Multinational Conglomerates
and the Financing Choices of U.S. Firms*

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Abstract

U.S. corporations are holding record-high amounts of cash while at the same time their investment to cash flow sensitivity, often considered a proxy of financial constraints, is dwindling. Both these phenomena date back before the crisis. While different independent explanations for each of these two findings have been proposed, no systematic analysis has been undertaken on whether (and through which channel) the two phenomena are related, and why they have prominently emerged after the mid-1990s. In this paper we show how the increasing organization of production across national borders of U.S. corporations can play a role in jointly explaining these two apparently inconsistent financing choices.

JEL codes: G34; F23; G32; L22; L23

Keywords: financial constraints, cash holdings, multinational enterprises, investment-cashflow sensitivity, multilevel modelling.

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1 Introduction

Under perfect financial markets, companies would be able to collect the financial resources needed for their investment projects according only to their future perspectives, (Modigliani and Miller, 1958) and thus would have no need to pool resources. Moreover, the marginal Tobin’s q (the present value of an additional dollar of capital) would be a sufficient statistic for investment behavior. In the presence of market frictions, however, firms might increase their cash holdings for precautionary reasons, while at the same time, since external funds become more costly than internal ones, they should also display a positive sensitivity of investment to cash flow.

Still, while the dramatic increase in cash holdings of (publicly traded) U.S. firms is a well-documented phenomenon since the mid-1990s, it is rather puzzling that, over the same period of time, the investment to cash flow (ICF) sensitivity for a similar pool of companies has markedly declined. Moreover, as both these phenomena date back before the crisis, they do not seem to be crisis-driven.

While different independent explanations for each of these two findings have been proposed, to the best of our knowledge no systematic analysis has been undertaken on whether (and how) the two phenomena are related, and why they have prominently emerged after the mid-1990s. In this paper we provide empirical evidence of a potential channel through which the decrease in ICF sensitivity and the increase in cash-holdings could be correlated. Our intuition is that, over the last twenty years, US corporations have increased their global reach through the expansion of their network of foreign affiliates, leading to the development of internal capital markets among possibly non-synchronized country/industry activities. The characteristics of these U.S. multinational entities, or conglomerates, would explain at the same time the necessity to accumulate cash resources to be provided to affiliates abroad when and where they are needed, as well as the reduced ICF sensitivity when measured at the level of the parent firm vs. the individual needs of affiliates for specific investment projects.

To investigate these issues, we exploit a unique dataset in which we match balance sheet data from Compustat for U.S. parents with data from Orbis to obtain detailed information on domestic and foreign affiliates owned by each U.S. parent worldwide, including information on their balance sheets over time.¹ We end up with a sample of 3,821 US parents active at least one year in the period of analysis (2004-2012), owning 17,986 foreign affiliates and 25,308 domestic affiliates.

Specifically, we test the ICF sensitivity first by a classical specification, as for example in Fazzari et al. (1988), then fitting a multilevel empirical model (Gelman and Hill, 2007) in which

¹Our general dataset encompasses 270,374 headquarters controlling 1,519,588 affiliates worldwide, across all industries. The primary source of data is Orbis, a global dataset containing detailed balance sheet information for some 100 million companies worldwide. In addition, the database contains information on over 30 million shareholder/subsidiary links, that we have been able to organize across each firm. The database has been significantly expanded since 2009, with a better coverage of countries traditionally not well mapped such as Japan and the United States. More detailed information on the dataset, as well as its validation across countries, is discussed in Altomonte and Rungi (2013).
we consider affiliates’ data as investment projects undertaken by the US parent, hence all nested into unique multinational or domestic business groups. The effect on cash holdings is tested by estimating a firm-level demand of cash holdings, as in Almeida Campello and Weisbach (2004), controlling again for the characteristic of the Multinational group structure, so as to disentangle the extent to which the impact of fragmentation/diversification is a possible driver of the observed cash hoarding.

Our selection of model designs retrieved from the literature is constructed in such a way that, for both our ICF sensitivity and cash holdings equations, we can exploit the same independent variable, that is cash flow (CF) over capital stock or total assets (K), controlling as well for a proxy of the Tobin’s q, and then changing the dependent variable accordingly (investment flows vs. cash holdings). To both these model designs we then overlay our business group structures.

We have two main findings. First, the apparent paradox of vanishing ICF sensitivity in the last decade is driven by a statistical aggregation bias, since parents’ accounts are consolidating financing choices actually made once taking into account the financing needs of the affiliates. Once controlling for the potentially complex network structure to which any affiliate belongs, the magnitude and significance of affiliates’ ICF sensitivity are comparable to what observed for the ’80s, for example by Chen and Chen (2011).

Further, we find that corporate cash hoarding is positively correlated with the geographic dispersion of sales by parents. At this stage of the analysis, we believe that the accumulation of liquidity reserves is indeed explained by the need to face potentially non-synchronized business cycles in different countries. This correlation is per se a sign for the existence of an internal capital market that involves also the parent company in building a capability to locate resources where and when they are most needed, within the established production network of affiliates.

