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Abstract

Several studies use the investment - cash flow sensitivity as a measure of financing constraints while some others disagree. The source of this disparity lies mostly in differences in opinion regarding the segregation of severely financially constrained firms from less constrained ones. We examine this controversy by analyzing firms affiliated to business groups that are subject to less financing constraints relative to independent firms. Our results show strong investment – cash flow sensitivities for both group and non-group firms, but no significant difference between them. The finding is robust to alternative investment models and estimation techniques. We investigate this finding further by analyzing the influence of various firm-specific characteristics like size, age, leverage and ownership structure. We continue to observe that less financially constrained firms do not exhibit a significantly lower sensitivity of investment to cash flow. The results of the study thus provide new and compelling evidence demonstrating the inability of investment – cash flow sensitivity to be a good measure of a firm's financing constraint.

1. Introduction

Understanding the determinants of a firm's investment behavior is an important topic of corporate finance. This is reflected in a number of studies that investigate the relationship of corporate investment to cash flow of individual firms.[1] A widely held belief is that the cash flow available to a firm is the principal determinant of its real investments. The amount of internal funds and the problems associated with obtaining additional external funds primarily affect these investments. The traditional view put forward by Fazzari, Hubbard and Petersen (1988) suggests that investments undertaken by firms facing severe financing constraints are more sensitive to its cash flows. Several papers subsequently support their argument. However, studies like Kaplan and Zingales (1997) and Cleary (1999) find evidence to the contrary: firms that are least financially constrained exhibit greater investment – cash flow sensitivity.

The source of this contradictory finding lies in the disagreement in identifying appropriate factors to segregate more financially constrained firms from less constrained ones (Moyen, 2004). The factors largely used in prior studies (e.g. dividend payout, debt financing, financial distress, firm size) are endogenous in the sense that these are not independently determined. Moreover, these factors are time-variant. A company identified as financially constrained in one year may not remain constrained in the following year.

These problems do not arise if one uses exogenous firm-characteristics. One such characteristic is the organizational structure of a firm: whether it is affiliated to a

business group or not. Usually, firms are not free to choose joining a particular business group. In addition, a firm's group-affiliation does not change over time. Hoshi, Kashyap and Scharfstein (1991) reports that membership in the six largest Japanese groups has been stable for over three decades. Group-affiliated firms are widely believed to have more access to funds relative to independent firms because of their ability to use internal capital market benefits and to tap more external financial resources. If a firm's financial constraint status really affects its investment – cash flow sensitivity as advocated by the traditional literature, then business group firms should exhibit significantly lower sensitivity than that of stand-alone firms. The purpose of our study is to examine this issue by using detailed data on a large sample of Indian group-affiliated firms and independent firms.

Although this is not the first study on business groups, our analysis fills an important gap in the literature. Hoshi, Kashyap and Scharfstein (1991) and Shin and Park (1999) earlier examine Japanese and Korean business groups. Interestingly, these two studies find dissimilar results: Japanese business group firms exhibit a lower investment - cash flow sensitivity while there is no relationship between cash flow and investment among group-affiliated firms in Korea. This contradictory finding could be attributed to unique characteristics of business groups of these two countries and/or lack of robustness checks with alternative empirical specifications.

Our study provides evidence on Indian business groups which possess several features that yield a more reliable empirical analysis. For example, it is possible to identify business group affiliation in India with a high level of accuracy. This information is publicly disclosed in annual reports and/or filings with regulatory

authorities.[2] Furthermore, we consider firms that are a member of only one business group and that did not change their group affiliation over time. Indian business groups are also not centered on a financial intermediary and do not have close banking ties, as is the case for business groups in Japan. Finally, the group firms analyzed in this study are representative of all types of business groups rather than being restricted to a few large groups like Big-6 *Keiretsus* in Japan and Top-30 *Chaebols* in Korea. All these characteristics of Indian business group firms and the availability of a relatively large sample of both group and non-group firms enable us to undertake a more appropriate analysis of investment – cash flow sensitivity and financing constraints.

In addition to the analysis of business group firms, our study contributes to the literature by making a thorough investigation of the interactions between numerous firm characteristics and group-affiliation. Prior studies have used different firm characteristics in categorizing firms' degree of financial constraints. However, the impact of these characteristics on the investment – cash flow sensitivity of group-affiliated firms remains largely unexplored. Moreover, an in-depth investigation of the role of ownership structure in business groups has not been previously undertaken. Therefore, we examine the role played by size, age, leverage and ownership in influencing the investment – cash flow sensitivity group-affiliated firms. We conduct all these analyses using robust econometric approaches: estimating by means of ordinary least squares and two-stage least squares techniques both the Q and the Euler equation models of investments.

The results of this study can be summarized as follows. We find a strong investment – cash flow sensitivity for both group-affiliated and independent firms.

However, we do not observe any significant difference in the sensitivity between these two categories of firms. The result is robust to different regression specifications and estimation techniques. If investment – cash flow sensitivity were a good indicator of a firm's financing constraint, then group-affiliated firms should have exhibited significantly lower sensitivity. But, there is no such evidence from Indian group-affiliated firms. To the extent that Hoshi, Kashyap and Scharfstein (1991) and Shin and Park (1999) report a significantly lower or no sensitivity for Japanese and Korean business groups, our findings provide new evidence.[3]

One can argue that the differences in various firm-specific characteristics can significantly influence our findings. Therefore, we undertake a detailed examination of these features. A priori belief based on the traditional literature suggests that firms that are both large *and* affiliated to a business group should be *least* financially constrained, and should depict a lower investment – cash flow sensitivity. Our analysis shows no support for this argument. We observe that investments are more sensitive to cash flows for larger group-affiliated firms while the opposite is true for larger independent firms. Younger firms are characterized by greater information asymmetry and financial constraints relative to older firms. If investment – cash flow sensitivity were a useful measure of financing constraints, then younger firms should have exhibited significantly higher sensitivity. But, no such relationship is observed. As for the influence of leverage, the traditional literature predicts that firms that are independent *and* highly levered should face relatively higher financing constraints, and therefore, a higher investment - cash flow sensitivity compared to group-affiliated firms. We find that highly levered firms depict no difference in investment - cash flow sensitivity.

