009	0.009
			(1.48)	(1.55)	(1.57)
FLUID x $LDWCR_{i,t}$			0.012***	0.012***	0.012***
			(3.11)	(3.14)	(3.17)
GINDEX x $DTWCR_{i,t}$			0.010**	0.010**	0.010**
			(2.29)	(2.30)	(2.31)
GINDEX x $LDWCR_{i,t}$			0.006**	0.006**	0.006**
			(2.33)	(2.33)	(2.33)
GPM x $DTWCR_{i,t}$			-0.010	-0.011	-0.010
			(-0.26)	(-0.29)	(-0.27)
GPM x $LDWCR_{i,t}$			-0.037	-0.038*	-0.037
			(-1.62)	(-1.66)	(-1.63)
SVOL x $DTWCR_{i,t}$			0.046	0.050	0.048
			(1.14)	(1.23)	(1.19)
SVOL x $LDWCR_{i,t}$			0.047	0.049	0.048
			(1.42)	(1.46)	(1.42)
MP x $DTWCR_{i,t}$			0.111	0.108	0.108
			(1.33)	(1.30)	(1.30)
MP x $LDWCR_{i,t}$			-0.045	-0.046	-0.047
			(-0.81)	(-0.83)	(-0.86)
$FLUID_{i,t-1}$			-0.001***	-0.001***	-0.001***
			(-5.44)	(-5.44)	(-5.45)
$GINDEX_{i,t-1}$			0.000	0.000	0.000
			(0.20)	(0.18)	(0.18)
$GDUM_{i,t-1}$			-0.003	-0.003	-0.003
			(-1.18)	(-1.19)	(-1.19)
$GPM_{i,t-1}$			0.001	0.001	0.001
			(1.05)	(1.08)	(1.07)
$SVOL_{i,t-1}$			0.003***	0.003***	0.003***
			(2.94)	(2.99)	(2.92)
$MP_{i,t-1}$			-0.006***	-0.006***	-0.006***
			(-4.46)	(-4.44)	(-4.50)
$VOFF03_{i,t-1}$		-0.000	-0.000		
		(-0.30)	(-0.13)		
$VOFF13_{i,t-1}$				-0.000	
				(-0.33)	
$VOFF23_{i,t-1}$					0.000
					(0.08)
N	4.37e+04	3.18e+04	2.03e+04	2.03e+04	2.03e+04
Adj_Rsquared	.08673	.08577	.09247	.09243	.0926
Fixed effects	Industry/year	Industry/year	Industry/year	Industry/year	Industry/year

*Notes: This table reports regression results for speed of adjustment of WC (SOA of WC) and effects of VOFF on SOA of WC using the error correction model (equation 9 in the text). ΔNWCi,t is the measure of annual change in NWC, calculated as the difference between NWC in year t and the year t-1. TDWCR is the change in target NWC overtime, calculated as the difference between the fitted value of regression NWC against its determinants in year t and lagged value of fitted value. LDWCRi,t is the deviation from target NWC in previous year, calculated as the difference between lagged value of fitted value of regression NWC against its determinants and lagged value of NWC. VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 9 Effects of VOFF on SOA, contingent on active and passive WCM

	Active WCM			Passive WCM		
	ΔNWC(1)	ΔNWC(2)	ΔNWC(3)	ΔNWC(4)	ΔNWC(5)	ΔNWC(6)
$TWCR_{i,t}$	0.262***	0.294***	0.280***	0.090**	0.100***	0.098***
	(2.87)	(3.24)	(3.23)	(2.54)	(2.81)	(2.80)
VOFF03 x $TWCR_{i,t}$	0.151**			-0.003		
	(2.28)			(-0.14)		
VOFF13 x $TWCR_{i,t}$		0.123*			-0.011	
		(1.92)			(-0.48)	
VOFF23 x $TWCR_{i,t}$			0.129**			-0.009
			(2.22)			(-0.42)
FLUID x $TWCR_{i,t}$	0.023***	0.023***	0.023***	-0.000	-0.000	-0.000
	(3.49)	(3.52)	(3.54)	(-0.14)	(-0.15)	(-0.15)
GINDEX x $TWCR_{i,t}$	0.011***	0.011***	0.011***	-0.001	-0.001	-0.001
	(2.60)	(2.60)	(2.59)	(-0.53)	(-0.53)	(-0.52)
GPM x $TWCR_{i,t}$	-0.058	-0.061	-0.059	0.009	0.009	0.009
	(-0.94)	(-0.97)	(-0.95)	(0.91)	(0.91)	(0.90)
SVOL x $TWCR_{i,t}$	0.074	0.079	0.077	0.025	0.026	0.026
	(1.25)	(1.32)	(1.28)	(0.93)	(0.94)	(0.93)
MP x $TWCR_{i,t}$	-0.103	-0.104	-0.106	0.001	0.002	0.002
	(-1.27)	(-1.29)	(-1.31)	(0.03)	(0.05)	(0.05)
$FLUID_{i,t-1}$	-0.001***	-0.001***	-0.001***	-0.000**	-0.000**	-0.000**
	(-5.23)	(-5.21)	(-5.25)	(-2.36)	(-2.37)	(-2.37)
$GINDEX_{i,t-1}$	0.000	0.000	0.000	0.000	0.000	0.000
	(0.53)	(0.51)	(0.51)	(0.26)	(0.26)	(0.26)
$GDUM_{i,t-1}$	-0.003	-0.003	-0.003	-0.000	-0.000	-0.000
	(-0.79)	(-0.80)	(-0.79)	(-0.10)	(-0.10)	(-0.11)
$GPM_{i,t-1}$	0.000	0.000	0.000	0.000	0.000	0.000
	(0.20)	(0.20)	(0.19)	(0.98)	(0.98)	(0.98)
$SVOL_{i,t-1}$	0.004**	0.004**	0.004**	0.001	0.001	0.001
	(2.52)	(2.57)	(2.50)	(1.59)	(1.58)	(1.56)
$MP_{i,t-1}$	-0.010***	-0.010***	-0.010***	-0.002	-0.002	-0.002
	(-4.10)	(-4.10)	(-4.16)	(-1.61)	(-1.58)	(-1.59)
$VOFF03_{i,t-1}$	0.001			-0.000		
	(0.44)			(-0.32)		
$VOFF13_{i,t-1}$		0.001			-0.000	
		(0.59)			(-0.22)	
$VOFF23_{i,t-1}$			0.002			-0.000
			(1.00)			(-0.03)
N	1.13e+04	1.13e+04	1.13e+04	9054	9054	9054
Adj_Rsquared	.129	.1287	.129	.01564	.01567	.01565
Fixed effects	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ year

*Notes: This table reports regression results for SOA of WC and effects of VOFF on SOA of WC using the PAM for portfolios of active WCM and passive WCM firms. Active (Passive) is the proportion of unexpected changes in NWC associated with changes in real NWC level (change in target NWC level). ΔNWCi,t is the annual change in NWC. TWCR is the deviation from target NWC, calculated as the difference between the fitted value of regression NWCi,t against its determinants and lagged value of NWC (NWCi,t-1). VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All variable definitions are given in Appendix B.3 The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 10 Effects of VOFF on SOA and excessive level of WC