The paper is related to different strands of literature. The first looks at the increase in the cash holding of US parent companies, a phenomenon that dates back to the mid-1990s. Sanchez and Yurdagul (2013) note that in 2011 cash holdings of publicly traded US firms amounted to nearly $5 trillion, with an annual rate of growth of 10 per cent in the period 1995 to 2010 (from $1.2 trillion to $4.9 trillion), but with average growth rates of 7 per cent already in the period 1980 to 1995. Moreover, from 1995 to 2010 the ratio of Cash to Net Assets has also doubled, moving from 6 to 12 per cent (with a slight fall during the financial crisis in 2008). Precautionary motives have been put forward as one of the main explanation for this behavior: firms facing uncertainty about future possible transactions find it rational to pile up significant amounts of cash in order not to lose the opportunity when the chance of the transaction presents itself; this effect in turn is stronger the more credit constrained the firm, or the more imperfect capital markets are. Indeed, Opler, Pinkowitz, Stulz and Williamson (1999) find that firms facing difficult access to external capital hold more cash, a result also confirmed by Almeida, Campello and Weisbach (2004) in their model of the precautionary demand for cash. More recently Bates, Kahle and Stulz (2009) also showed that firms with higher uncertainty in their cash flows end up having higher cash-to-assets ratios.
An alternative explanation for the increased cash holding of firms has been proposed by Foley, Hartzell, Titman and Twite (2007), based on the role of foreign income and repatriation taxes. The authors look at the different affiliates of the US parents and, based on the country in which these are located, calculate the implicit repatriation cost of foreign profits (which would be higher if foreign taxes are relatively low). Based on these data, they find that firms that are subject to higher repatriation taxes hold significantly more cash. These findings have been challenged in a recent paper by Pinkowitz, Stulz and Williamson (2013), in which they look at the ‘abnormal’ cash holdings of US firms, measured as the difference between the cash holdings of firms predicted using their patterns in the late 1990s and their actual cash holdings in subsequent periods. Through this lens they find that the tax explanation for the cash holdings of U.S. multinational firms cannot entirely explain the large abnormal holdings of these firms; rather, they show how the increase in cash holdings of multinationals is strongly related to their R&D intensity, so that multinationals with no R&D expenditures do not have an increase in abnormal cash holdings compared to domestic firms with no R&D expenditures.

The literature looking at investment to cash flow sensitivity dates back to Fazzari, Hubbard and Petersen (1988) who have been the first to show empirically a positive sensitivity of investment to cash flow, even after controlling for the Tobin’s q, interpreting this as the result of the existence of financial constraints. This finding is however not systematic, with Kaplan and Zingales (1997, 2000) observing that ex post many firms that were classified as sensitive to cash flows eventually showed to be non-constrained according to estimates. The latter critique has opened empirical controversies, related to a problem of endogeneity of a firm’s financial variables to its future returns of capital (Gilchrist and Himmelberg, 1995; Almeida, Campello and Weisbach, 2004), and to the identification of a correct measure of marginal returns of capital used as a control of a firms’ fundamentals, in absence of information on the expected future marginal profitability, for which the Tobin’s Q-value at the firm-level demonstrates to be only an imperfect measure (Gilchrist and Himmelberg, 1998; Erickson and Whited, 2012; and more recently Lewellen and Lewellen, 2014). Taking into account these refinements and controversies, the analysis of the investment-to-cash-flow sensitivity remains a key issue in the corporate finance literature (Biddle and Hilary, 2006; Almeida and Campello, 2007).

In particular, some studies have shown how the magnitude of the investment-to-cash-flow sensitivity has considerably reduced over time, especially in the aftermath of the recent financial crisis in US. Of particular interest for our analysis, Chen and Chen (2011) noted that estimates of sensitivities tended to decline over the last four decades, almost disappearing in 2007-2009, when on the contrary one would expect that firms were more credit-constrained as less external resources were available to financing firms’ investment projects. They also show that ICF sensitivity has disappeared in firms with low and high dividend ratios, in young and old firms, among small and large firms, and firms with and without credit ratings. As their results show

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2 Previous works showing a decline of the investment-to-cash-flow sensitivity are Allayannis and Mozumdar (2004), Agca and Mozumdar (2008), Brown and Petersen (2009).
that the decline and disappearance of IFC sensitivity cannot be explained by changes in sample
composition, corporate governance, or market power of firms, they conclude that the puzzle
remains.

The third strand of literature covered in this paper relates to the behavior of conglomerate firms and the development of internal capital markets. While the literature on business
groups is very large and spans different fields, from management to industrial economics to
finance, what we are interested here is the idea that the development of internal capital markets may allow firms to allocate capital from affiliates that have extra funds to affiliates that
do not produce sufficient capital themselves, yet have profitable projects. Billett and Mauer
(2003) provide some of the earliest evidence on this question, showing that funds flow toward
financially constrained efficient divisions of conglomerates, and that these types of transfers to
constrained segments with good investment opportunities increase the overall valuation of the
conglomerate. Maksimovic and Phillips (2008) also find that in growth and for consolidating
industries, conglomerates enable financially dependent divisions to invest and acquire assets at a
higher rate than similar financially dependent stand-alone firms. Desai, Foley and Hines (2004)
showed that affiliates to US multinationals were financed with less external debt in countries
with underdeveloped capital markets or weak creditor rights, where local borrowing costs were
higher. Kuppuswamy and Villalonga (2010), and Matvos and Seru (2012) explore instead the
reasons behind the finding that conglomerate firms tend to exhibit less cyclical behavior than
single-segment firms during economic and financial crises.\footnote{See Maksimovic and Phillips (2013) for a detailed survey of the effects of internal capital markets within
conglomerate firms.}

All the above evidence is thus consistent with the idea that conglomerate firms willing to
exploit internal capital markets tend to hold an above average amount of cash (consolidated at
the parent level) as a buffer for investment opportunities within the group, while the investment
to cash flow sensitivity of the same conglomerate would be relevant only at the individual affiliate
level. Moreover, it does also make sense that these financing choices would not be affected by
the crisis, as conglomerates tend to fare better and cut investment less during times of distress.