Finally, we examine the impact of ownership structure on the investment – cash flow relationship. Firms with large block holdings facilitate a greater alignment of inside and outside shareholder interests that leads to a reduction in information asymmetry and managerial discretion. This should result in a lower investment – cash flow sensitivity. Our results indicate that larger ownership holdings - corporate, institutional or insider - do not reduce the investment – cash flow sensitivity of group-affiliated firms. For independent firms, institutional and insider shareholdings have no impact, whereas higher corporate ownership is associated with even a higher investment – cash flow sensitivity. These findings are once again contrary to expectation based on the traditional perspective. If investment – cash flow sensitivity were a good indicator of financial constraints, all these analyses should not have yielded such contradictory results. Overall, the evidence presented in this study casts serious doubt on the reliability of using investment – cash flow sensitivity as a good measure of financing constraints of firms.

The rest of the article is organized in the following manner. The literature on the investment - cash flow relationship with a special emphasis on business groups is briefly discussed in Section 2. In Section 3 we present the methodology used in examining the relationship. A description of the data used in this study is presented in Section 4. The empirical results are reported and discussed in Section 5. Some concluding remarks are made in Section 6.

2. Literature

The phenomenon of business groups provides an interesting and unique ground to analyze the investment – cash flow relationship of firms. Business groups are usually a collection of many independent firms bound together with common ties and formal and informal relationships. Although a business group functions as a single and informal organization, each of the firms under its control is a separate legal entity. Most of these firms have well-defined production facilities and are listed on a stock exchange.

Firms affiliated with business groups possess several advantages vis à vis independent firms. Investments of group firms can take place without severe financial constraints because business groups enable the formation of an internal capital market that supplements the capital-allocation function of the external capital market. Group-affiliated firms are also expected to cope better with asymmetric information and contract enforcement problems present in the external capital market. The wedge between internal and external costs of funds is reduced as a result of business group formation. The fact that individual firms may also rely on the aggregate financial resources of the whole group is likely to improve their access to external funds. Taken together, all these advantages of being affiliated to a business group result in a less financing constraint for group-affiliated firms compared to independent firms.[4]

A large body of literature investigates the investment – cash flow relationship using data from different countries. Many of these focus on developed economies (for example, Vogt, 1994; Kadapakkam et al., 1998; Goergen and Renneboog, 2001;

Degryse and de Jong, 2005), while some others relate to emerging economies (Laeven, 2003). All these studies provide evidence of a firm's investments being highly related to its cash flows. A few papers also analyze the investment – cash flow relationship for business groups, but obtain dissimilar findings. Hoshi, Kashyap and Scharfstein (1991) find that Japanese companies that are affiliated with Keiretsu and have a close link with a main bank exhibit lower investment – cash flow sensitivity. However, Shin and Park (1999) observe no relationship between cash flow and investment for Korean Chaebol firms. Both studies document a significant positive relationship for non-group companies, and therefore, infer that unaffiliated firms face higher financial constraints in their investment decisions. Deloof (1998) and Perotti and Gelfer (2001) analyze the presence of business groups in two European countries: Belgium and Russia, respectively. Although Deloof (1998) uses a small sample of private firms in Belgium and faces problems in clearly distinguishing independent firms, he finds that investments of group-affiliated firms are not related to their cash flows. On the other hand, Perotti and Gelfer (2001) analyze single year data from a small sample of Russian firms and observe cash flows to be a significant determinant of investment for both industrial group firms and independent firms. Overall, these studies do not provide a clear-cut picture on the relationship between investment – cash flow sensitivity and financing constraints of business group firms.

Almost all studies mentioned above accept the stance put forward by Fazzari et al. (1988) to use investment – cash flow sensitivity in gauging a firm's financial constraint status. These studies claim that firms with more constraints exhibit a larger-than-average investment – cash flow sensitivity. However, several recent studies dispute this interpretation. Kaplan and Zingales (1997) show that the less financially

constrained firms also exhibit a significantly higher sensitivity than firms that are more constrained. Cleary (1999) also observes that investments of firms with high creditworthiness are significantly more sensitive to internal funds than firms that are less creditworthy. Kadapakkam et al. (1998) analyze six OECD countries and document that smaller firms that are expected to have more financing constraints show lesser investment – cash flow sensitivity compared to larger firms. Finally, Allayanis and Mozumdar (2004) document that investment – cash flow sensitivity of firms with severe financial constraints is not different from firms having less financial constraints.

Several recent studies also question the relevance of investment – cash flow sensitivity as an indicator of financial constraints. Gomes (2001) and Alti (2003) argue that firms facing financing constraints need not exhibit significant investment – cash flow sensitivities. Erickson and Whited (2000) use an advanced estimation technique like measurement error consistent generalized method of moments and find that the significant cash flow coefficients reported by earlier studies need not represent evidence of financing constraints. As a consequence of these criticisms, Almeida, Campello and Weisbach (2004) propose to use a new measure like the cash - cash flow sensitivity rather than the investment – cash flow sensitivity to test the importance of firm's financial constraints.

3. Methodology

The most popular approaches to test the investment – cash flow relationship involve examining two types of investment models: the Q model and the Euler

equation model. Since each of these models has its own strengths and weaknesses and is widely employed in previous studies, we use both models to estimate the empirical results and to ensure that our results are not due to estimation bias. According to the Q model, a firm's investments are mainly determined by expectations of future profit opportunities, usually estimated by the ratio of the market value of assets to its replacement value. The model adjusted to include the availability of internal funds as an additional determinant of investment can be written as follows:

$$\left(\frac{I}{K}\right)_{it} = \beta_o + \beta_1 Q_{it} + \beta_2 \left(\frac{CF}{K}\right)_{it} + \varepsilon_{it}\,, \tag{1}$$

where I denotes the investment in fixed assets; K denotes the capital stock at the beginning of the period; Q is the ratio of the market value of capital to its replacement value; CF stands for the cash flows; i and t denote the firm and time period, respectively; and ε is the error term.[5]

There are studies that divide the sample of firms based on a firm characteristic and then examine if the cash flow coefficient is different across the groups of firms. An equivalent and more direct approach is to estimate the model for the entire sample and interact the cash flow variable with a dummy variable representing the same characteristic. This direct approach is used throughout the study.[6] The specific regression specification we use in the empirical analysis is the following:

$$\left(\frac{I}{K}\right)_{it} = \beta_o + \beta_1 Q_{it} + \beta_2 \left(\frac{CF}{K}\right)_{it} + \beta_3 \left(\frac{CF}{K}\right)_{it} * Group + \beta_4 Group + \delta_i X_{it} + \varepsilon_{it}\,. \tag{2}$$

In this equation, β_1 is expected to be positive, because an increase in firm's future profitability should lead to an increase in firm's investment. If higher cash flows are a significant determinant of higher investments, then the coefficient β_2 should be positive. With *Group* as a dummy variable equal to 1 for group-affiliated firms, the traditional view is that the investment – cash flow sensitivity is expected to be smaller for less financially constrained firms. Therefore, the regression coefficient β_3 capturing the influence of group-affiliation on the sensitivity of investment to cash flow should be negative. In equation (2), we also add a few control variables (e.g. size, age, industry) denoted by X_{it}.