	Positive excessive NWC			Negative excessive NWC		
	ΔNWC(1)	ΔNWC(2)	ΔNWC(3)	ΔNWC(4)	ΔNWC(5)	ΔNWC(6)
$TWCR_{i,t}$	0.555***	0.602***	0.618***	0.517***	0.526***	0.484***
	(8.01)	(8.75)	(8.89)	(6.12)	(6.15)	(6.04)
VOFF03x $TWCR_{i,t}$	0.012			0.373***		
	(0.26)			(6.67)		
VOFF13 x $TWCR_{i,t}$		-0.027			0.354***	
		(-0.57)			(6.34)	
VOFF23 x $WCR_{i,t}$			-0.035			0.370***
			(-0.77)			(7.48)
FLUID x $TWCR_{i,t}$	0.018***	0.018***	0.018***	-0.012**	-0.011**	-0.010**
	(3.33)	(3.44)	(3.41)	(-2.41)	(-2.13)	(-2.06)
GINDEX x$TWCR_{i,t}$	0.002	0.002	0.002	0.007	0.007	0.007
	(0.49)	(0.49)	(0.47)	(1.33)	(1.50)	(1.47)
GPM x $TWCR_{i,t}$	-0.199***	-0.198***	-0.198***	0.056***	0.054***	0.056***
	(-4.33)	(-4.27)	(-4.28)	(3.04)	(2.89)	(3.01)
SVOL x $TWCR_{i,t}$	-0.004	0.001	0.000	0.081	0.093*	0.087
	(-0.15)	(0.03)	(0.01)	(1.46)	(1.65)	(1.54)
MP x $TWCR_{i,t}$	-0.069	-0.070	-0.068	-0.036	-0.038	-0.042
	(-0.87)	(-0.88)	(-0.86)	(-0.42)	(-0.45)	(-0.49)
$FLUID_{i,t-1}$	-0.000	-0.000	-0.000	0.000**	0.000*	0.000*
	(-0.91)	(-0.70)	(-0.77)	(2.13)	(1.83)	(1.82)
$GINDEX_{i,t-1}$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.82)	(-0.75)	(-0.77)	(-0.33)	(-0.34)	(-0.36)
$GDUM_{i,t-1}$	0.006**	0.006**	0.006**	-0.011***	-0.011***	-0.011***
	(2.19)	(2.28)	(2.26)	(-4.80)	(-4.77)	(-4.74)
$GPM_{i,t-1}$	-0.001	-0.001	-0.001	-0.000	-0.000	-0.000
	(-1.54)	(-1.54)	(-1.57)	(-0.33)	(-0.24)	(-0.30)
$SVOL_{i,t-1}$	0.004***	0.004***	0.004***	-0.003**	-0.004**	-0.003**
	(2.78)	(3.09)	(3.02)	(-2.18)	(-2.40)	(-2.38)
$MP_{i,t-1}$	-0.019***	-0.019***	-0.019***	0.009***	0.009***	0.009***
	(-7.15)	(-7.13)	(-7.15)	(4.47)	(4.52)	(4.47)
$VOFF03_{i,t-1}$	0.007***			-0.012***		
	(3.58)			(-6.93)		
$VOFF13_{i,t-1}$		0.005**			-0.010***	
		(2.33)			(-6.34)	
$VOFF23_{i,t-1}$			0.006***			-0.011***
			(2.86)			(-7.20)
N	9486	9486	9486	1.08e+04	1.08e+04	1.08e+04
Adj_Rsquared	.2326	.2316	.2322	.5235	.5223	.5246
Fixed effects	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ year

*Notes: This table reports regression results for SOA of W) and effects of VOFF on SOA of WC using the PAM for firms with positive and negative excessive NWC. Firms are assigned to positive (negative) excess NWC portfolio if the residuals of equation (4) are positive (negative). ΔNWCi,t is the annual change in NWC, calculated as the difference between NWC in year t and the year t-1. TWCR is the deviation from target NWC, calculated as the difference between the fitted value of regression NWCi,t against its determinants and lagged value of NWC (NWCi,t-1). VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 11 SOA of WC and effects of VOFF on SOA across financial conditions

	KZ index		Size		Commercial paper		Bond rating		Dividend payment	
	Low	High	Large	Small	Rate	Unrated	Rated	Unrated	Payer	Nonpayer
	ΔNWC(1)	ΔNWC(2)	ΔNWC(4)	ΔNWC(3)	ΔNWC(5)	ΔNWC(6)	ΔNWC(7)	ΔNWC(8)	ΔNWC(9)	ΔNWC(10)
$TWCR_{i,t}$	0.416***	0.310***	0.489***	0.280**	0.238	0.217***	0.530***	0.117	0.331***	0.201***
	(2.89)	(4.14)	(5.06)	(2.10)	(1.18)	(3.75)	(8.12)	(1.48)	(3.97)	(2.68)
VOFF23 x $TWCR_{i,t}$	0.013	0.007	-0.101	0.095	-0.061	0.076*	-0.080**	0.139**	0.019	0.082*
	(0.14)	(0.15)	(-1.63)	(1.12)	(-0.42)	(1.84)	(-2.18)	(2.46)	(0.31)	(1.68)
FLUID x $TWCR_{i,t}$	0.017*	-0.001	-0.009	0.018*	0.003	0.013***	-0.010**	0.021***	-0.007	0.020***
	(1.75)	(-0.12)	(-1.52)	(1.92)	(0.26)	(3.10)	(-1.97)	(4.02)	(-1.30)	(3.68)
GINDEX x $TWCR_{i,t}$	0.006	0.004	0.009**	-0.022	0.017***	0.005	0.004	0.005	0.005	0.009*
	(1.01)	(0.67)	(2.33)	(-1.33)	(2.83)	(1.55)	(1.16)	(1.20)	(1.49)	(1.74)
GPM x $TWCR_{i,t}$	0.017	-0.006	-0.035	-0.003	0.083	-0.004	-0.074	0.005	-0.039	0.000
	(0.42)	(-0.15)	(-0.42)	(-0.07)	(0.45)	(-0.12)	(-1.29)	(0.18)	(-0.69)	(0.01)
SVOL x $TWCR_{i,t}$	0.143*	0.009	0.039	0.029	-0.077	0.051	0.007	0.047	0.119*	0.013
	(1.75)	(0.20)	(0.96)	(0.43)	(-0.72)	(1.39)	(0.21)	(1.08)	(1.83)	(0.34)
MP x $TWCR_{i,t}$	-0.446***	0.317**	-0.037	-0.030	0.200	-0.039	0.055	-0.102	-0.035	-0.058
	(-3.56)	(2.43)	(-0.45)	(-0.13)	(0.99)	(-0.65)	(0.61)	(-1.29)	(-0.53)	(-0.55)
$VOFF23_{i,t-1}$	-0.004	0.003*	0.003*	-0.000	0.010***	-0.000	0.004***	-0.001	0.003	-0.001
	(-1.11)	(1.83)	(1.72)	(-0.15)	(3.19)	(-0.13)	(3.41)	(-0.73)	(1.37)	(-0.39)
$FLUID_{i,t-1}$	-0.001***	0.000	-0.000	-0.001***	-0.000	-0.001***	-0.000	-0.001***	-0.000**	-0.001***
	(-4.12)	(0.02)	(-1.56)	(-4.24)	(-0.09)	(-6.14)	(-0.73)	(-6.46)	(-2.51)	(-5.47)
$GINDEX_{i,t-1}$	-0.001	-0.000	0.000	0.002	-0.000	0.000	0.000	-0.000	-0.000	0.000
	(-1.29)	(-0.39)	(1.16)	(0.72)	(-0.01)	(0.23)	(0.88)	(-0.41)	(-0.53)	(1.07)
$GDUM_{i,t-1}$	-0.014***	-0.001	0.001	0.009	-0.003	-0.003	-0.002	-0.005	-0.006**	0.002
	(-2.72)	(-0.26)	(0.34)	(0.46)	(-0.52)	(-0.91)	(-0.72)	(-1.04)	(-2.05)	(0.37)
$GPM_{i,t-1}$	-0.000	0.001	-0.002	0.001	-0.003	0.000	-0.002	0.000	-0.002	0.000
	(-0.17)	(1.05)	(-1.12)	(0.92)	(-0.98)	(0.46)	(-1.32)	(0.29)	(-1.50)	(0.76)
$SVOL_{i,t-1}$	0.001	0.004**	0.004***	0.004*	0.000	0.003***	0.004***	0.003**	0.002	0.003***
	(0.51)	(2.44)	(3.58)	(1.75)	(0.16)	(2.90)	(3.83)	(1.99)	(1.13)	(2.59)
$MP_{i,t-1}$	-0.007*	-0.010***	-0.002	-0.004	-0.003	-0.006***	-0.003**	-0.009***	-0.004***	-0.007**
	(-1.91)	(-3.08)	(-0.88)	(-0.40)	(-0.98)	(-3.73)	(-1.99)	(-3.73)	(-2.74)	(-2.40)
N	4817	6437	7061.	4759	2405.	1.79e+04	8419	1.19e+04	9485.	1.08e+04
Adj_Rsq	.1245	.07044	.08308	.08292	.09045	.08462	.09399	.08735	.08294	.08671
Fixed effects	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year