The paper is organized as follows. In Section 2 we introduce our linked data matching balance
sheet information on U.S. parent companies as retrieved from Compustat with information on
the individual affiliates owned by these parents worldwide, together with some stylized facts on
the evolution of cash flows and reserves in latest years. Section 3 presents our results on the ICF
sensitivity of conglomerates, while Section 4 analyzes the cash holding behavior of these firms.
Section 5 concludes.

2 Data and stylized facts

We match data on the activities of US companies as reported in Compustat with information
on their ownership structure as retrieved from the Ownership Database produced by Bureau
Van Djik. The Ownership Database reports complete proprietary linkages for about 5.5 million

\footnote{See Maksimovic and Phillips (2013) for a detailed survey of the effects of internal capital markets within
conglomerate firms.}
of firms across 200 countries in 2010 (the version we have used), and thus allows to map the position of each firm in a proprietary hierarchy. As such, the firm can be a parent company, i.e. it is the ‘ultimate owner’ of a corporate proprietary structure, an affiliate, i.e. it is controlled by some other firm (not excluding that the same firm controls other affiliates), or the firm can be independent. We opt here for a definition of control as established in international standards for multinational corporations (OECD 2005; UNCTAD, 2009; Eurostat, 2007), where control is assumed if (directly or indirectly, e.g. via another controlled affiliate) the parent exceeds the majority (50.01%) of voting rights of the affiliate and can thus be considered as the Ultimate Controlling Institution / Ultimate Beneficial Owner. In Altomonte and Rungi (2013) we describe the whole dataset of proprietary linkages, in which we retrieve information on 270,374 parents controlling a total of 1,519,588 (foreign and domestic) affiliates in 207 countries, and provide a validation of these data against existing official sources for foreign activities.

For the purpose of this paper, we follow Bates, Kahle and Stulz (2009) and consider all U.S. firms in Compustat with positive assets (Compustat data item #6) and positive sales (data item #12), while we exclude financial firms (SIC codes 6000-6999) and utilities (SIC codes 4900-4999). We then match these firms to our dataset of proprietary linkages, and retrieve 3,821 U.S. parent companies controlling 17,986 foreign affiliates and 25,308 domestic affiliates. For these firms we have complete information on the financial variables of interest for the years 2004 to 2012. Financial information on the U.S. parent companies is retrieved from Compustat, while balance sheet data of each affiliate in each country (including the U.S.) are retrieved from Orbis, a companion dataset always produced by Bureau Van Dijk where balance sheet data on some 60 million of companies are stored, although with some heterogeneity in the quality of balance sheet data across countries. We report in Appendix A a detailed description of the variables derived from each dataset and the correspondence criteria we adopted, coherently with previous studies.

In 1 we report some descriptive statistics for the validation of our dataset against the figures collected by US Bureau of Economic Analysis (BEA, 2014). Aggregating total assets from affiliate-level we find a good correspondence for year 2011. As for the geographical distribution of affiliates present in our data, roughly 58% of affiliates of the 3,821 parents are located in the US, the rest abroad. Not surprisingly, the European Union constitutes the most important location of U.S. international affiliates (12,454 firms, i.e. some 70% of the total). In terms of size, domestic affiliates tend to be slightly smaller than the average foreign affiliates, although the latter group is characterized by a larger heterogeneity (with affiliates operating in Latin America and Africa being typically very large).

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4 Control derived by voting power, i.e. majority ownership, can be obtained through either direct or indirect cross-participations. A company X can control 60% of shares of company A, which controls 70% of shares of company B. Although company X does not formally control company B directly, it does indirectly, via company A. The latter, known as the principle of the Ultimate Controlling Institution in OECD FATS Statistics (or Ultimate Beneficial Owner in UNCTAD data), allows to assign control of company B to company X, thus called the parent company.

Descriptive statistics for our sample of U.S. parents are comparable to other similar studies based on data derived from Compustat. In particular, Pinkowitz et al. (2013) look at data on 2,704 U.S. firms in 2010, using a threshold of market capitalization (in year 2000 dollars) greater than $5 million, retrieving a (unweighted) mean Cash/Asset ratio of 21.5% in 2010; Bates, Kahle and Stulz (2009) analyse 3,297 firms, with a (unweighted) mean Cash/Asset ratio of 23.2% in 2006 (last available year).

As shown in the first panel of 2, our 3,821 U.S. parent companies report in Compustat an average (unweighted) Cash/Asset ratio of 21.7% in 2010 and 22.9% in 2006, in line with previous samples analyzed in the literature.