The Q model has the advantage that it uses information from the capital market thus allowing direct measurement of expected value of future profitability. The results of the Q model are also more informative. On the other hand, stock market prices can be inefficient, the replacement value of all assets can be difficult to measure, and the commonly used average Q can be an imprecise proxy for the value of an additional unit of new capital (marginal Q). The main alternative to the Q model is the Euler equation investment model. The model exploits the relationship between investments in successive time periods and has the advantage that it does not require explicit use of future values. According to the Euler equation model, a firm's current investments are determined by its total sales, cash flows, past investments and total debt. The model yields the following empirical specification:[7]

$$\left(\frac{I}{K}\right)_{it} = \beta_0 + \beta_1\left(\frac{S}{K}\right)_{i,t-1} + \beta_2\left(\frac{CF}{K}\right)_{i,t-1} + \beta_3\left(\frac{I}{K}\right)_{i,t-1} + \beta_4\left(\frac{I}{K}\right)^2_{i,t-1} + \beta_5\left(\frac{D}{K}\right)^2_{i,t-1} + \varepsilon_{it}, \tag{3}$$

where S and D represent total sales and total debt, respectively, and all other variables are as defined earlier. The explicit regression specification we estimate to test the differential effect of business group firms is the following:

$$\left(\frac{I}{K}\right)_{it} = \beta_0 + \beta_1\left(\frac{S}{K}\right)_{i,t-1} + \beta_2\left(\frac{CF}{K}\right)_{i,t-1} + \beta_3\left(\frac{CF}{K}\right)_{i,t-1} * Group + \beta_4 * Group + \beta_5\left(\frac{I}{K}\right)_{i,t-1} + \beta_6\left(\frac{I}{K}\right)^2_{i,t-1} + \beta_7\left(\frac{D}{K}\right)^2_{i,t-1} + \delta_i X_{it} + \varepsilon_{it}. \quad (4)$$

In this equation, the coefficient β_2 reflects the investment – cash flow relationship and is expected to be positive. According to the traditional view, the less financially constrained group-affiliated firms are expected to show a lower investment – cash flow sensitivity relative to independent firms. In that case, the regression coefficient β_3 should be negative.

Both Q and Euler equation models are estimated using the ordinary least squares method. Since we wanted to ensure that our results are free from any estimation-bias, we also use two-stage least squares estimation procedure. Similar to prior studies, we use lagged values of current period regressors as instruments.

4. Data

The data come from the database called “Capitaline 2000” which contains balance sheet, income statement and ownership information for a large number of Indian firms listed on the Bombay Stock Exchange. The sample period covers the fiscal years ending 1995-2000. We select those firms for which complete data are

available for all six years. Similar to Cleary (1999), we eliminate firms undergoing restructuring and/or bankruptcy by including firms with positive values of total assets and total sales. Our sample consists of a balanced panel of 339 firms. The sample firms are distributed across several industries, the most important of which are chemicals, construction, metal, transport, and trade and services.

The database clearly identifies firms affiliated to a business group. The identification of business groups in India is relatively easy because firms are usually members of only one group. All firms in our sample have been affiliated with a group for many years. There is no evidence of any change in group-membership over time. Whether a firm is affiliated to a group or not is determined using a variety of sources like public announcements made by individual corporations and groups, and regulatory filings.[8] Our sample comprises of 141 (42%) non-group firms and 198 (58%) group firms (a total of 2034 firm-year observations).

We collect data on various firm-specific variables. The precise definition of all variables is presented in the appendix. In order to eliminate the influence of extreme observations, we winsorize the data following the procedure adopted by Cleary (1999). The following rules are applied: (i) assign a value of 5 (-5) if cash flow/capital ratio is greater (lower) than 5 (-5); (ii) assign a value of 2 if investment/capital ratio is greater than 2; (iii) assign a value of 10 if Q is greater than 10; (iv) assign a value of 5 if debt/capital ratio is greater than 5; (v) assign a value of 15 if sales/capital ratio is greater than 15.

We also collect data on the ownership structure of firms. Three different ownership variables are analyzed: the percentage of shares held by insiders (directors and family members), financial institutions and non-financial corporations. The ownership data are available for one year and are assumed to remain same for the sample period. In the light of sporadic large-scale ownership transfers in India, any potential error in our results will be negligible.

5. Empirical Results

The descriptive statistics of different variables are presented in Table 1. Since we want to contrast the investment – cash flow relationship of group and non-group firms, we divide the full sample according to group affiliation. The table presents mean, median and standard deviations of each variable for both categories of firms. Several interesting results emerge.

Looking first at the investment (I/K) and cash flow (CF/K) variables, we find that there are almost no remarkable differences between group and non-group firms. The mean investment-to-capital ratio is about 18% for both group and non-group firms, whereas the median values are 11.4% and 9.5%, respectively. The mean and median cash flow-to-capital ratios of group-affiliated firms are 36.8% and 27.3%, respectively. They are insignificantly different from those of stand-alone firms, which are 40.9% and 29.5%, respectively.

We find that the mean and median Q ratios of group firms are larger than those of stand-alone firms. The mean (median) Q ratios of group and non-group firms

are 1.06 (0.78) and 0.82 (0.73), respectively. Focusing on the size of firms, we observe that group firms are much larger than non-group firms. The mean (median) total assets (TA) of group firms is 752 (173) millions Rupees compared to 134 (43) millions of non-group firms. The larger size of group firms is also observed when we look at the total sales (TS) figures. The differences in mean and median sales of group and non-group firms are statistically significant. The mean leverage (D/K) of group-affiliated firms is significantly lower than that of independent firms, whereas the median values are not different. Group-affiliated firms are, on average, older than independent firms. The mean age of group-firms is 31 years compared to 22 years of non-group firms.