Notes: This table reports regression results for speed of adjustment of WC (SOA of WC) and effects of VOFF on SOA of WC using the PAM across financial constraint proxies. KZ index is calculated by following formula: kz= -1.001909((ib+dp)/l.ppent) + 0.2826389*((at+me-ceq-txdb)/at + 3.139193*((dltt+dlc)/(dltt+dlc+seq)) - 39.3678*((dvc+dvp)/l.ppent) - 1.314759*(che/l.ppent). Size is defined as total assets. Rated commercial paper (bond rating) equals 1 if a firm has commercial paper (bonds) rated; 0 otherwise. Dividend payers are firms with payout ratio ((dvt/ebit)) larger than zero. ∆NWCi,t is the measure of annual change in NWC, calculated as the difference between NWC in year t and the year t-1. TWCR is a measure of deviation from target NWC, calculated as the difference between the fitted value of regression NWCi,t against its determinants and lagged value of NWC (NWCi,t-1). VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 12 Effects of VOFF on SOA and type of industry

	Service industries			Standardized industries			Differentiated industries		
	ΔNWC(1)	ΔNWC(2)	ΔNWC(3)	ΔNWC(4)	ΔNWC(5)	ΔNWC(6)	ΔNWC(7)	ΔNWC(8)	ΔNWC(9)
$TWCR_{i,t}$	0.380**	0.403**	0.382**	0.180***	0.203***	0.195***	0.469	0.269	0.276
	(2.09)	(2.24)	(2.08)	(2.95)	(3.50)	(3.48)	(1.07)	(0.54)	(0.59)
VOFF03 x $TWCR_{i,t}$	0.018			0.095**			0.118		
	(0.15)			(2.15)			(0.38)		
VOFF13 x $TWCR_{i,t}$		0.003			0.075*			0.367	
		(0.03)			(1.85)			(0.97)	
VOFF23 x $WCR_{i,t}$			0.020			0.078**			0.375
			(0.17)			(2.12)			(1.07)
FLUID x $TWCR_{i,t}$	0.006	0.006	0.005	0.013***	0.013***	0.013***	-0.084*	-0.092**	-0.094**
	(0.45)	(0.43)	(0.40)	(3.15)	(3.16)	(3.19)	(-1.89)	(-2.06)	(-2.12)
GINDEX x $TWCR_{i,t}$	0.009	0.009	0.009	0.006**	0.006**	0.006**	0.007	0.007	0.007
	(0.90)	(0.89)	(0.89)	(2.04)	(2.04)	(2.04)	(0.30)	(0.31)	(0.34)
GPM x $TWCR_{i,t}$	-0.077	-0.077	-0.077	-0.009	-0.010	-0.009	1.067	0.860	0.790
	(-0.74)	(-0.74)	(-0.74)	(-0.28)	(-0.32)	(-0.30)	(1.13)	(0.99)	(0.90)
SVOL x $TWCR_{i,t}$	0.154	0.154	0.152	0.028	0.032	0.030	-0.532	-0.621	-0.633
	(1.35)	(1.35)	(1.34)	(0.78)	(0.87)	(0.83)	(-1.24)	(-1.42)	(-1.45)
MP x $TWCR_{i,t}$	-0.751***	-0.751***	-0.753***	-0.006	-0.006	-0.008	-0.180	-0.190	-0.194
	(-5.51)	(-5.53)	(-5.51)	(-0.10)	(-0.10)	(-0.13)	(-0.81)	(-0.85)	(-0.86)
$FLUID_{i,t-1}$	-0.000	-0.000	-0.000	-0.001***	-0.001***	-0.001***	0.000	0.000	0.000
	(-0.69)	(-0.73)	(-0.76)	(-6.25)	(-6.24)	(-6.25)	(0.28)	(0.31)	(0.33)
$GINDEX_{i,t-1}$	0.001	0.001	0.001	0.000	0.000	0.000	0.001	0.001	0.001
	(0.46)	(0.46)	(0.47)	(0.32)	(0.31)	(0.30)	(0.39)	(0.41)	(0.43)
$GDUM_{i,t-1}$	-0.007	-0.007	-0.007	-0.002	-0.002	-0.002	0.020	0.020	0.020
	(-0.61)	(-0.61)	(-0.60)	(-0.79)	(-0.81)	(-0.80)	(1.33)	(1.32)	(1.33)
$GPM_{i,t-1}$	-0.005	-0.005	-0.005	0.001	0.001	0.001	0.026	0.027	0.027
	(-1.11)	(-1.11)	(-1.12)	(1.04)	(1.06)	(1.06)	(1.56)	(1.65)	(1.60)
$SVOL_{i,t-1}$	-0.003	-0.003	-0.003	0.004***	0.004***	0.004***	-0.008	-0.007	-0.008
	(-1.33)	(-1.38)	(-1.39)	(3.93)	(4.01)	(3.93)	(-0.85)	(-0.84)	(-0.87)
$MP_{i,t-1}$	-0.013***	-0.013***	-0.013**	-0.006***	-0.006***	-0.006***	-0.008*	-0.008	-0.008*
	(-2.60)	(-2.59)	(-2.58)	(-3.93)	(-3.90)	(-3.97)	(-1.71)	(-1.66)	(-1.71)
$VOFF03_{i,t-1}$	-0.001			0.000			-0.002		
	(-0.16)			(0.27)			(-0.21)		
$VOFF13_{i,t-1}$		0.001			0.000			-0.006	
		(0.23)			(0.22)			(-0.72)	

$VOFF23_{i,t-1}$			0.001			0.001			-0.004
			(0.32)			(0.61)			(-0.56)
N	2244	2244	2244	1.76e+04	1.76e+04	1.76e+04	440	440	440
Adj_Rsquared	.08617	.08619	.08629	.08364	.08342	.08358	.1389	.1423	.1423
Fixed effects	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year

*Notes: This table reports regression results for speed of adjustment of WC (SOA of WC) and effects of VOFF on SOA of WC using the PAM across types of industry. Following (Giannetti et al., 2011, Hill et al., 2012), industries are classified based on the first two digits of two-digit standard industrial classification (SIC) code. Service contains 41, 42, 44, 45, 47-57, 59, 61, 64, 65, 73, 75, 78 and 79. Differentiated includes 25, 27, 30, 32, 34-39. Standardized includes 12, 14, 20, 22-24, 26, 28, 29, 31, 33 and remaining firms. ΔNWCi,t is the measure of annual change in NWC, calculated as the difference between NWC in year t and the year t-1. TWCR is a measure of deviation from target NWC, calculated as the difference between the fitted value of regression NWCi,t against its determinants and lagged value of NWC (NWCi,t-1). VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 13 Investment efficiency in WC - VOFF association – Robustness check