When looking at the evolution over time (2004-2012) of cash holdings by parents, in the first panel of 2, we find confirmation of what already detected by Pinkowitz et al. (2013): on aggregate, there is no sensitive difference before and after the crisis in terms of liquidity strategies. Rather, we observe a higher heterogeneity over the distribution, with companies on the 75th percentile detaining cash reserves exceeding 30% of total assets. But observed dispersions should not be an issue once assuming that liquidity strategies are already related to firm-specific characteristics, as for example size or industrial activities.

Once looking instead at the affiliate-level, we find that: i) on average they detain a lower level of cash holdings with respect to parent companies; ii) on aggregate the average cash-on-assets ratio was increasing already before the outburst of the financial crisis in 2008, although the trend is driven mainly by affiliates in the fourth quartile.

In general, however, when the deflagration of the crisis occurs, a sudden and temporary decrease in cash-on-assets ratio is observed for both parents and affiliates. Then there’s a simple restocking for parents and a back on the increasing trend for parents.

Table 1: Validation of our dataset with BEA (2014)

<table>
<thead>
<tr>
<th>Geographic area</th>
<th>Total assets (Orbis)</th>
<th>Total assets (BEA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Canada</td>
<td>1,218.35</td>
<td>1,240.46</td>
</tr>
<tr>
<td>Europe</td>
<td>13,062.71</td>
<td>12,267.81</td>
</tr>
<tr>
<td>Latin America and Other</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Hemisphere</td>
<td>3,535.70</td>
<td>3,656.55</td>
</tr>
<tr>
<td>Africa</td>
<td>207.11</td>
<td>297.25</td>
</tr>
<tr>
<td>Middle East</td>
<td>157.05</td>
<td>141.18</td>
</tr>
<tr>
<td>Asia and Pacific</td>
<td>3,138.21</td>
<td>3,231.08</td>
</tr>
<tr>
<td>Total</td>
<td>21,319.13</td>
<td>20,834.33</td>
</tr>
</tbody>
</table>
Table 2: Cash holdings of U.S. parents and worldwide affiliates, by quartiles of size distribution (sales) and year

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean</th>
<th>P25</th>
<th>P50</th>
<th>P75</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>22.05%</td>
<td>3.01%</td>
<td>10.93%</td>
<td>32.59%</td>
<td>25.52%</td>
</tr>
<tr>
<td>2005</td>
<td>22.51%</td>
<td>2.96%</td>
<td>11.16%</td>
<td>33.32%</td>
<td>26.15%</td>
</tr>
<tr>
<td>2006</td>
<td>22.88%</td>
<td>2.89%</td>
<td>11.36%</td>
<td>34.24%</td>
<td>26.62%</td>
</tr>
<tr>
<td>2007</td>
<td>22.43%</td>
<td>2.71%</td>
<td>10.38%</td>
<td>33.19%</td>
<td>26.92%</td>
</tr>
<tr>
<td>2008</td>
<td>20.75%</td>
<td>2.59%</td>
<td>9.90%</td>
<td>29.62%</td>
<td>25.27%</td>
</tr>
<tr>
<td>2009</td>
<td>22.01%</td>
<td>3.32%</td>
<td>12.18%</td>
<td>31.23%</td>
<td>24.97%</td>
</tr>
<tr>
<td>2010</td>
<td>21.69%</td>
<td>3.75%</td>
<td>12.36%</td>
<td>30.89%</td>
<td>24.13%</td>
</tr>
<tr>
<td>2011</td>
<td>20.76%</td>
<td>3.30%</td>
<td>11.42%</td>
<td>29.59%</td>
<td>23.85%</td>
</tr>
<tr>
<td>2012</td>
<td>19.96%</td>
<td>3.19%</td>
<td>10.84%</td>
<td>27.53%</td>
<td>23.27%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean</th>
<th>P25</th>
<th>P50</th>
<th>P75</th>
<th>St Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td>17.11%</td>
<td>-1.86</td>
<td>0.49</td>
<td>12.16</td>
<td>399.81</td>
</tr>
<tr>
<td>2005</td>
<td>17.12%</td>
<td>-2.36</td>
<td>0.37</td>
<td>13.46</td>
<td>420.96</td>
</tr>
<tr>
<td>2006</td>
<td>17.66%</td>
<td>-4.31</td>
<td>0.13</td>
<td>10.37</td>
<td>351.79</td>
</tr>
<tr>
<td>2007</td>
<td>18.50%</td>
<td>-2.65</td>
<td>0.63</td>
<td>15.54</td>
<td>340.65</td>
</tr>
<tr>
<td>2008</td>
<td>17.88%</td>
<td>-6.47</td>
<td>-0.02</td>
<td>10.23</td>
<td>869.73</td>
</tr>
<tr>
<td>2009</td>
<td>19.10%</td>
<td>-2.56</td>
<td>0.52</td>
<td>21.44</td>
<td>710.43</td>
</tr>
<tr>
<td>2010</td>
<td>19.46%</td>
<td>-3.75</td>
<td>0.23</td>
<td>14.81</td>
<td>492.99</td>
</tr>
<tr>
<td>2011</td>
<td>19.16%</td>
<td>-7.00</td>
<td>0.00</td>
<td>10.08</td>
<td>471.23</td>
</tr>
<tr>
<td>2012</td>
<td>19.55%</td>
<td>-6.77</td>
<td>0.13</td>
<td>13.69</td>
<td>580.37</td>
</tr>
</tbody>
</table>

