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Wall of cash: The investment-cash flow sensitivity when capital becomes abundant

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ABSTRACT

In the mid 2000s the oil and gas industry was hit by what might be best described as a 'wall of cash' as oil prices successively reached new record levels and access to external financing improved greatly. In this article we investigate what this sudden abundance of liquidity implied for the investment-cash flow relationship, the interpretation of which continues to generate controversy in the literature. For financially constrained firms we find that the investment-cash flow sensitivity decreases in the abundance period (2005–2008), suggesting that the financing constraints became less binding in this period. For financially unconstrained firms the investment-cash flow sensitivity instead increases over time, suggesting that this relationship is driven by agency problems related to free cash flow. Our paper is the first in the investment-cash flow literature to bring evidence from a natural experiment in which there was an unexpected, exogenous, substantial, and persistent decrease in the cost of external financing.

1. Introduction

Beginning with Fazzari et al. (1988) a large empirical literature has documented a positive and significant relationship between cash flow and investment, holding investment opportunities constant. What is more, this research has generally shown that the investment sensitivity to cash flow tends to be higher for firms a priori classified as more financially constrained, which has typically been interpreted as evidence of contracting problems in the financial markets caused by information asymmetries (Myers and Majluf, 1984) or agency problems (Jensen and Meckling, 1976). This financing constraints view has been challenged by several researchers who have found the investment-cash flow sensitivity to be unrelated (Chen and Chen, 2012) or even inversely related (Kaplan and Zingales, 1997; Kadapakkam et al., 1998; Cleary, 1999) to financial constraints. The interpretation of the investment-cash flow sensitivity continues to generate controversy.

One of the key challenges facing empirical research in this area is to find a valid prior to identify differentials in the cost of external financing. The cost of external financing is fundamental to this literature, because it is the cost wedge between internal and external capital that gives rise to the financing constraints that motivate the investment-cash flow sensitivity. Unfortunately, most priors used in the literature are theoretically ambiguous. Hadlock and Pierce (2010), for example, point out that high cash holdings have an unclear relation to financing constraints because it possibly signals both the ready availability of funds and the need to save for precautionary motives. Likewise, the dividend ratio, another common proxy for financing constraints, is an endogenous choice variable and thus imperfect as a sorting mechanism. Composite measures of financing constraints, such as the KZ index (Lamont et al., 2001) or the WW index (Whited and Wu, 2006) potentially incorporate large amounts of financial information, but do not appear to fare particularly well empirically (Hadlock and Pierce, 2010).

We contribute to this literature by providing evidence from a natural experiment in which firms experience an unexpected, exogenous, substantial, and persistent decrease in the cost of external financing. By analyzing the same set of firms before and after the cost of external financing went down, we avoid many of the problems associated with endogenous priors. If investment-cash flow sensitivities are indeed measures of financing constraints, we expect that the sensitivity decrease following such a negative shock to the cost of external financing. We posit that the oil and gas industry in the 2000s affords us a rare chance to study the effects on the investment-cash flow relationship from such a shock. In 2004 the oil price began a relentless upward march and successively reached new record levels, peaking at a quarterly

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average of $122 in the second quarter of 2008, compared to a previous high of $36 in 2000. Crucially for our research strategy, the forward curve for oil (at long maturities) showed a similar increase as the spot price around 2004 and in subsequent years did not predict a return to the pre-2004 levels.[2] It is also significant that the level of uncertainty did not change materially as the price increased.[3] These factors signaled that the exogenous shock was expected to be permanent. As a consequence, the collateral value of oil and gas assets rose sharply, and in market value terms the leverage of firms in this industry dropped significantly. Reflecting the ensuing decrease in the cost of outside financing, both debt and equity became abundantly available: for the industry as a whole, the average growth rate in interest-bearing debt was 76% per year after 2004, and aggregate share issues increased tenfold. In what follows we refer to 2005–2008 as "the abundance period".

Moreover, the oil and gas industry compares well in terms of identification, which allows us to study how the exogenous shock differentially impacted financially constrained and unconstrained firms. The large firms in this industry, who were by most measures financially unconstrained already, accounted for the bulk of the increase in cash flows that began in the mid 2000s. Between 2003 and 2005, in the space of two years, the aggregate cash position of these firms increased by over 400%. The small firms did not experience nearly the same windfall due to having less producing assets. In fact, since the investment opportunities for many of these firms increased at a quicker rate than their operating cash flows, these firms continued to be dependent on external funding in the abundance period.[4] To sum up, the oil and gas industry in the selected period offers a clearly identifiable exogenous shock to the cost of external financing as well as robust identification of financially constrained firms.