	Median industry (Panel A)			1st stage – GMM (Panel B)		
	WCEFF(1)	WCEFF(2)	WCEFF(3)	WCEFF(4)	WCEFF(5)	WCEFF(6)
$VOFF03_{i,t-1}$	-0.011***			-0.004***		
	(-4.26)			(-4.38)		
$VOFF13_{i,t-1}$		-0.011***			-0.004***	
		(-4.74)			(-4.55)	
$VOFF23_{i,t-1}$			-0.012***			-0.005***
			(-5.01)			(-5.11)
$SGR_{i,t-1}$	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(-0.42)	(-0.70)	(-0.67)	(-0.59)	(-0.75)	(-0.75)
$GPM_{i,t-1}$	0.005***	0.005***	0.005***	-0.000	-0.000	-0.000
	(4.68)	(4.65)	(4.64)	(-0.55)	(-0.58)	(-0.58)
$SVOL_{i,t-1}$	0.004**	0.005**	0.005**	0.000	0.000	0.000
	(2.06)	(2.07)	(2.14)	(0.40)	(0.41)	(0.48)
$CF_{i,t-1}$	0.016**	0.019**	0.019**	0.005	0.006*	0.006*
	(2.15)	(2.41)	(2.45)	(1.55)	(1.81)	(1.81)
$Q1_{i,t-1}$	-0.004***	-0.004***	-0.004***	-0.003***	-0.003***	-0.003***
	(-3.97)	(-4.04)	(-4.02)	(-8.51)	(-8.59)	(-8.57)
$SIZE2_{i,t-1}$	0.007***	0.007***	0.007***	0.004***	0.004***	0.004***
	(8.47)	(8.53)	(8.51)	(19.35)	(19.46)	(19.46)
$MP_{i,t-1}$	0.015*	0.015*	0.015*	-0.004*	-0.004*	-0.004*
	(1.90)	(1.90)	(1.92)	(-1.95)	(-1.95)	(-1.93)
$DIFF_{i,t-1}$	0.001	0.001	0.001	-0.002	-0.002	-0.002
	(0.23)	(0.20)	(0.18)	(-0.97)	(-0.99)	(-1.01)
$AGE_{i,t-1}$	-0.000***	-0.000***	-0.000***	-0.000	-0.000	-0.000
	(-2.98)	(-2.99)	(-2.97)	(-1.15)	(-1.15)	(-1.13)
$GINDEX_{i,t-1}$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.57)	(-0.60)	(-0.59)	(-0.26)	(-0.29)	(-0.29)
$GDUM_{i,t-1}$	-0.007	-0.007	-0.007	-0.002	-0.002	-0.002
	(-1.30)	(-1.32)	(-1.31)	(-1.18)	(-1.21)	(-1.20)
$FLUID_{i,t-1}$	0.002***	0.002***	0.002***	0.000***	0.000***	0.000***
	(4.94)	(4.90)	(4.90)	(3.30)	(3.25)	(3.25)
$R\&D_{i,t-1}$	0.052**	0.052**	0.053**	-0.015**	-0.015*	-0.015*
	(2.43)	(2.44)	(2.49)	(-1.97)	(-1.95)	(-1.92)
N	2.02e+04	2.02e+04	2.02e+04	2.01e+04	2.01e+04	2.01e+04
Adj_Rsq	.3141	.3143	.3148	.1619	.162	.1624
Fixed effects	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year

*Notes: This table reports the robustness check results on association between investment efficiency in WC and VOFF (equation (5) in the text). Dependent variable is investment efficiency, WCEFF. In Panel A it is the absolute value of industry-adjusted NWC. In panel B, it is the absolute value of residuals of NWC equation based on GMM multiplied by -1. VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All other variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 14 Over/under investment in WC and VOFF – Robustness check

	Median industry (A)				1st stage – GMM (B)			
	UNNWC(1)	OVNWC(2)	UNNWC(3)	OVNWC(4)	UNNWC(5)	OVNWC(6)	UNNWC(7)	OVNWC(8)
$VOFF03_{i,t-1}$	-0.004	-0.014***			-0.002**	-0.009***		
	(-1.516)	(-3.958)			(-2.461)	(-4.704)		
$VOFF23_{i,t-1}$			-0.003	-0.017***			-0.002***	-0.010***
			(-1.297)	(-4.920)			(-2.656)	(-5.412)
$SGR_{i,t-1}$	0.001	-0.000	0.000	-0.001	0.000	0.000	0.000	-0.000
	(0.533)	(-0.088)	(0.332)	(-0.183)	(0.260)	(0.228)	(0.182)	(-0.031)
$GPM_{i,t-1}$	0.004***	0.020***	0.004***	0.020***	-0.001**	0.001	-0.001**	0.001
	(5.504)	(2.946)	(5.499)	(2.909)	(-2.456)	(0.927)	(-2.470)	(0.932)
$SVOL_{i,t-1}$	-0.005**	0.007*	-0.005**	0.007**	0.001	-0.002	0.001	-0.002
	(-2.332)	(1.945)	(-2.337)	(2.067)	(0.773)	(-1.460)	(0.786)	(-1.358)
$CF_{i,t-1}$	0.042***	-0.002	0.042***	0.003	-0.000	0.011**	0.000	0.013**
	(5.214)	(-0.149)	(5.196)	(0.207)	(-0.075)	(2.086)	(0.012)	(2.413)
$Q1_{i,t-1}$	-0.002**	-0.005***	-0.002**	-0.005***	-0.003***	-0.004***	-0.003***	-0.004***
	(-2.478)	(-3.110)	(-2.495)	(-3.178)	(-8.221)	(-6.128)	(-8.236)	(-6.218)
$SIZE2_{i,t-1}$	-0.000	0.012***	-0.000	0.012***	0.005***	0.005***	0.005***	0.005***
	(-0.437)	(9.801)	(-0.396)	(9.835)	(23.057)	(14.016)	(23.166)	(14.125)
$MP_{i,t-1}$	-0.026***	-0.006	-0.026***	-0.006	-0.008***	-0.003	-0.008***	-0.003
	(-2.977)	(-0.417)	(-2.982)	(-0.385)	(-3.313)	(-0.907)	(-3.307)	(-0.851)
$DIFF_{i,t-1}$	0.008*	-0.004	0.008*	-0.004	-0.004*	0.002	-0.004*	0.001
	(1.814)	(-0.420)	(1.801)	(-0.450)	(-1.704)	(0.371)	(-1.721)	(0.319)
$AGE_{i,t-1}$	0.000**	-0.000**	0.000**	-0.000**	-0.000***	0.000	-0.000***	0.000
	(2.438)	(-2.510)	(2.434)	(-2.491)	(-6.617)	(0.869)	(-6.594)	(0.874)
$GINDEX_{i,t-1}$	0.000	-0.001	0.000	-0.001	0.000	-0.000	0.000	-0.000
	(0.268)	(-1.232)	(0.257)	(-1.238)	(0.871)	(-1.312)	(0.871)	(-1.376)
$GDUM_{i,t-1}$	-0.003	-0.012	-0.003	-0.012	-0.001	-0.003	-0.001	-0.004
	(-0.540)	(-1.313)	(-0.549)	(-1.313)	(-0.366)	(-1.180)	(-0.359)	(-1.238)
$FLUID_{i,t-1}$	-0.000	0.003***	-0.000	0.003***	0.000	0.001***	0.000	0.001***
	(-0.622)	(5.093)	(-0.637)	(5.061)	(0.106)	(2.877)	(0.080)	(2.818)
$R\&D_{i,t-1}$	0.018	0.061*	0.018	0.063*	-0.024***	-0.009	-0.024***	-0.009
	(0.979)	(1.754)	(0.974)	(1.812)	(-3.222)	(-0.796)	(-3.214)	(-0.731)
N	9071	9704	9071	9704	1.09e+04	9375	1.09e+04	9375

Adj_Rsquared	.3413	.4065	.3412	.4077	.1312	.1661	.1313	.1675
Fixed effects	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year

*Notes: This table reports the robustness check results on association between type investment efficiency in WC and VOFF (equation (5) in the text). Dependent variables are overinvestment (OVNWCi,t) and underinvestment (UNNWCi,t). In panel A, OVNWCi,t is computed as the positive value of industry-adjusted NWC, multiplied by -1. UNNWCi,t is the negative value of industry-adjusted NWC. In panel B, OVNWCi,t is residuals of investment model (i.e., equation (4)) estimated using GMM estimator, multiplied by -1. UNNWCi,t is the negative value of residuals of investment model (i.e., equation (4)) estimated using GMM estimator. VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All other variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 15 The first stage is based on Driscoll and Kraay (1998) – PAM