3 ICF sensitivity and conglomerate firms

3.1 Baseline results

In order to test our hypothesis of a reduced ICF sensitivity, when measured at the level of the parent firm vs. the individual needs of affiliates, we first attempt at reproducing the estimates of investment cash flow sensitivity reported in previous works on our sample. To this extent, we start with the classical empirical setup originally set in Fazzari, Hubbard and Petersen (1998):

\[
\frac{I_{it}}{K_{it-1}} = \alpha_0 + \alpha_1 \frac{CF_{it}}{K_{it-1}} + \alpha_2 Q_{it} + \alpha_3 size_{it} + \gamma cs + \theta t + \varepsilon_{it}
\]  

where \( I_{it} \) is the ith firm’s fixed investment (capital expenses) at time \( t \), \( CF_{it} \) is the ith specific internal cash flow, \( K_{it-1} \) is the capital stock (book value of assets) at the beginning of period used to deflate previous variables, and \( size_{it} \) is the firm’s number of employees. Industry fixed effects (\( \gamma_s \)) at the NAICS 3-digit level and time fixed effects (\( \theta_t \)) are further included.
The control \((Q_{it})\) we introduce for the viability of affiliates’ investment projects is different when we test parents or affiliates.\(^6\) In the case of parent-level data, sourced from Compustat, we use a traditional proxy of Tobin’s q as market capitalization \((MC_{it})\) to the book value of assets \((K_{it-1})\), whereas we substitute operating income \((INC_{it})\) to market capitalization at the numerator as most of affiliates are not usually quoted at any stock exchange and have no market capitalization.

Our baseline results for parents are reported in Column 1 of Table 4.

Table 4: Investment-to-cash-flow for US, at the parent- and affiliate-level, basic estimates for 2004-2012.

<table>
<thead>
<tr>
<th>Dependent variable: (\frac{I_{it}}{K_{it-1}})</th>
<th>parent-level</th>
<th>affiliate-level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(CF_{it}/K_{it-1})</td>
<td>0.002</td>
<td>0.122***</td>
</tr>
<tr>
<td></td>
<td>(0.002)</td>
<td>(0.007)</td>
</tr>
<tr>
<td>(Q_{it})</td>
<td>0.026***</td>
<td>0.010**</td>
</tr>
<tr>
<td></td>
<td>(0.010)</td>
<td>(0.000)</td>
</tr>
<tr>
<td>(Size_{it})</td>
<td>0.250***</td>
<td>0.015***</td>
</tr>
<tr>
<td></td>
<td>(0.084)</td>
<td>(0.002)</td>
</tr>
<tr>
<td>Constant</td>
<td>1.411***</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.539)</td>
<td>(0.009)</td>
</tr>
</tbody>
</table>

| Country*industry fixed effects | No | Yes |
| Industry fixed effects        | Yes| No  |
| Time fixed effects            | Yes| Yes |

| Observations                  | 33,182 | 73,021 |
| Firms (parents or affiliates) | 3,821  | 43,294 |
| Adjusted R-squared            | 0.051  | 0.032  |

*, **, *** significance at 10%, 5% and 1%. Robust standard errors in parenthesis.

When testing the ICF equation on parent companies, we detect a small and non-significant effect, as indicated by the correlation between capital expenses and cash flow, both weighted by assets at the beginning of the period. This finding for consolidated parent data is comparable in magnitude to previous results by Chen and Chen (2011), who reported a vanishing ICF sensitivity over the last decade.

However this result changes when, rather than looking at the financial accounts of parent companies, we look in Column 2 at the balance sheet of worldwide affiliates controlled by the same parents included in the first column. In this case, we are able to recover a positive and significant investment to cash flow sensitivity. The result is robust to potential composition biases deriving from country and industry characteristics of our sample (e.g. the presence of

\(^6\)More details on the construction of variables are included in Appendix A.
firms operating in industries characterised by different financial constraints in certain countries), as we have included in our estimation a full set of interacted country and industry fixed effects, as well as to specific time shocks.

Interestingly, we do not detect a joint statistical significance for time fixed effects, neither for parents nor for affiliates’ estimates. That is, although we test a proxy for financial constraints across a period that has seen an exceptional financial shock, our ICF sensitivities are on average not affected.

It thus seems that the apparent paradox of fading financial constraints for US firms is already solved once we control for a possible aggregation bias, which derives from the consolidation of all the financing and investment choices. Our results seem consistent with the idea that investment choices and relative expenses occur more conveniently at the level of the affiliates, where and when informative asymmetries are revealed once looking for resources on local financial markets. At this stage of the analysis, we cannot also exclude that our results are driven by the existence of internal capital markets, managed by the parent company from the center, which collects and redirect funds where and when they are most needed.

The previous result, however, is obtained within a model design implying the assumption that US parents and their affiliates are statistically independent in their financing choices: indeed, in Column 2 of Table 4 we have simply run our ICF sensitivity Equation (1) on the pooled sample of US affiliates worldwide. In order to relax this assumption, we need to explicitly take into account the potential within-group correlation of affiliates’ financial constraints, as the financial choices of firms within each conglomerate are likely to depend (also) on the decision of the parent company, and in turn are likely to vary across groups. According to this estimation strategy, we thus consider all affiliates belonging to a multinational group as nested under an upper level represented by a common ownership structure and estimate a hierarchical (two-level) linear model. From an economic point of view, the strategy is likely to more realistically reproduce the joint management choices undertaken by headquarters when engaging in different investment projects run by single affiliates.