Using a balanced sample of 78 firms, rendering 612 firm-year observations, we find that for the sample as a whole the investment-cash flow sensitivity decreases in the abundance period. Following the standard methodology in the literature, we carry out regressions on investment with Tobin's *Q* and financial variables (cash flow, cash, and leverage) as independent variables. As expected, cash flow and Tobin's *Q* are positive and significant at the 1%-level in the large majority of regressions. To explore the impact of the exogenous shock we interact cash flow with a regime-shift dummy (or alternatively a deterministic time trend variable). For the full sample, the interaction term is negative and significant, which suggests that the financing constraints for the industry as a whole decreased over the sample period.

However, the full-sample result hides important differences in the way firms classified as constrained or unconstrained were impacted by the exogenous shock. For small firms the interaction term between cash flow and the regime shift dummy is negative and significant (at the 5%-level). For large firms the results look very different. The interaction term is now positive, albeit marginally insignificant (*p*-value 0.12). When cash flow is instead interacted with a deterministic time trend, the interaction term for large firms is positive and significant at the 1%-level. We carry out several robustness checks and obtain similar results for both small and large firms. In particular, the results are robust to the exclusion of negative cash-flow observations, which previous research has shown to suppress the investment-cash flow sensitivity (Allayannis and Mozumdar, 2004).

Our findings with regard to small firms support the financing constraints interpretation of the cash flow-investment relationship. The sensitivity behaves as predicted following the negative shock to the cost of external financing. A plausible interpretation of this result is that the financing constraints of these firms became less binding in the abundance period. This occurs in spite of the fact that the aggregate funding need of this category of firms actually increased in the same period, which suggests that the beneficial impact from the decreased cost wedge between internal and external capital is the dominating influence on the investment-cash flow relationship. However, it is difficult to reconcile with efficient investment behavior our finding that the fraction of cash flow spent on investment increases for large firms following the cash windfall. Too see why, consider the argument by Hirth and Viswanatha (2011) that financing constraints increase the option value of waiting, which may prompt constrained firms to postpone investments. Unconstrained firms, on the other hand, have incentives to accelerate investment as a hedge against the risk of experiencing future constraints. A persistent cash windfall would reduce the likelihood of unconstrained firms becoming constrained, thereby reducing the need for accelerated investment. This argument predicts that the large firms in our sample would, if anything, respond to the cash windfall by underinvesting, which in turn implies a reduction in the investment-cash flow sensitivity. We find the opposite.

To explain why the sensitivity has increased over time for large firms we need to consider an altogether different explanation of the investment-cash flow relationship, namely that it reflects overspending by managers with incentives to maximize assets under control (in line with Jensen, 1986). Kadapakkam et al. (1998) find that large firms in six different countries have larger investment-cash flow sensitivities than their smaller counterparts, and argue that this could be explained by agency problems related to overinvestment. More broadly, the agency model of managerial behavior has found empirical support in a number of empirical studies of corporate investment (e.g., Blanchard et al., 1994; Peyer and Shivdasani, 2001; Richardson, 2006; D'Mello and Miranda, 2010). We posit that the increase in the investment-cash flow relationship could come about if higher liquidity and creditworthiness due to higher current (and expected) cash flows mean that management assigns a lower probability of future financial distress, and therefore feel confident to divert a larger fraction of current cash flow to investment projects. That is, as the prospect of financial distress gets more distant, the disciplining effect this has on capital discipline wears off. This argument is an application of the 'discipline hypothesis' developed by Luo (2011), who finds empirical support for the idea that financially constrained firms have better spending discipline than unconstrained firms. Supporting this interpretation, in a regression with Tobin's *Q* as dependent we find that the market appears to value incremental investment by large firms (but not small firms) less over time.

A main contribution of this paper is to bring evidence from a natural experiment to the investment-cash flow literature. As far as the authors are aware no previous study has investigated the sensitivity before and after a substantial and persistent shock to the cost of external financing. Our paper helps to fill this gap. By focusing on an exogenous shock to cash flow we follow in the tradition of Blanchard et al. (1994) and Lamont (1997). We differ from Blanchard et al. (1994) and Lamont (1997) in that we focus on a persistent shock. This is important, since it is the key explanation behind a reduction in financing constraints. Consistent with

[2] Prior to 2004, the forward curve gave little or no indication about the increase that was about to take place, suggesting that it was largely unexpected by the industry.

[3] The annualized standard deviation of log oil price changes, estimated as a GARCH (1, 1) process, fluctuated around 30% throughout the sample period with no discernible relation between oil price increases and volatility.

[4] At the end of 2003, the small firms in our sample considered together had $258mn in outstanding long-term debt. Five years later, the corresponding figure was $4.2 *billion*. Prior to 2005 aggregate equity issues for these firms did not exceed $80mn in any year; in 2007 and 2008 this number was $1 and $2.7 billion, respectively. These figures clearly suggest that small firms to a significant degree relied on external funding for their investment growth in the latter part of the sample period.