	(1) ΔNWC	(2) ΔNWC	(3) ΔNWC	(4) ΔNWC	(5) ΔNWC
$TWCR_{i,t}$	0.899***	0.605***	0.492***	0.526***	0.504***
	(39.19)	(6.66)	(3.61)	(4.11)	(4.12)
VOFF03 x $TWCR_{i,t}$		0.196***	0.240**		
		(2.64)	(2.52)		
VOFF13 x $TWCR_{i,t}$				0.209**	
				(2.40)	
VOFF23 x $TWCR_{i,t}$					0.216***
					(2.75)
FLUID x $TWCR_{i,t}$			0.011	0.011	0.011
			(1.24)	(1.29)	(1.32)
GINDEX x $TWCR_{i,t}$			0.013**	0.013**	0.013**
			(2.06)	(2.05)	(2.05)
GPM x $TWCR_{i,t}$			0.050	0.048	0.050
			(1.51)	(1.43)	(1.48)
SVOL x $TWCR_{i,t}$			0.007	0.016	0.014
			(0.10)	(0.22)	(0.18)
MP x $TWCR_{i,t}$			-0.105	-0.108	-0.113
			(-0.80)	(-0.82)	(-0.86)
$FLUID_{i,t-1}$			-0.000	-0.000	-0.000
			(-1.41)	(-1.34)	(-1.32)
$GINDEX_{i,t-1}$			0.001*	0.001*	0.001*
			(1.91)	(1.89)	(1.89)
$GDUM_{i,t-1}$			-0.001	-0.002	-0.002
			(-0.63)	(-0.65)	(-0.64)
$GPM_{i,t-1}$			0.001	0.001	0.001
			(1.06)	(1.00)	(1.05)
$SVOL_{i,t-1}$			0.002	0.002	0.002
			(0.68)	(0.81)	(0.75)
$MP_{i,t-1}$			-0.006	-0.006	-0.007
			(-1.25)	(-1.26)	(-1.31)
$VOFF03_{i,t-1}$		0.007***	0.008***		
		(2.89)	(2.83)		
$VOFF13_{i,t-1}$				0.007***	
				(2.72)	
$VOFF23_{i,t-1}$					0.008***
					(3.32)
N	5.21e+04	3.72e+04	2.03e+04	2.03e+04	2.03e+04
Adj_Rsquared	.08208	.07839	.08596	.08579	.086
Fixed effects	Industry/year	Industry/year	Industry/year	Industry/year	Industry/year

*Notes: This table reports the robustness check results for SOA of WC and effects of VOFF on SOA of WC using the PAM, based on fixed effect regression results of the first stage where SEs that are robust to arbitrary common autocorrelated disturbances clustering on firm and year at 2 bandwidth. ΔNWCi,t is the annual change in NWC, calculated as the difference between NWC in year t and the year t-1. TWCR is deviation from target NWC, calculated as the difference between the fitted value of regression NWCi,t against its determinants and lagged value of NWC (NWCi,t-1. VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All other variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table 16 The first stage is based on Driscoll and Kraay (1998) – ECM

	(1) ΔNWC	(2) ΔNWC	(3) ΔNWC	(4) ΔNWC	(5) ΔNWC
$DTWCR_{i,t}$	0.710***	0.379***	0.300**	0.302**	0.277**
	(27.08)	(3.84)	(2.27)	(2.31)	(2.21)
$LDWCR_{i,t}$	0.843***	0.544***	0.469***	0.477***	0.460***
	(34.64)	(5.71)	(3.54)	(3.84)	(3.88)
VOFF03 x $DTWCR_{i,t}$		0.239***	0.274***		
		(2.96)	(2.92)		
VOFF03 x $LDWCR_{i,t}$		0.214***	0.223**		
		(2.70)	(2.47)		
VOFF13 x $DTWCR_{i,t}$				0.265***	
				(2.92)	
VOFF13 x $LDWCR_{i,t}$				0.211**	
				(2.56)	
VOFF23 x $DTWCR_{i,t}$					0.272***
					(3.32)
VOFF23 x $LDWCR_{i,t}$					0.214***
					(2.88)
FLUID x $DTWCR_{i,t}$			0.011	0.012	0.012
			(1.24)	(1.32)	(1.35)
FLUID x $LDWCR_{i,t}$			0.016*	0.017**	0.017**
			(1.94)	(2.00)	(2.04)
GINDEX x $DTWCR_{i,t}$			0.017**	0.017**	0.017**
			(2.44)	(2.44)	(2.45)
GINDEX x $LDWCR_{i,t}$			0.014**	0.014**	0.014**
			(2.22)	(2.22)	(2.22)
GPM x $DTWCR_{i,t}$			0.040	0.038	0.040
			(1.10)	(1.04)	(1.09)
GPM x $LDWCR_{i,t}$			0.017	0.015	0.017
			(0.86)	(0.77)	(0.85)
SVOL x $DTWCR_{i,t}$			-0.014	-0.006	-0.009
			(-0.21)	(-0.09)	(-0.13)
SVOL x $LDWCR_{i,t}$			-0.007	0.000	-0.002
			(-0.10)	(0.01)	(-0.03)
MP x $DTWCR_{i,t}$			0.045	0.040	0.036
			(0.33)	(0.29)	(0.26)
MP x $LDWCR_{i,t}$			-0.098	-0.102	-0.107
			(-0.75)	(-0.78)	(-0.82)
$FLUID_{i,t-1}$			-0.000	-0.000	-0.000
			(-0.61)	(-0.53)	(-0.50)
$GINDEX_{i,t-1}$			0.001*	0.001*	0.001*
			(1.89)	(1.86)	(1.86)
$GDUM_{i,t-1}$			-0.002	-0.002	-0.002
			(-0.80)	(-0.81)	(-0.81)
$GPM_{i,t-1}$			0.000	0.000	0.000
			(0.49)	(0.42)	(0.50)
$SVOL_{i,t-1}$			0.001	0.001	0.001
			(0.48)	(0.60)	(0.54)
$MP_{i,t-1}$			-0.006	-0.006	-0.006
			(-1.21)	(-1.23)	(-1.28)
$VOFF03_{i,t-1}$		0.007***	0.007***		
		(2.70)	(2.71)		
$VOFF13_{i,t-1}$				0.007***	
				(2.72)	
$VOFF23_{i,t-1}$					0.007***

					(3.29)
N	4.37e+04	3.18e+04	2.03e+04	2.03e+04	2.03e+04
Adj_Rsquared	.09676	.09417	.09901	.09899	.09921
Fixed effects	Industry/ year	Industry/ year	Industry/ year	Industry/ year	Industry/ year

*Notes: : This table reports the robustness check results for speed of adjustment of WC (SOA of WC) and effects of VOFF on SOA of WC using error correction model, based on fixed effect regression results of the first stage where SEs that are robust to arbitrary common autocorrelated disturbances clustering on firm and year at 2 bandwidth. ∆NWCi,t is the measure of annual change in NWC, calculated as the difference between NWC in year t and the year t-1. TDWCR is the change in target NWC overtime, calculated as the difference between the fitted value of regression NWC against its determinants in year t and lagged value of fitted value. LDWCRi,t is the deviation from target NWC in previous year, calculated as the difference between lagged value of fitted value of regression NWC against its determinants and lagged value of NWC. VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All other variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

A.2 List of supplementary tables

Table A.2- 1 Testing for mean-reversing properties

	(1)
	$\Delta NWC_{i,t}$
$\Delta NWC_{i,t-1}$	-0.217***
	(-30.90)
Const	-0.003***
	(-163.84)
N	5.20e+04
Adj_Rsquared	.04957

Notes: This table reports the regression results for mean-reversing property of NWC (Equation (12)). Dependent variable is the change in NWC in year t, $\Delta NWCi,t$*, and independent variable is the change in the NWC in year t-1,* $\Delta NWCi,t-1$*. The data are obtained from COMPUSTAT. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for firm fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table A.2- 2 Non-linear relation WCR and firm performance