In terms of model design, the basic assumptions behind the idea of ICF sensitivity can be easily extended to observational units implying conglomerates of firms. Following the neoclassical investment theory set by the seminal work by Modigliani and Miller (1958), there should be no ICF sensitivity after controlling for the profitability of the project. In the event that such sensitivity does exist, it means that the firm has to rely on its own financial resources, either to be considered as a pledge to repay the credit obtained or to finance the project with internal resources. By extension, if capital markets were frictionless, not only the ICF sensitivities should be non-significant at the affiliate-level, but they should also be independent across affiliates within the same multinational group.

Starting from this baseline scenario, a positive and significant ICF might then appear either homogeneously across groups, or heterogeneously across different groups, thus signalling the presence of financial constraints at the market or at the group level, respectively.
To discriminate between the two possible scenarios, we test a hierarchical model characterized by a random-intercept and a random-slope as follows:

\[
\frac{I_{i(j)t}}{K_{i(j)t-1}} = (\alpha_0 + \zeta_{0j}) + (\alpha_1 + \zeta_{1j})Q_{it} + (\alpha_2 + \zeta_{2j})\frac{INC_{i(j)t}}{K_{i(j)t-1}} + \lambda_{cs} + \theta_t + \varepsilon_{i(j)t}
\]  

(2)

As in Eq. (1), the subindex \(i\) identifies the firm (in this case the affiliate) now nested in group \(j\), thus resulting in a \(i(j)\) partition of the sample. As before, \(I_{i(j)t}\) is the fixed investment (capital expenses) of the \(i\)th affiliate’s of group \(j\) at time \(t\), \(CF_{i(j)t}\) is the \(i(j)\)th affiliate’s internal cash flow, \(Op\)\(INC_{i(j)t}\) is the \(i(j)\)th affiliate’s operating income, \(K_{i(j)t-1}\) is the affiliate’s capital stock at the beginning of period used to deflate previous variables. As before, country-per-industry fixed effects (\(\lambda_{cs}\)) and time fixed effects (\(\theta_t\)) control for sample composition and time-specific shocks.

What sorts out Eq. (2) from the previous model is the fact that coefficients now include both a fixed (\(\alpha\)) and a random, group-specific (\(\zeta_j\)) component. The fixed component is common to the whole affiliates included in the sample, whereas the random part varies with \(j\)th membership to the group. The fixed part of each coefficient is in other words the contribution to that coefficient given by the general market structure, while the random part is the contribution to that coefficient attributable to the specific common characteristic of the group (the parent’s decision of investment) to which the affiliate belongs. As a random variable, each random part has its own distribution that we assume as normal: \(\zeta_{nj} \sim N(\mu_{nj}, \psi_{nj})\), for each \(n = \{0, 1, 2\}\). Maximum-likelihood estimates with unstructured covariance structure are reported in Table 5.

In the upper part of Table 5 we have the sample estimates of the fixed components: after controlling for our proxy of investment opportunities, we obtain a highly significant affiliate-specific ICF sensitivity of .156, which is not far in magnitude from the figure we obtained in the pooled independent estimation presented in the second column of Table 4. In the lower part of the table, we find instead the standard deviation of the random component (\(\zeta_{1j}\)) of the same ICF. The latter allows us to define a confidence interval into which the sensitivity falls once taking into account the heterogeneous contribution of the different parent firms’ decisions. With a 99 percent confidence, the sensitivity falls in a range \((-203; 339)\), thus crossing 0. This implies that the affiliation to a specific ownership structure makes the difference, as the market-induced fixed ICF coefficient observed for the 'average' firm can be either boosted or mitigated until reversing for some affiliates controlled by specific parents.

In other words, while in general the affiliates show financial constraints when drawing upon external financial markets, their constraints can however be softened, to the point of vanishing, or magnified by inclusion in one corporate group or another.

At this stage of the analysis we don’t know which group features determine this huge variation of the ICF sensitivities, but we already can conclude that these sensitivities are not neutral to corporate affiliations. We can however speculate on two possible determinants affecting financial constraints after affiliation: the establishment of internal financial markets and/or the enhanced reliability that can come with corporate affiliation. In the first case, a coordination of the finance
Table 5: Random coefficient model for within-group financial constraints in the period 2004-2012.