Finally, Table 1 provides descriptive statistics on equity ownership of firms. We find that there are statistically significant differences in the ownership structure between group and non-group firms. The mean percentage of shares held by other companies in group-affiliated firms is 38% which is larger than that of stand-alone firms (24%). Similarly, the mean percentage of shares held by financial institutions in affiliated firms is 12% which is larger than that of independent firms (6%). On the other hand, the average insider ownership stake is higher in non-group firms (24% for stand-alone companies versus 7% for group affiliates).

The investment – cash flow relationship of group and non-group firms is estimated using several alternative model specifications. Table 2 displays the regression results estimated from several specifications of the Q model in equation (2). Panel A reports the results of all model specifications using the ordinary least squares estimation method (OLS), while Panel B shows the results of same

specifications using the two-stage least squares method (2SLS). All models use log of size and log of age as control variables. We also present results with and without time and industry dummies. In order to test whether the phenomenon of group-affiliation affects investments – cash flow relationship, we interact the cash flow variable with a group affiliation dummy variable.

Panel A results indicate that there is a positive and statistically significant relationship between investment and Q. All model specifications show almost the same magnitude of the estimated coefficient. The explanatory power of regressions is not low (varying from 13% to 17%) and consistent with prior studies. Turning to the cash flow variable, we observe that the estimated coefficient is positive and statistically significant in each model specification. It indicates that cash flows are strongly related to investments for all firms. We also observe that the estimated cash flow coefficient is not significantly different between group-affiliated and independent firms. The interaction coefficients of cash flow and group dummy variable in models (2) and (4) are statistically insignificant.[9]

Besides the OLS technique, we estimate the same specifications using the 2SLS technique. The results are presented in Panel B of Table 2. As before, the coefficients of Q and cash flow are found to be positive and statistically significant. We observe that the coefficients of the cash flow term interacting with business group dummy in models (6) and (8) are positive and statistically significant. This is opposite of that attributed to it by the traditionalists. If investment – cash flow sensitivity were a good measure of financing constraints, then group-affiliated firms should have depicted significantly lower sensitivity.

We also assess the robustness of our results by estimating the Euler model of investment. The results are presented in Table 3. Once again, the cash-flow coefficients are positive and statistically significant, but the group interaction terms are statistically insignificant. This is inconsistent with the claim that firms belonging to business groups should depict a lower investment – cash flow relationship because these firms experience lower financing constraints relative to independent firms.

We make further sensitivity checks of our results. One can argue that the observed strong investment – cash flow sensitivity of group-affiliated firms can be attributed to overinvestments made by group firms with poor growth prospects (Hoshi et al., 1991). To examine this, we follow prior studies in using Q as a proxy for a firm's growth prospects and split the group-affiliated sample into high Q and low Q firms based on the median value. For overinvestment to be a reason behind higher sensitivity of group-affiliated firms, one expects cash flows of group-firms with meager growth prospects (low Q) should be more sensitive to their investments than the cash flows of group-firms with huge growth prospects (high Q). The results of the analysis are presented in Table 4.[10] The OLS results indicate that the investment - cash flow sensitivity of group-affiliated firms with poor growth prospects are statistically indistinguishable from that of firms with high growth prospects. The 2SLS results indicate even significantly higher cash flow sensitivity for group-affiliated high Q firms. This is contrary to the expectation if overinvestments were driving our results.[11]

Allayannis and Mozumdar (2004) argue that the inclusion of negative cash flow observations (which are essentially firms in financial distress) in a sample could

significantly influence investment - cash flow sensitivities. Cash flows of firms with weaker financial positions can be less sensitive to investment. In order to examine the possibility that this phenomenon could influence our findings, we re-estimate the results using various OLS and 2SLS regression specifications after eliminating all negative cash flow observations (which constitute 6.7% of the sample). These results show similar sensitivities among group-affiliated and independent firms, and hence, are not reported.

The use of different specifications and methodologies yield very similar results. We find no support for the claim that the investment – cash flow sensitivity for group-affiliated firms is lower than for unaffiliated firms. Since group firms are widely believed to have relatively easier access to more financial resources than non-group firms, an implication of our result is that the investment – cash flow sensitivity cannot be used as a reliable measure for firm's financing constraints.

The influence of firm characteristics

The descriptive statistics presented in Table 1 show that there are significant differences in firm characteristics such as size, age, leverage and ownership structure between group-affiliated and stand-alone firms. This leads to the question whether our finding of no difference in investment – cash flow relationship is affected by these characteristics as well. Therefore, to investigate further whether the investments of group-affiliated firms respond differently to cash flows than the investments of stand-alone firms, we perform additional analyses by disaggregating the total sample into sub-samples.

Size

The size of a firm may influence the investment – cash flow relationship. Larger firms are in general believed to face less capital market imperfections because lenders of funds have lower screening and monitoring costs. These firms are therefore expected to exhibit lower investment – cash flow sensitivity. In Table 5, we present the results when the total sample is divided according to firm size. Since group-affiliated firms are, on average, several times larger than independent firms, it is important for the empirical analysis to appropriately control for it. We classify group and non-group firms as large when their total assets are greater their corresponding median values. We distinguish the investment – cash flow sensitivity between affiliated and independent firms by adding an interactive group dummy variable. Our results show that in the large firm sub-sample, the coefficient of cash flow and group dummy interaction is positive (0.097) and statistically significant (t = 2.378). It indicates that the investment – cash flow sensitivity for large group-affiliated firms is significantly higher than that for large non-group firms. If investment – cash flow sensitivity were a good measure of financing constraints, then this finding is contrary to the expectation. This is because both large *and* group-affiliated firms are deemed a priori to have less financing constraints, and therefore, should exhibit the *least* investment – cash flow sensitivity.