	(1) ROA	(2) ROA	(3) ROA	(4) ROA
$NWC_{i,t-1}$	0.167***	0.290***	0.215***	0.212***
	(12.82)	(7.78)	(10.86)	(10.66)
$NWCSQ_{i,t-1}$	-0.142***	-0.225***	-0.195***	-0.191***
	(-7.06)	(-4.67)	(-7.08)	(-7.00)
$SIZE2_{i,t-1}$	0.005***	0.008***	0.006***	0.006***
	(13.14)	(10.28)	(15.94)	(13.95)
$BLEV_{i,t-1}$	0.001	0.007	0.002	0.002
	(0.27)	(0.87)	(0.33)	(0.37)
$AGE_{i,t-1}$	-0.000*	-0.000	-0.000	-0.000
	(-1.76)	(-1.43)	(-0.21)	(-0.89)
$R\&D_{i,t-1}$	-0.274***	0.064	-0.301***	-0.293***
	(-10.59)	(0.89)	(-9.44)	(-9.15)
$RETVOL_{i,t-1}$	-0.128***	-0.007	-0.091***	-0.115***
	(-7.60)	(-0.40)	(-5.93)	(-6.69)
$AGR_{i,t-1}$	-0.001	-0.005*	-0.002	-0.001
	(-0.35)	(-1.96)	(-0.82)	(-0.34)
$CASH_{i,t-1}$	0.053***	0.102***	0.059***	0.057***
	(8.31)	(8.38)	(8.16)	(7.86)
$SVOL_{i,t-1}$	-0.019***	-0.000	-0.017***	-0.017***
	(-5.88)	(-0.06)	(-5.24)	(-5.30)
$CF_{i,t-1}$	0.559***	0.247***	0.547***	0.548***
	(31.86)	(13.37)	(30.94)	(30.73)
$DIFF_{i,t-1}$	0.005	0.005	0.008	0.008
	(0.77)	(0.72)	(1.07)	(1.08)
$SGR_{i,t-1}$	0.002	0.014***	0.000	0.002
	(0.45)	(3.35)	(0.02)	(0.46)
N	43856	43142	43852	43852
Adj_Rsquared	.3428	.4539	.3373	.3468
Fixed effects	Year	Firm	Industry	Industry/Year

*Notes: This table presents the results of estimating non-linear relationship between firm performance and NWC (equation (13)) in the text. The dependent variable is return on assets, ROA. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT and CRSP. Final sample includes 8024 non-financial firms over 1987-2013 period (unbalanced panel data). Ratio variables are winsorized at the 1% on two tails to eliminate potential effects of outliers. White (1980)'s standard errors are clustered at the firm-level. Estimation accounts for industry fixed effects and year fixed effects. Statistical significances are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively and the associated t-statistics are presented in parentheses.*

Table A.2- 3 Contemporaneous determinants of NWC - 1st stage SYSGMM

	(1)
	NWC
$NWC_{i,t-1}$	0.752^{***}
	(70.90)
$SGR_{i,t}$	0.018^{***}
	(14.75)
$GPM_{i,t}$	0.002^{***}
	(4.99)
$SVOL_{i,t}$	-0.016^{***}
	(-14.56)
$CF_{i,t}$	0.015^{***}
	(3.95)
$Q1_{i,t}$	0.002^{***}
	(5.23)
$SIZE2_{i,t}$	-0.008^{***}
	(-19.26)
$MP_{i,t}$	0.019^{***}
	(8.71)
$DIFF_{i,t}$	-0.009^{***}
	(-4.75)
$AGE_{i,t}$	0.000^{***}
	(10.56)
Cons	0.080^{***}
	(20.17)
N	5.21e+04
Chi2	38034
Sargan	868.3
m2	3.785

*Notes: This table presents the results of estimating equation (4) in the text with additional explanatory variable being lagged NWC, NWCi,t-1, using system GMM (SYSGMM) estimator. The dependent variable is Net WC scaled by total assets. All variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT and CRSP. Final sample includes 8024 non-financial firms over 1987-2013 period (unbalanced panel data). Ratio variables are winsorized at the 1% on two tails to eliminate potential effects of outliers. SYSGMM refers to two-step SYSGMM estimator. m2 is the test for second order serial correlation and is asymptotically distributed as N(0,1) under the null of no serial correlation in the error terms. Sargan test is the test for the validity of instruments and is asymptotically distributed as Chi-Squared under the null of valid instruments. Statistical significant are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively.*

Table A.2- 4 Investment efficiency in WCR-VOFF association – contemporaneous determinants of NWC in the 1st stage

	Industry and year FE in 1st stage (Panel A)			Firm and year FE in 1st stage (Panel B)			SYSGMM estimation in 1st stage (Panel C)		
	WCEFF(1)	WCEFF(2)	WCEFF(3)	WCEFF(4)	WCEFF(5)	WCEFF(6)	WCEFF(7)	WCEFF(8)	WCEFF (9)
$VOFF03_{i,t-1}$	-0.012***			-0.004***			-0.004***		
	(-5.16)			(-3.82)			(-4.21)		
$VOFF13_{i,t-1}$		-0.012***			-0.004***			-0.004***	
		(-5.36)			(-4.13)			(-4.40)	
$VOFF23_{i,t-1}$			-0.013***			-0.005***			-0.005***
			(-5.66)			(-4.60)			(-4.88)
$SGR_{i,t-1}$	0.000	-0.000	-0.000	-0.003***	-0.003***	-0.003***	-0.001	-0.001	-0.001
	(0.34)	(-0.06)	(-0.01)	(-3.36)	(-3.59)	(-3.55)	(-0.84)	(-1.01)	(-1.01)
$GPM_{i,t-1}$	-0.001*	-0.001*	-0.001*	-0.000	-0.000	-0.000	0.000	0.000	0.000
	(-1.66)	(-1.70)	(-1.72)	(-0.64)	(-0.67)	(-0.68)	(0.69)	(0.67)	(0.66)
$SVOL_{i,t-1}$	-0.002	-0.002	-0.001	-0.001	-0.001	-0.001	0.000	0.000	0.000
	(-0.77)	(-0.78)	(-0.69)	(-0.95)	(-0.95)	(-0.86)	(0.16)	(0.17)	(0.23)
$CF_{i,t-1}$	0.019***	0.021***	0.021***	0.009**	0.009**	0.010**	0.003	0.004	0.004
	(2.88)	(3.14)	(3.19)	(2.14)	(2.33)	(2.39)	(0.98)	(1.24)	(1.24)
$Q1_{i,t-1}$	-0.003***	-0.003***	-0.003***	-0.001***	-0.001***	-0.001***	-0.003***	-0.003***	-0.003***
	(-2.97)	(-3.06)	(-3.04)	(-2.64)	(-2.71)	(-2.70)	(-8.26)	(-8.35)	(-8.33)
$SIZE2_{i,t-1}$	0.004***	0.004***	0.004***	0.003***	0.003***	0.003***	0.005***	0.005***	0.005***
	(5.82)	(5.93)	(5.90)	(8.74)	(8.82)	(8.79)	(19.58)	(19.68)	(19.68)
$MP_{i,t-1}$	-0.004	-0.004	-0.003	0.002	0.002	0.002	-0.004*	-0.004*	-0.004*
	(-0.53)	(-0.53)	(-0.51)	(0.59)	(0.59)	(0.61)	(-1.87)	(-1.86)	(-1.85)
$DIFF_{i,t-1}$	0.003	0.002	0.002	-0.003	-0.003	-0.003	-0.001	-0.001	-0.001
	(0.69)	(0.66)	(0.62)	(-1.02)	(-1.04)	(-1.06)	(-0.38)	(-0.40)	(-0.42)
$AGE_{i,t-1}$	-0.000	-0.000	-0.000	-0.000***	-0.000***	-0.000***	-0.000*	-0.000*	-0.000*
	(-0.05)	(-0.05)	(-0.03)	(-11.00)	(-11.00)	(-10.99)	(-1.74)	(-1.74)	(-1.73)
$GINDEX_{i,t-1}$	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.41)	(-0.44)	(-0.43)	(-0.11)	(-0.13)	(-0.12)	(-0.30)	(-0.33)	(-0.33)
$GDUM_{i,t-1}$	-0.006	-0.006	-0.006	-0.002	-0.003	-0.003	-0.002	-0.002	-0.002
	(-1.16)	(-1.19)	(-1.18)	(-0.98)	(-1.00)	(-0.99)	(-1.03)	(-1.05)	(-1.04)
$FLUID_{i,t-1}$	0.001*	0.001*	0.001*	0.000	0.000	0.000	0.000***	0.000***	0.000***
	(1.85)	(1.80)	(1.80)	(0.29)	(0.25)	(0.25)	(3.37)	(3.33)	(3.32)
$R\&D_{i,t-1}$	0.045***	0.045***	0.046***	0.016*	0.017*	0.017*	-0.009	-0.008	-0.008
	(2.78)	(2.78)	(2.84)	(1.72)	(1.72)	(1.77)	(-1.13)	(-1.12)	(-1.08)
N	2.02e+04	2.02e+04	2.02e+04	2.02e+04	2.02e+04	2.02e+04	2.01e+04	2.01e+04	2.01e+04