<table>
<thead>
<tr>
<th>Dependent variable:</th>
<th>Multilevel model - Random slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\frac{I_t}{K_{it-1}}$</td>
<td></td>
</tr>
</tbody>
</table>

**Fixed component**
- $\frac{\text{CF}_t}{K_{it-1}}$: 0.156***
- $Q_t$: -1.24***
- $\text{Size}_t$: 0.015***
- Constant: 0.012

**Random component**
- $\text{sd}(\frac{\text{CF}_t}{K_{it-1}})$: 0.183***
- $\text{sd}(Q_t)$: 0.387***
- $\text{sd}(\text{Size}_t)$: 0.051***
- $\text{sd}(\text{constant})$: 0.063***
- $\text{corr}(\frac{\text{CF}_t}{K_{it-1}}, Q_t)$: -0.663***
- $\text{corr}(\frac{\text{CF}_t}{K_{it-1}}, \text{Size}_t)$: -0.185***
- $\text{corr}(\frac{\text{CF}_t}{K_{it-1}}, \text{constant})$: -0.319***
- $\text{sd}(\text{residuals})$: -0.181***

Country*industry fixed effects: Yes
Time fixed effects: Yes
Observations: 55,316
Affiliates: 14,557
Headquarters: 3,042
Log likelihood: -2,373.39
chi2 LR test w OLS: 860.00 (6)

*, **, *** significance at 10%, 5% and 1%. Robust standard errors in parenthesis.

function among co-affiliates can reduce the need to accumulate cash reserves. To invest in new projects, an affiliate can draw upon the pooled financial resources eventually coordinated by a common management. In the second case, borrowing capacities can depend also on the tangible and intangible collaterals of the entire corporation.

For example, affiliates to bigger corporations can benefit from both a higher amount of internal funds and bargain better credit conditions after spending corporate reputation on financial markets. MNEs and conglomerates, operating in different countries and/or industries, can rely on unsynchronized business cycles. They can therefore be more able to transfer funds to affiliates suffering from market downturns, relocating from affiliates operating in prosperous markets.

From the random components of Table 5 we can also quantify the within-group correlation of the estimated equation as follows:

$$\hat{\rho} = \frac{\psi_{uj}}{\psi_{uj} + \psi_\varepsilon}$$

(3)
where $\psi_{0j}$ is the variance of the random intercept and $\vartheta$ is the residuals’ variance. The implied within-group correlation in our sample is .505, thus relatively high, a fact that we interpret as a sign of high interdependence among coaffiliates and headquarters in terms of investment and financial allocation decisions.

In order to visualize the results obtained from the two-level random coefficient model, we can also derive predicted investment-to-cash-flow sensitivities that are common for affiliates belonging to the same group. We fit values according to the following equation:

$$\frac{I_{i(j)t}}{K_{i(j)t-1}} = \tilde{\alpha}_0 + \tilde{\alpha}_1 \frac{CF_{i(j)t}}{K_{i(j)t-1}} + \tilde{\zeta}_{0j} + \tilde{\zeta}_{1j} \frac{CF_{i(j)t}}{K_{i(j)t-1}}$$

where empirical Bayesian investment cash flow sensitivities are represented by the term \((\tilde{\alpha}_1 + \tilde{\zeta}_{1j})\) specific for each of the 3,042 parents included in our sample, while the composite random intercept term \((\tilde{\alpha}_0 + \tilde{\zeta}_{0j})\) can be considered as identification of the financial constraints observed in the market (thus independent on specific decisions by a given parent). The Bayesian nature of our estimate is due to our use of estimates of random variables that we consider as given \((\tilde{\zeta}_{0j}; \tilde{\zeta}_{1j})\).

In Figure 1 we plot the predicted regression lines, the affiliates’ average regression line and the consolidated parents’ regression lines. The complete predicted regression lines sum up the fixed and the random components of eq. 4, whereas the affiliates’ average regression line is the one that considers only the fixed components \((\tilde{\alpha}_0 + \tilde{\alpha}_1 \frac{CF_{i(j)t}}{K_{i(j)t-1}})\). We added also the consolidated parents regression line, as borrowed from results reported in Table 4 second column, in order to show the difference with the now unconsolidated but structural estimates.

Figure 1: Empirical Bayesian investment cash flow sensitivities

We have in Figure 1 a clear visualization of how the average sensitivity of sample affiliates can
conceal very different situations. Predicted slopes and intercepts in the bundle of group-specific regression lines vary in some cases from negative to positive. On the other hand, the estimates that we obtained in Table 4, when considering the headquarters’ consolidated data, inevitably suffered from an aggregation bias since the process of investment decisions and allocation of financial resources is very heterogeneous at the affiliate-level, even within the same MNE.

The estimates for the coefficient on investment opportunities ($Q_{it}$, our proxy for the Tobin’s $q$) also show a high variation after accounting for within-corporate interdependence. First of all, we observe a sign reversal with respect to estimates in 4, from positive to negative. This counterintuitive result gives rise to doubts on the validity of our proxy for viability of projects. Remember that we cannot rely on a market capitalization value for affiliates that are not quoted at any stock exchange. Hence we chose a ratio of operating income on assets as a substitute for affiliates. In general, extensive literature has discussed the endogeneity bias that can come with a proxy of Tobin’s $q$ based on observed data, in relationship with both borrowing capacities and capital expenses.\(^7\) In general, it is said, not only a higher borrowing capacity can correlate with overall firm viability, but also propensity to invest can be correlated to firms’ expectations on the basis of actual viability. The exploration of this endogeneity bias falls beyond the scope of this article, but in this light we can discuss variation observed once looking at within-corporation interdependence.