We also analyze where the total sample is divided into group-affiliated firms and stand-alone firms, and the coefficient of the cash flow term is interacted with a zero/one size dummy variable. Size Dummy is equal to one if the total assets of a

group (non-group) firm is higher than the median, and zero otherwise. These results are presented in the last two columns of Table 5. We find that the investment - cash flow sensitivity for large group-affiliated firms is positive (0.098) and statistically significant (t = 1.735). It indicates that investment is more sensitive to cash flows of larger group companies and less sensitive for smaller group companies. This contradiction is, once again, supportive of the claim that the investment – cash flow relationship is not a useful measure of a firm's financing constraints.[12]

Age

Next, we test whether the differences in age affect the investment – cash flow sensitivity of group and non-group firms. The age of firms may play a role on the severity of financial constraints. It is generally believed that older firms face relatively less constraints than younger firms because these have better credit records and better information availability. On the other hand, younger firms are riskier, more opaque and less likely to obtain external financing. The empirical results are presented in Table 6. The sample is split into group and non-group firms. In each regression, in addition to the earlier used explanatory variables, we interact cash flow variable with a dummy that identifies older or younger firms. As before, our results show that the cash flow variable has a positive and significant relationship with investments for both group-affiliated and unaffiliated firms. But, we find that age does not influence this relationship among group and non-group firms. The interaction coefficients are statistically insignificant. It indicates that neither young nor old firms exhibit a different sensitivity of investments to cash flows.

Leverage

The amount of leverage can also produce a differential impact. Companies with relatively high leverage are expected to face more difficulty in obtaining additional external funds from the capital market, and therefore, are more financially constrained than firms with low leverage. The results presented in Table 6 show that for group-affiliated firms, the investment – cash flow sensitivity is not different for high leveraged firms in comparison to low leveraged firms. Similarly, the leverage interaction variable is statistically insignificant for independent firms. If firms with high leverage are expected to face more difficulty in obtaining additional funds, then the traditionalist expects, at least in case of independent firms, a high investment – cash flow sensitivity. Our finding of no such difference is remarkable because independent firms do not have access to internal capital market, a feature group-affiliated firms do possess. This result further questions the validity of using investment – cash flow sensitivity as a measure of firm's financial constraints.

Ownership

Ownership structure can affect investment – cash flow sensitivity through shareholders' monitoring qualities and the possibility of investing additional resources into the firm. Active monitoring by large shareholders is expected to reduce managerial discretion and information asymmetry thereby lowering firm's investment – cash flow sensitivity. At the same time, large shareholders can help in reducing financing constraints. Since these features can vary according to different types of shareholders, it is necessary to examine their influence separately. We form three sub-

samples: corporate ownership, institutional ownership and insider ownership. As before, the regression estimations are done for group and non-group firms separately, and an interaction term is used to reflect the ownership of a specific category of shareholders. The results are presented in Table 7.

In line with our earlier results, we continue to observe that the investment – cash flow sensitivity is positive and statistically significant for both group and non-group firms. But, there is a differential impact of corporate ownership. Corporate ownership does not affect the investment – cash flow sensitivity among group-affiliated firms. On the other hand, it has a significant positive impact among independent firms. The interaction coefficient for corporate ownership dummy is positive (0.112) and statistically significant (t = 2.374). Thus, for unaffiliated firms with high corporate ownership, the cash flow sensitivity is significantly larger than for those with low corporate ownership. If investment – cash flow sensitivity were a good measure of financing constraints, then these firms with higher corporate ownership should have depicted significantly lower sensitivity. Our results fail to offer any support for this prediction.

With regard to institutional ownership, we find that it does not significantly influence the investment - cash flow sensitivity of group-affiliated as well as unaffiliated firms. The presence of large institutional shareholders is expected to reduce managerial discretion of overinvestments while making it easier for firms to have more funds available. Had investment – cash flow sensitivity been a valid measure of financial constraints, then firms with larger institutional ownerships would have exhibited a significantly lower sensitivity. Similarly, the empirical results

presented in Table 7 indicate no significant difference in the influence of insider ownership in the investment – cash flow sensitivity among group-affiliated and independent firms. These results are again not in line with the traditional expectation of a lower investment – cash flow sensitivity for firms with higher levels of insider shareholdings.

6. Summary and Conclusions

This study examines the reliability of using the investment – cash flow sensitivity as a good measure of financing constraints by comparing business group firms with independent firms. It focuses on Indian business groups because these are characterized by some important features like accurate identification of group affiliation, absence of in-house banks, and stability of affiliation to one specific business group allowing us to perform a reliable empirical analysis. Two different frameworks are widely used to test the investment – cash flow relationship: the Q model and the Euler equation model. Since each of these models has different strengths and weaknesses, we use both to estimate the empirical results. We also perform robustness checks using both OLS and 2SLS estimation techniques. We estimate the results using a panel data set of 339 firms of the period 1995 – 2000.

Our results show that there is a positive and statistically significant investment – cash flow sensitivity for all firms, but no significant difference in the sensitivity between group-affiliates and independent firms. A few authors like Hoshi et al. (1991) and Shin and Park (1999) argue that group membership helps in relieving financial constraints, and therefore, should exhibit lower investment – cash flow sensitivity. On

the other hand, independent firms are relatively more financially constrained, and thus, expected to have larger cash flow sensitivity. The results of our study lend no support to the findings of these studies.

In order to probe these findings further and to check the robustness of our results, we examine the impact of several firm specific characteristics such as size, age, leverage and ownership by forming sub-samples and using interactive dummies. According to the traditional literature, larger group firms are in general expected to show the least investment – cash flow sensitivity. These firms face less capital market imperfections as lenders of funds have lower screening and monitoring costs. In addition, these firms are able to reap the benefits of an internal capital market. Our results indicate that the investment – cash flow sensitivity is high for large business group firms whereas it is low for large non-group firms. The finding is inconsistent with investment – cash flow sensitivity being a reliable measure of financing constraints.

We find that age does not influence the relationship among both group and non-group firms: young and old firms exhibit no difference in their investment – cash flow sensitivity. This result is also surprising and contrary to the traditional expectation as older firms arguably have better credit records and are characterized by lower information asymmetry problems that reduce the wedge between internal and external funds and should result in lower investment - cash flow sensitivity.

Another notable finding is that leverage has no significant differential impact: for both group and non-group firms, the investment – cash flow sensitivity for high-

levered firms is not different from that of low-levered firms. If investment – cash flow sensitivity were a good indicator of financial constraints, then one should have at least observed a significantly higher sensitivity among highly levered independent firms which should be more handicapped in their ability to obtain funds than corresponding group-affiliated firms. Apart from the enhanced costs and difficulties in obtaining resources from the external market, these firms do not have access to an internal capital market to alleviate their liquidity constraints.