Adj_Rsq	.2803	.2803	.2812	.2101	.2102	.2106	.1922	.1923	.1926
Fixed effects	Industry/ year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ year

*Notes: This table reports the robustness check results on association between investment efficiency in WC and VOFF (equation (5) in the text). Dependent variable is investment efficiency, WCEFF, which is calculated against contemporaneous determinants of NWC in the first stage. In Panel A it is the absolute value of the residuals of regression equation based on firms and year fixed effects multiplied by -1. In panel B, it is the absolute value of the residuals of regression equation based on industry and year fixed effects multiplied by -1. In panel C it is the absolute value of the residuals of regression equation based SYSGMM estimator multiplied by -1. VOFFs (s=03, 13, 23) is the value of financial flexibility, calculated based on column (1), (2) and (3) of table 3, respectively. All other variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

Table A.2- 5 Over/under investment in WC and VOFF - contemporaneous determinants of NWC in 1st stage

	Industry/year FE in 1st stage (Panel A)		Firm and year FE in 1st stage (Panel B)		GMM estimation in 1st stage (Panel C)	
	UNNWC(1)	OVNWC(2)	UNNWC(3)	OVNWC(4)	UNNWC(5)	OVNWC(6)
VOFF23 $_{i,t-1}$	-0.003	-0.020***	-0.006***	-0.004***	-0.001	-0.008***
	(-1.184)	(-5.863)	(-3.988)	(-2.953)	(-1.382)	(-4.482)
SGR $_{i,t-1}$	0.004***	-0.003	0.001	-0.007***	-0.002*	-0.000
	(3.115)	(-1.417)	(1.317)	(-4.485)	(-1.732)	(-0.190)
GPM $_{i,t-1}$	-0.002**	-0.002	-0.000	-0.000	0.001	-0.000
	(-2.437)	(-1.297)	(-0.034)	(-0.283)	(1.334)	(-0.257)
SVOL $_{i,t-1}$	0.001	-0.005	-0.000	-0.001	0.003**	-0.002
	(0.485)	(-1.559)	(-0.159)	(-0.798)	(2.460)	(-1.340)
CF $_{i,t-1}$	0.011	0.034***	0.013**	0.008	-0.005	0.013**
	(1.488)	(3.108)	(2.571)	(1.338)	(-1.186)	(2.520)
Q1 $_{i,t-1}$	-0.001	-0.004***	-0.001**	-0.001**	-0.004***	-0.002***
	(-1.441)	(-2.747)	(-2.053)	(-2.303)	(-9.009)	(-3.826)
SIZE2 $_{i,t-1}$	0.004***	0.004***	0.003***	0.003***	0.006***	0.004***
	(5.754)	(3.910)	(6.812)	(7.459)	(24.378)	(9.667)
MP $_{i,t-1}$	-0.006	-0.004	0.005	-0.002	-0.012***	0.001
	(-0.857)	(-0.383)	(1.096)	(-0.510)	(-5.881)	(0.435)
DIFF $_{i,t-1}$	0.005	-0.002	-0.002	-0.003	-0.000	-0.000
	(1.117)	(-0.244)	(-0.529)	(-0.830)	(-0.012)	(-0.073)
AGE $_{i,t-1}$	0.000	-0.000	-0.000***	-0.000***	-0.000***	0.000**
	(0.107)	(-0.537)	(-9.483)	(-6.512)	(-8.196)	(2.108)
GINDEX $_{i,t-1}$	0.000	-0.001	-0.000	-0.000	0.000	-0.000
	(0.984)	(-1.432)	(-0.502)	(-0.034)	(0.541)	(-0.275)
GDUM$_{i,t-1}$	-0.000	-0.014*	-0.005	-0.002	-0.002	-0.000
	(-0.012)	(-1.863)	(-1.352)	(-0.513)	(-0.989)	(-0.120)
FLUID $_{i,t-1}$	-0.001**	0.002***	-0.000	0.000	-0.000*	0.001***
	(-2.026)	(3.736)	(-0.718)	(1.324)	(-1.742)	(4.689)
R&D $_{i,t-1}$	0.015	0.094***	0.040***	-0.005	-0.023***	-0.004
	(0.788)	(3.510)	(3.213)	(-0.403)	(-2.813)	(-0.289)
N	1.05e+04	9620.0000	9830.0000	1.02e+04	1.07e+04	9328.0000
Adj R2	.3152	.3549	.2745	.2072	.2095	.2208
Fixed effects	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year	Industry/ Year

*Notes: This table reports the robustness check results on over/under investment in WC-VOFF relation (equation (5) in the text) which is based on contemporaneous determinants of NWC in the first stage. Dependent variables are overinvestment (OVNWCi,t) and underinvestment (UNNWCi,t). In panel A, B and C, OVNWCi,t is computed as the positive value of the residuals of regression equation based on firms and year fixed effects, industry and year fixed effect, SYSGMM estimator, respectively, multiplied by -1. In panel A, B and C, UNNWCi,t is the negative value of the residuals of regression equation based on firms and year fixed effects, industry and year fixed effect, SYSGMM estimator, respectively. VOFF23 is the value of financial flexibility, calculated based on column (3) of table 3. All other variable definitions are given in Appendix B.3. The data are obtained from COMPUSTAT, CRSP, Thompson Financial F13 and ISS (formerly RiskMetrics). Data for competition in product market are provided by Prof Gerard Hoberg and Prof Gorden Phillips at http://hobergphillips.usc.edu/. Final sample includes 8024 non-financial firms over 1987-2013 period. Estimation accounts for industry fixed effects and year fixed effects. Standard errors are clustered at the firm-level. Statistical significance are at 1%, 5% or 10% level as indicated by ***, **, or *, respectively, and the associated t-statistics are presented in parentheses.*

A.3 Variables and their definitions

Variables	Definition
ME	Market value of equity at the fiscal year end, absolute value of CSHO*PRCC_F, (Source: Compustat).
CFAL	Cash flow, (IB + DP - DVT)/ME_{t-1}, (Source: Compustat).
CAPEX	Capital expenditure, (CAPX/ ME_{t-1}) , (Source: Compustat).
AQCS	Acquisition expenditure, (AQC/ ME_{t-1}) , (Source: Compustat).
ΔNWC	Change in noncash net working capital, (NWC_t - NWC_{t-1})/ ME_{t-1}), (Source: Compustat).
ΔSTD	Change in short term debts, (DLC_t-DLC_{t-1})/ ME_{t-1}, (Source: Compustat).
$r_{i,t} - R^B_{i,t}$	Annual cumulative excess returns, where $r_{i,t}$ is the annual firm stock return and $R^B_{i,t}$ is three - factor portfolio returns at year end t, (Source: CRSP).
ΔC(naive model)	The first proxy for unexpected changes in cash, (CHE_t - CHE_{t-1})/ME_{t-1}, (Source: Compustat).
ΔC (baseline model)	The second proxy for unexpected changes in cash, calculated as the residuals of baseline specification of cash holding model proposed by Almeida et al. (2004).
ΔC (Full model)	The third proxy for unexpected changes in cash, calculated as the residuals of full specification of cash holding model proposed by Almeida et al. (2004).
LSGR	Firm growth opportunities, Log(SGR) for consistent with Rapp et al. (2014)
ΔE	Firm profitability. Following Rapp et al. (2014), (E_t-E_{t-1})/ ME_{t-1}. Where, earning (E_t) = (IB + XINT + TXDITC).
T	Effective costs of holding cash, TC/TI. In which, TC is the cash effective tax rate at corporate level (firm's cash taxes paid ($TXPD_t$)/pretax income (PI_t)). Following Rapp et al. (2014), TC is set to zero when cash taxes paid (TXPD) are zero or negative. TC is also truncated to range [0,1]. TI is the average federal tax rate of an US middle three quintiles (21st to 80th percentiles) of income groups. TI is available at www.cbo.gov/publication/49440, accessed on 07/07/2015.
SPREAD	Firm’s cost of external financing, i.e., flotation cost. Following Rapp et al. (2014) it is computed as the average bid-ask spread of all trades for each firm from the third Wednesday each month during a firm's fiscal year (Source: CRSP).
TANG	Reversibility of firm’s capital. (PPENT/AT), Source (Compustat)
SGR*ΔC	Demeaned value of LSGR*ΔC. ΔC is identified either on naive model or residuals of baseline and full specifications of cash holding model proposed by Almeida et al. (2004).