As in the case of ICF sensitivities, the affiliation to some corporate structures can induce sign reversal at the level of affiliate. With a 99 percent confidence interval, the coefficient on investment viability falls within a range $(-.511, .263)$, thus crossing 0. That is, correlation with investment propensity seems on average negative, whereas across corporate structures it can be either negative or positive. That is, a higher investment propensity is on average associated with a lower profitability for the population of affiliates, but parent affiliation adds makes the difference. Indeed, we can assume that

At this stage of the analysis nothing can be said about the nature of this aggregation bias. We can think for the moment of two possible explanations. On one side, it can be due to the creation of an internal capital market, that allows for a centralization of the finance function so that a parent can relocate liquidity resources where they are most needed. In this case capital expenses would occur at the affiliate-level, while cash flows are borrowed from the parent and there would be no reason to find a correlation on aggregate from parents’ financial accounts. On the other side, there is a possibility that bigger parents, with an increasing international activity, can rely on a reputation effect on financial markets when asking for funds thanks to a better collateral. In this case parents are indeed less financially constrained, while affiliates have still to accumulate liquidity reserves.

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\(^7\)See Erickson and Whited (2012) for an overview of the problem and a proposed solution based on generating moments techniques.
4 Cash holdings and conglomerate firms

In the previous section we have found that, to successfully assess financial constraints in US corporations, we had to account for the interdependence among the single investment projects undertaken by single affiliates. Whether due to the possibility to develop an internal capital market, or due to a better intangible collateral to be spent on financial markets, parent companies do not display a correlation between capital expenses and liquidity means, which we however find again at the level of their own affiliates, a result confirmed by both a simple pooled model and a structural hierarchical level estimation.

In this section we further explore the idea of the existence of an internal capital market within these groups, by exploiting the evidence that US corporations are hoarding cash reserves, a feature that we also retrieve in our data. In particular, we test the following equation:

\[ \Delta \frac{CH_{jt}}{K_{jt-1}} = \alpha_0 + \alpha_1 \frac{CF_{jt}}{K_{jt-1}} + \alpha_2 \frac{Inc_{jt}}{K_{jt-1}} + \alpha_3 ind_{jt} + \alpha_4 geo_{jt} + \lambda + \theta + \epsilon_{jt} \]  

(5)

where on the left side we have cash holdings \((CH_{jt})\) of the \(j\)th parent at time \(t\), weighted by total assets at the beginning of the period. In order to stick as closely as possible to the existing debate in the literature, we follow Almeida et al. (2004) in relating asset-weighted cash holdings to asset-weighted cash flows \((CF_{jt})\) and a proxy for Tobin’s Q. \((Inc_{jt}/K_{jt-1})\), both introduced in the course of our previous analysis. To that, we add our group-level dimension, by introducing an indicator of industrial diversification \(\text{ind}_{jt}\) and one for geographic fragmentation \(\text{geo}_{jt}\), which are specific for each parent and each year in our sample. Both are calculated as Herfindahl-Hirschman indexes for affiliates’ turnover, the first on the basis of the industries in which single affiliates are active, the second on the basis of countries in which single affiliates are located. Further, we include industry fixed effects by core activity of the parent (at the NAICS 3-digit level) and time fixed effects to account for idiosyncratic shocks.

Results are reported in Table 6 for our parent firms. In the first column we find the well-known positive and significant correlation between cash flows and cash holdings, with a magnitude similar to the one found by Almeida et al. (2004).

In the second column of Table 6 we find that including both geographic and industrial diversification however reduces such a correlation by 50 per cent. Furthermore, parents that are more fragmented internationally tend to accumulate more cash reserves. Industrial diversification seems not driving cash hoarding.

We interpret this result as a hint to the existence of an internal capital market that is more relevant for Multinational groups, which have to manage possibly non-synchronized business cycles around the world. A centralization of the finance function and the ability to relocate financial resources, when and where they are more needed, could be a valid economic rationale for why US corporations are hoarding cash reserves.
5 Conclusions and further work

In this contribution we provide a systematic analysis of financing choices by US conglomerates while trying to explain the twin paradox of apparently vanishing financial constraints, assessed through investment-to-cash-flow (ICF) sensitivities, and record-high amounts of cash reserves over the last decades.

We find that the increasing fragmentation of production across national borders, and the consequent necessity to establish a complex internal capital market, can jointly explain these two paradoxes.

On one side, the apparent fading ICF sensitivity seems to be the result of an aggregation bias, when neglecting what happens at the level of single affiliates, where actual investment projects are implemented. When including affiliates’ financial accounts, the ICF sensitivity arises again with a magnitude similar to the one registered in previous works and for previous years. Then, we detect a high degree of interdependence of financing choices between parents and affiliates, once we control for belonging to common ownership structures after the adoption of a multilevel empirical model. The population-average financial constraint observed for affiliates can be considerably mitigated until reversing for some units, depending on the ownership network they belong to.

At this stage of the analysis we can’t tell more on whether this interdependence among productive units is due to the possibility to develop an internal capital market or to an additional...
form of collateral that can be spent on financial markets, given by the increasing complexity of the network structure (i.e. more assets) from international fragmentation.

However, the positive correlation between cash holdings and geographic dispersion of activities could be a clue that US corporations are piling up reserves for potentially non-synchronized business cycles in different countries and industries.

Further work is needed, however, to assess the role for possible lack of good investment opportunities in both cash hoarding and vanishing ICF sensitivity. A more structural estimation will take into account the simultaneity of demand and supply of financial resources at the firm-level, in line with what Almeida et al. (2004) did, but including also the international fragmentation of production in countries with different financing environments and fiscal incentives.
References