Finally, we examine if the investment – cash flow sensitivity is influenced by corporate governance characteristic like ownership structure. We observe that differences in corporate ownership do not affect the investment – cash flow sensitivity of group-affiliated firms. On the other hand, large corporate ownership is associated with a significantly higher sensitivity among independent firms. This is contrary to the traditional expectation, as high corporate ownership which is assumed to be associated with greater alignment of inside and outside shareholder interests and lower agency costs should have yielded a reduction in investment – cash flow sensitivity.

The impact of institutional shareholdings is insignificant and not in line with expectation. One would anticipate a reduction in investment - cash flow sensitivity among firms with high institutional ownership. This is because these shareholders have dual debt and equity holdings and are expected to face lower moral hazard problems thereby leading to lower financial constraints of firms. As for the insider ownership, it is expected that high insider holdings should result in greater alignment of interests and reduction of agency problems and, therefore, reduced investment -

cash flow sensitivity. However, for both group-affiliated and unaffiliated firms, we find insignificant results. These results once again demonstrate the inability of investment – cash flow sensitivity to be a good indicator of a firm's financial constraints.

Cumulatively, the results of this study show that investment of firms that are *a priori* expected to be more financially constrained are not necessarily more sensitive to their cash flows. The use of investment functions using alternative models based on the Q ratio and the Euler equation, and alternative estimation techniques like OLS and 2SLS yields consistent results, and thereby strengthens the paper's conclusions. Our results lend strong empirical support for the doubts raised by earlier studies in interpreting investment – cash flow sensitivity as a reliable measure of a firm's financing constraint.

Appendix: Definition of variables

I	Investment in fixed assets (= purchase of fixed assets)
K	Book value of fixed assets
CF	Earnings before interest, taxes, depreciation and amortization
Q	(Market value of equity + Book value of total debt) / Book value of total assets
TA	Book value of total assets
TS	Total sales
D	Book value of total debt
AGE	Number of years since incorporation
COR	Percentage of shares held by non-financial corporations
FIN	Percentage of shares held by financial institutions
INS	Percentage of shares held by directors and family

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Footnotes

[1] For a survey, see Hubbard (1998) and Lensink, Bo and Sterken (2001).

[2] Hoshi, Kashyap and Scharfstein (1991) discuss the problems one faces in accurately determining group membership of Japanese firms.

[3] It is important to note here that our result of less constrained firms not exhibiting lower investment – cash flow sensitivity is not a characteristic of Indian business groups alone. Analyzing recent data of US firms, Allayannis and Mozumdar (2004) do not observe any significant difference in the investment - cash flow sensitivity between constrained and unconstrained firms.

[4] Under certain circumstances, group-affiliated firms may also face some financing constraints. A financial intermediary, if present, can use its relationship to exploit the firm for its own advantage thereby increasing the cost of external finance. The controlling owners may engage in activities to redirect funds for their own benefits and to invest in other affiliated firms. The magnitude of such constraint, however, is not expected to outweigh many other benefits of group-affiliation.

[5] For the derivation of the Q model, see Hubbard (1998).

[6] We did examine the specifications using group and non-group samples separately and found similar results.

[7] For the derivation of the Euler equation, see Bond and Meghir (1994).

[8] A random check of group-affiliation of many firms conducted by us reveals that the classification of the database is accurate.

[9] Our findings are similar to those obtained by Khanna and Palepu (2000). The main focus of their study was to examine the relative profitability of Indian business groups. They just mention finding a strong investment – cash flow sensitivity for both group and non-group firms, but do not provide any numerical result.

[10] For comparison purpose, we present the results of non-group firms as well.

[11] The results are qualitatively similar when we use Q >1 as the partitioning criteria.

[12] As before, we have performed estimations using the 2SLS technique and also the Euler equation. These estimations yielded similar results and, for that reason, we have chosen not to report them here.

Table 1. Summary statistics comparing group and non-group firms

The table presents summary statistics of variables calculated over the fiscal years ending 1997-2000. The sample contains 198 group firms (792 firm-year observations) and 141 non-group firms (564 firm-year observations). Investment (I), capital stock (K), cash flow (CF), total assets (TA), total sales (TS), total debt (D) are expressed in million Indian Rupees. Q is the ratio of market to book value of total assets. AGE is expressed in years since incorporation. Insider (INS) is the percentage of shares held by directors and family. Financial (FIN) is the percentage of shares held by domestic financial institutions. Corporation (COR) is the percentage of shares held by domestic non-financial corporations. All variables are defined in the appendix. The asterisks * and ** denote statistical significance of the difference between group and non-group firms at 10% and 5% level, respectively.

	Group			**Non-Group**		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
I/K	0.184	0.114**	0.221	0.179	0.095	0.247
CF/K	0.368	0.273	0.461	0.409	0.295	0.595
Q	1.057**	0.780**	1.042	0.819	0.734	0.539
TA	752**	173**	2100	134	43	612
TS	574**	192**	1283	158	57	628
TS/K	2.761**	2.000**	2.567	3.471	2.291	3.344
D/K	0.978*	0.840	0.679	1.054	0.821	0.885
AGE	31*	24	21.343	22	16	16.228
COR	0.378**	0.387**	0.186	0.240	0.195	0.194
FIN	0.117**	0.086**	0.107	0.061	0.023	0.086
INS	0.068**	0.014**	0.125	0.236	0.224	0.178

Table 2. Regression results for the Q Model

Panel A. OLS estimation

The table presents the regression results where the estimation method is the ordinary least squares (OLS). The dependent variable is the investment-to-capital ratio. Q is the ratio of the market value of total assets to book value of total assets. Cash flow is the cash flow-to-capital ratio. Group Dummy is an indicator variable that is equal to one if a firm belongs to a business group, and zero otherwise. Size is the natural logarithm of total assets. Age is the natural logarithm of years since incorporation. The heteroskedasticity and autocorrelation-corrected absolute t-values are mentioned in parentheses. The total number of firm-year observations is 1356. Statistical significance at the 10% and 5% levels is indicated in bold face and by * and **, respectively.