ΔE *ΔC	Demeaned value of ΔE*ΔC. ΔC is identified either on naive model or residuals of baseline and full specifications of cash holding model proposed by Almeida et al. (2004).
T *ΔC	Demeaned value of T*ΔC. ΔC is identified either on naive model or residuals of baseline and full specifications of cash holding model proposed by Almeida et al. (2004).
SPREAD*ΔC	Demeaned value of SPREAD*ΔC. ΔC is identified either on naive model or residuals of baseline and full specifications of cash holding model proposed by Almeida et al. (2004).
TANG*ΔC	Demeaned value of TANG*ΔC. ΔC is identified either on naive model or residuals of baseline and full specifications of cash holding model proposed by Almeida et al. (2004).
$C_{i,t-1}$	Lagged value of cash holding, CHE_{t-1}/ME_{t-1} (Source: Compustat)
ΔRD	Annual change in R&D expense, ($XRD_{t\ t}/ME_{t-1}$). Where $XRD_{t\ t}$ is set to zero if missing, (Source: Compustat).
ΔNA	Annual changes in assets net of cash, (NA_t-NA_{t-1})/ ME_{t-1}. Where NAt = total assets (AT_t) - cash holding (CHE_t), (Source: Compustat).
ΔI	Annual changes in interest expense, ($XINT_t$/ ME_{t-1}), (Source: Compustat).
ΔD	Annual changes in common dividend, (DVC/ ME_{t-1}), (Source: Compustat).
ML	Market leverage, ($DLTT_t + DLC_t$)/($DLTT_t + DLC_t + ME_t$).
NF	Net financing, ($NETEI_t$+NDI_t)/ME_{t-1}. Net equity issue (NETEI = SSTK-PRSTKC). Net debt issuance (NDI) = (DLTIS- DLTR + DLCCH). (Source: Compustat).
VOFF03	The first measure of value of financial flexibility. The unexpected changes of cash holding used to estimate marginal value of cash (MOCH) is ΔC (naive model).
VOFF13	The second measure of value of financial flexibility. The unexpected changes of cash holding used to estimate marginal value of cash (MOCH) is ΔC (baseline model).
VOFF23	VOFF23 is the third measure of value of financial flexibility. The unexpected changes of cash holding used to estimate MOCH is value of ΔC (Full model).
NWC	Net working capital, (Inventories (INVT) + receivables (RECTR) - accounts payable (AP))/total assets (AT). Source (Compustat)
SVOL	Sales volatility, the standard deviation of a firm's annual sale growth rate over the previous five-year window, including current year. Firms must have at least three observations to participate in calculation.
SGR	Sale growth rate, (SALEt − SALEt− 1)/ SALEt− 1.
CF	Cash flow, ((IB) + (DP)/(AT)).

DIFF	Financial distress dummy, taking 1 if a firm is in financial distress. Following Aktas et al. (2015b), a firm is financially distressed if two criteria are met: Firstly, the firm faces difficulty to cover its interest expenses. Firms face difficulty to cover its interest expenses if its interest coverage ratio (i.e., operating income before depreciation (oibdp) divided by interest expense (xint)) is below one for two consecutive years or less than 0.80 in any given year. Secondly, the firm is overleveraged. The firm is considered to be overleveraged if it is in the top two deciles of industry leverage, defined at 3- digit SIC code in a given year.
AGE	Firm age, the time span in year between beginning date firms' data appeared in CRSP and the ending date the firms' data not reported in CRSP.
GPM	Contribution margin, (SALEi,t - COGSi,t)/SALEi,t
MP	Market power, the ratio of a firm's annual sales to the total annual sum of sales in a given industry defined at SIC3 digits ($MP_{i,t} = \frac{SALE_{i,t}}{\sum_{i=1}^{n} SALE_{j,it}}$).
WCIVEFF	Investment efficiency of working capital, calculated as the absolute value of residuals of investment model (i.e., equation (4)), multiplied by 1 to represent the idea that the higher value of WCIVEFF means the higher investment efficiency in WC.
OVNWC	Overinvestment in WC, computed as the positive value of residuals of investment model (i.e., equation (4)), multiplied by -1 to represent that the higher value of OVWCR represents the higher investment efficiency.
UNNWC	Underinvestment of WC which is the negative value of residuals of investment model (i.e., equation (4)).
ROA	Return on assets, Net income (NI)/Total assets (AT).
INTANG	Intangible asset, INTAN/AT.
GINDEX	Managerial entrenchment, G-Index proposed by Gompers et al. (2003a). Source: ISS.
FLUID	Predatory threat from product market, proposed by Hoberg et al. (2014).
BLEV	Book leverage, DLTT/AT.
RDX	R&D expense, XRD/AT. Where, R&D expense (XRD) is set to 0 if missing.
RETVOL	Stock volatility, Standard deviation of stock returns over the rolling past 24 months based on monthly data from CRSP.
AGR	Annual growth rate of asset, (AT- L.AT)/L.AT
CR	CR is the cash reserve over total asset, (CHE/AT)
ΔNWC	ΔNWC is the annual change in NWC, NWCit – NWCi,t-1.

TWCR	Deviation from target NWC, $NWC_{it}^{*} - NWC_{it-1}$. Where, NWC_{it}^{*} is the fitted values of regression NWC against its determinants.
DTWCR	Change in target WCR overtime, $DTWCR_{i,t} = NWC_{it}^{*} - NWC_{it-1}^{*}$
LDWCR	Deviation from target NWC in previous year, $LDWCR_{it} = NWC_{it-1}^{*} - NWC_{it-1}$
TNIC3HHI	Product market competition based on Text-based Network Industry Classifications (TNIC) built by Hoberg and Phillips (2015).
FIC300HHI	Product market competition based on fitted industry classification proposed by Hoberg and Phillips (2010a).
EINDEX	Managerial entrenchment, E-Index proposed by Bebchuk et al. (2009).
SALECV	Coefficient of variation of sale (salesd / salemean), in which sale standard deviation and mean is calculated on 5 year rolling basis, including current year.
INDLI	Industry-adjusted Lerner index, defined as 3 SIC digits. INDLI $= LI_i - \sum_{i=1}^{N} w_i \, LI_i$. Where Lerner index (LI)=((sale-cogs-xsga)/sale), wi is the market share of firm i within the industry.
KZ	KZ index proposed by Kaplan and Zingales (1997). Specifically, kz= -1.001909*((ib+dp)/l.ppent) + 0.2826389*((at+me-ceq-txdb)/at) + 3.139193*((dltt+dlc)/(dltt+dlc+seq)) -39.3678*((dvc+dvp)/l.ppent) -1.314759*(che/l.ppent).
LOWKZ (HIGHKZ)	Dummy variables, equal 1 if KZ value is smaller (larger) than KZ value at 30th (70th) percentile; 0 otherwise.

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