	Model (1)	Model (2)	Model (3)	Model (4)
Intercept	**0.093** **(3.814)**	**0.105** **(4.379)**	**0.141** **(4.296)**	**0.145** **(4.280)**
Q	**0.023** **(2.649)**	**0.022** **(2.418)**	**0.019** **(2.284)**	**0.018** **(2.134)**
Cash flow	**0.143** **(7.106)**	**0.113** **(3.840)**	**0.138** **(7.034)**	**0.115** **(3.970)**
Cash flow * Group Dummy		0.064 (1.636)		0.050 (1.258)
Group Dummy		**-0.036*** **(-1.897)**		**-0.038** **(-2.015)**
Size	**0.013** **(3.634)**	**0.016** **(3.886)**	**0.012** **(3.637)**	**0.016** **(3.948)**
Age	**-0.016** **(1.966)**	**-0.019** **(2.510)**	-0.012 (1.447)	**-0.014*** **(1.793)**
Time and Industry dummies	No	No	Yes	Yes
Adj. R^2	0.13	0.13	0.16	0.17

Panel B. 2SLS estimation

The table presents the regression results where the estimation method is two-stage least squares estimation (2SLS). The dependent variable is the investment-to-capital ratio of a firm. The variable Q is the ratio of the market value of total assets to book value of total assets. Cash flow is the cash flow-to-capital ratio. Group Dummy is an indicator variable that is equal to one if a firm belongs to a business group, and zero otherwise. Size is the natural logarithm of total assets. Age is the natural logarithm of years since incorporation. All regressions use previous year's variables as instruments. The heteroskedasticity and autocorrelation-corrected absolute t-values are mentioned in parentheses. The total number of firm-year observations is 1356. Statistical significance at the 10% and 5% levels is indicated in bold face and by * and **, respectively.

	Model (5)	Model (6)	Model (7)	Model (8)
Intercept	**0.062** **(2.370)**	**0.083**** **(3.036)**	**0.119**** **(3.672)**	**0.132**** **(3.823)**
Q	**0.043**** **(2.832)**	**0.034**** **(2.399)**	**0.030**** **(2.305)**	**0.028*** **(1.938)**
Cash flow	**0.166**** **(6.600)**	**0.118**** **(4.002)**	**0.157**** **(6.493)**	**0.117**** **(4.194)**
Cash flow * Group Dummy		**0.103**** **(2.126)**		**0.085*** **(1.805)**
Group Dummy		**-0.055**** **(2.842)**		**-0.053**** **(-2.790)**
Size	**0.011**** **(3.153)**	**0.010**** **(3.986)**	**0.011**** **(3.356)**	**0.017**** **(4.062)**
Age	-0.012 (1.553)	**-0.016**** **(2.208)**	-0.009 (1.123)	-0.013 (1.626)
Time and Industry dummies	No	No	Yes	Yes
Adj. R^2	0.12	0.12	0.16	0.16

Table 3. Regression results for the Euler equation

The table presents the regression results where the estimation methods are the ordinary least squares (OLS) and the two-stage least squares estimation (2SLS). The dependent variable is the investment-to-capital ratio of a firm. The variable sales (-1) is the one-period lagged sales-to-capital ratio. Cash flow (-1) is the one period lagged cash flow-to-capital ratio. Group Dummy is an indicator variable that is equal to one if a firm belongs to a business group, and zero otherwise. Investment (-1) is one-period lagged investment-to-capital ratio. Investment (-1) sq is the squared value one-period lagged investment. Leverage (-1) sq is the squared value of total debt divided by total assets lagged by one-period. Size is the natural logarithm of total assets. Age is the natural logarithm of years since incorporation. The 2SLS estimation uses previous year's values as instruments. The heteroskedasticity and autocorrelation-corrected absolute t-values are mentioned in parentheses. The total number of firm-year observations is 1356. Statistical significance at the 10% and 5% levels is indicated in bold face and by * and **, respectively.

	OLS	**2SLS**
Intercept	**0.102**** **(3.050)**	**0.133**** **(2.590)**
Sales (-1)	0.003 (0.826)	-0.003 (0.583)
Cash flow (-1)	**0.109**** **(3.048)**	**0.135**** **(2.593)**
Cash flow (-1) * Group Dummy	0.069 (1.630)	0.089 (1.330)
Group Dummy	**-0.037**** **(1.965)**	**-0.048*** **(1.660)**
Investment (-1)	**0.411**** **(6.278)**	0.586 (0.990)
Investment (-1) sq.	**-0.188**** **(3.913)**	-0.449 (0.674)
Leverage (-1) sq.	**-0.011**** **(3.019)**	-0.007 (1.177)
Size	**0.011**** **(2.462)**	0.010 (1.179)
Age	**-0.020**** **(2.419)**	**-0.023*** **(1.775)**
Time and Industry dummies	Yes	Yes
Adj. R^2	0.22	0.14

Table 4. Regression results examining overinvestment

The table presents the regression results where the estimation method is the ordinary least squares (OLS) and the two-stage least squares estimation (2SLS). The dependent variable is the investment-to-capital ratio. The variable Q is the ratio of the market value of total assets to book value of total assets. Cash flow is the cash flow-to-capital ratio. High Q is an indicator variable that is equal to one if the group or non-group firm's Q is greater than or equal to the corresponding medians, and zero otherwise. Size is the natural logarithm of total assets. Age is the natural logarithm of years since incorporation. The 2SLS estimations use previous year's variables as instruments. The heteroskedasticity and autocorrelation-corrected absolute t-values are mentioned in parentheses. Statistical significance at the 10% and 5% levels is indicated in bold face and by * and **, respectively.

	OLS		**2SLS**	
	Group	Non-group	Group	Non-group
Intercept	**0.182**** **(3.379)**	0.064 (1.210)	**0.159**** **(3.030)**	0.040 (0.742)
Q	0.004 (0.584)	0.055 (1.533)	-0.003 (0.176)	**0.105**** **(1.961)**
Cash flow	**0.156**** **(4.681)**	**0.110**** **(2.835)**	**0.181**** **(4.166)**	**0.152**** **(2.368)**
Cash flow * High Q	0.039 (0.396)	-0.003 (0.064)	**0.099**** **(2.022)**	-0.051 (0.731)
Size	**0.010**** **(1.994)**	**0.028**** **(2.887)**	**0.011**** **(2.467)**	**0.021**** **(2.101)**
Age	-0.013 (1.427)	**-0.026*** **(1.749)**	-0.016 (1.529)	-0.022 (1.547)
Time and Industry dummies	Yes	Yes	Yes	Yes
Adj. R^2	0.20	0.15	0.19	0.14
No. of observations	792	564	792	564

Table 5. Regression results for the size sub-samples

The table presents the ordinary least squares regression (OLS) results. The dependent variable is the investment-to-capital ratio of a firm. The size sub-samples are formed by using the median values of group and non-group firms. Large firms are those with total assets greater than or equal to sample median whereas small firms are those with total assets lower than sample median. Group Dummy is an indicator variable that is equal to one if a firm belongs to a business group, and zero otherwise. Size Dummy is an indicator variable that is equal to one if the size of group or non-group firm is larger than or equal to respective median values, and zero otherwise. The variable Q is the ratio of the market value of total assets to book value of total assets. Cash flow is the cash flow-to-capital ratio. Size is the natural logarithm of total assets. Age is the natural logarithm of years since incorporation. The heteroskedasticity and autocorrelation-corrected absolute t-values are mentioned in parentheses. Statistical significance at the 10% and 5% levels is indicated in bold face and by * and **, respectively.

	Large	**Small**	**Group**	**Non-group**
Intercept	**0.308**** **(4.452)**	0.061 (1.095)	**0.240**** **(4.197)**	-0.005 (0.081)
Q	**0.016*** **(1.777)**	**0.026*** **(1.402)**	0.005 (0.552)	0.040 (1.566)
Cash flow	**0.059**** **(2.798)**	**0.137**** **(3.427)**	**0.155**** **(5.213)**	**0.227**** **(5.193)**
Cash flow * Group Dummy	**0.097**** **(2.378)**	0.035 (0.650)		
Group Dummy	**-0.079**** **(2.750)**	-0.033 (1.453)		
Cash flow * Size Dummy			**0.098**** **(1.735)**	**-0.177**** **(3.750)**
Size Dummy			0.010 (0.457)	**0.062**** **(2.111)**
Size	-0.005 (0.871)	**0.027**** **(2.674)**	-0.001 (0.048)	**0.030**** **(2.457)**
Age	-0.019 (1.456)	-0.015 (1.371)	**-0.017*** **(1.814)**	-0.016 (1.147)
Time and Industry dummies	Yes	Yes	Yes	Yes
Adj. R^2	0.17	0.18	0.20	0.19
No. of observations	678	678	792	564

Table 6. Regression results for the age and leverage sub-samples

The table presents the ordinary least squares regression results (OLS). The dependent variable is the investment-to-capital ratio of a firm. The age and leverage sub-samples are formed by segregating these into group and non-group firms. The variable Q is the ratio of the market value of total assets to book value of total assets. Cash flow is the cash flow-to-capital ratio. Age Dummy and Leverage Dummy are indicator variables that are equal to one if the corresponding values are greater than or equal to the group and non-group medians, and zero otherwise. Size is the natural logarithm of total assets. Age is the natural logarithm of years since incorporation. The heteroskedasticity and autocorrelation-corrected absolute t-values are mentioned in parentheses. Statistical significance at the 10% and 5% levels is indicated in bold face and by * and **, respectively.

	Age		**Leverage**	
	Group	Non-group	Group	Non-group
Intercept	**0.186**** **(3.251)**	0.079 (1.340)	**0.172**** **(3.218)**	0.060 (1.105)
Q	0.010 (1.289)	0.055 (1.527)	**0.015**** **(2.134)**	0.048 (1.260)
Cash flow	**0.143**** **(4.940)**	**0.092**** **(3.058)**	**0.154**** **(5.361)**	**0.148**** **(4.063)**
Cash flow * Age Dummy	0.058 (1.024)	0.076 (1.540)		
Age Dummy	-0.024 (0.970)	-0.016 (0.468)		
Cash flow * Leverage Dummy			0.101 (0.196)	-0.054 (0.985)
Leverage Dummy			**0.082**** **(4.122)**	**0.064**** **(2.416)**
Size	**0.010**** **(2.061)**	**0.029**** **(2.966)**	0.006 (1.317)	**0.027**** **(2.660)**
Age	-0.011 (0.751)	-0.032 (1.468)	**-0.017*** **(1.803)**	**-0.031**** **(2.039)**
Time and Industry dummies	Yes	Yes	Yes	Yes
Adj. R^2	0.20	0.15	0.23	0.16
No. of observations	792	564	792	564

Table 7. Regression results for the ownership sub-samples

The table presents the ordinary least squares regression (OLS) results. The dependent variable is the investment-to-capital ratio of a firm. The ownership sub-samples are formed by segregating these into group and non-group firms. The variable Q is the ratio of the market value of total assets to book value of total assets. Cash flow is the cash flow-to-capital ratio. Ownership Dummy is an indicator variable that is equal to one if the corresponding ownership values are greater than or equal to the group or non-group sample median, and zero otherwise. Size is the natural logarithm of total assets. Age is the natural logarithm of years since incorporation. The heteroskedasticity and autocorrelation-corrected absolute t-values are mentioned in parentheses. Statistical significance at the 10% and 5% levels is indicated in bold face and by * and **, respectively.

	Corporate ownership		**Institutional ownership**		**Insider ownership**	
	Group	Non-group	Group	Non-group	Group	Non-group
Intercept	**0.171** **(3.286)**	0.067 (1.297)	**0.190** **(3.094)**	0.042 (0.813)	**0.151** **(2.715)**	0.057 (1.070)
Q	0.009 (1.251)	0.044 (1.443)	0.009 (1.236)	0.052 (1.561)	0.008 (1.216)	0.053 (1.540)
Cash flow	**0.173** **(4.315)**	**0.070** **(3.242)**	**0.166** **(5.215)**	**0.145** **(3.737)**	**0.200** **(5.032)**	**0.114** **(2.854)**
Cash flow * Ownership Dummy	-0.013 (0.216)	**0.112** **(2.374)**	0.007 (0.098)	-0.071 (1.478)	-0.046 (0.797)	-0.016 (0.342)
Ownership Dummy	0.019 (0.984)	-0.023 (1.090)	0.003 (0.142)	0.008 (0.290)	**0.041** **(1.984)**	0.015 (0.711)
Size	**0.010** **(2.130)**	**0.027** **(2.855)**	**0.008** **(1.483)**	**0.031** **(2.822)**	**0.011** **(2.203)**	**0.029** **(3.021)**
Age	-0.013 (1.385)	-0.021 (1.514)	-0.014 (1.367)	**-0.023** **(1.677)**	-0.013 (1.388)	**-0.026** **(1.767)**
Time and Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.20	0.17	0.20	0.16	0.20	0.15
No. of observations	792	564	792	564	792	564