INVESTMENT SPENDING IN THE NETHERLANDS: ASYMMETRIC INFORMATION OR MANAGERIAL DISCRETION?

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Abstract

This paper examines the relation between cash-flow availability and investment spending in the Netherlands. In particular, we are interested whether managerial discretion and/or asymmetric information underpin the positive relation between cash-flow and investment spending. This relation is significantly positive for both firms with low and high investment opportunities. It is however significantly larger for firms with low investment opportunities suggesting that the managerial-discretion problem is most important in the Dutch setting. Effective corporate-governance may reduce this agency problem. Specific to the Netherlands, firms with low shareholder influence posit a higher cash-flow-investment sensitivity. The relevance of asymmetric information is confirmed as smaller firms and firms from information-sensitive industries show a larger cash-flow-investment sensitivity.

1. Introduction

In capital markets without imperfections, no systematic relationship is predicted between cash-flow availability and investment expenditures. Investments should take place whenever they are expected to realise a positive net present value and should not necessarily be linked to cash-flow. The empirical literature starting with the seminal article of Fazzari, Hubbard and Petersen (1988), however, has reported a substantial positive influence of cash-flow on firms' investment spending. According to Myers and Majluf (1984), the theoretical underpinning of this empirical regularity is underinvestment. Financing constraints due to asymmetric-information problems in the issuance of equity cause the cash-flow-investment dependence. Stiglitz and Weiss (1981), and Greenwald, Stiglitz and Weiss (1984) obtain similar results for debt. More recently, Jensen's (1986) managerial-discretion problem is found to provide an alternative underpinning for the positive link between cash-flow and investment spending. The reason is that managers' utility is positively correlated with firm size since this increases their pay, status and power. Overinvestment results due to the availability of free cash-flow. Thus both the managerial-discretion problem and the asymmetric-information problem provide an explanation for the positive influence of cash-flow on firm's investment spending.

Asymmetric information intensifies financing constraints as in Myers and Majluf's (1984) problem. A number of empirical studies test for asymmetric-information problems. Building on Fazzari, Hubbard and Petersen (1988), these studies apply a sample split based on an approximation of asymmetric information. In line with theory, the results show that the impact of cash-flow on investment is larger for firms with higher information asymmetries (see e.g. Devereux and Schiantarelli (1990), Oliner and Rudebusch (1992), Schaller (1993), Gilchrist and Himmelberg (1995) and Kadapakkam, Kumar and Riddick (1998)). Thus, the intensity of asymmetric-information problems, and the resulting underinvestment, depends on certain firm characteristics, such as the information-sensitivity of the industry and the bank-firm relationships. Hoshi, Kashyap and Scharfstein (1991) introduce the overinvestment problem explicitly by distinguishing firms with low and high investment opportunities. This problem is expected to be less relevant for the firms with good prospects. Vogt (1994) adds to the literature by designing an empirical model that tests whether underinvestment or overinvestment is the predominant cause of cash-flow-investment sensitivities. Finally, the degree of Jensen's (1986)

managerial-discretion problem and the implied overinvestment hinges on corporate governance. Hadlock (1998) relates the overinvestment problem to governance as he introduces insider ownership as an explanatory variable for the cash-flow-investment sensitivity.

We investigate the relevance of the asymmetric-information problem vis-à-vis the managerial-discretion problem. The basis of our empirical investigation is a panel data set of Dutch non-financial firms. The Dutch setting allows us to identify which of the two problems−asymmetric information or managerial discretion−is driving the cash-flow-investment sensitivity. We expect that the managerial discretion problem is highly relevant in the Netherlands. This expectation arises because Dutch firms operate in an environment where corporate-governance mechanisms are weak, relative to those in the Anglo-Saxon system. In the Netherlands, firms are characterized by the presence of large blockholders, limited shareholder influence, a multitude of takeover defenses and multiple firm-bank relations. In addition, share ownership by insiders is relatively small in the exchange-listed firms. La Porta, Lopez-de-Silanes and Shleifer (1998) describe for 49 countries the level of shareholder-rights protection. On a scale from zero (no protection) to six (high protection), Dutch firms receive a score of two. This is very low in comparison with the score of five for firms in the US and UK. While the differences with Anglo-Saxon countries are clear-cut, characteristics of Dutch firms resemble aspects of firms in other continental-European countries. For example, in La Porta, Lopez-de-Silanes and Shleifer (1998), France and Germany also get low scores for shareholder protection (three and one, respectively). Becht and Mayer (2001) describe ownership structures in the Netherlands, six other continental-European countries, the UK and the US. Although distinct differences are observed, blockholdings are dominant in the continental-European countries and ownership is much more dispersed in the Anglo-Saxon countries. With respect to bank influence, the median voting power of banks in the seven continental-European countries is above 20%, and below 10% in the two Anglo-Saxon countries. Thus, Dutch firms have governance mechanisms that are not or hardly present in the Anglo-Saxon setting, but are found in many continental-European countries. Moreover, the sample of Dutch firms exhibits sufficient heterogeneity in these governance structures. This variability in the characteristics allows us to identify the influence of each of the governance mechanisms on

overinvestment as predicted in the managerial-discretion problem. However, it remains an empirical question to which extent alternative governance devices mitigate overinvestment.[1]

In this paper, we first discriminate empirically between the asymmetric-information problem and the managerial-discretion problem for Dutch firms. We approach this by considering the cash-flow-investment sensitivity of firms with and without good prospects (respectively, the asymmetric-information problem and the managerial-discretion problem). In particular, we allow for different levels of cash-flow-investment sensitivity in subsamples. For the firms with low investment opportunities we expect managerial discretion to be relevant, while asymmetric-information problems are expected to apply in firms with high investment opportunities. In addition to our subsamples, we allow for an interaction between investment opportunities and cash-flow within the two subsamples. That is, we permit to have varying degrees of asymmetric-information problems and managerial-discretion problems within groups of firms, having good and bad prospects respectively. Secondly, we investigate how information-sensitive characteristics shape the asymmetric-information problem and affect underinvestment. Similarly, we analyze how corporate governance alleviates or sharpens the managerial-discretion problem. We expect that effective corporate governance reduces overinvestment problems, i.e. lowers the magnitude of the cash-flow-investment relation.

Our analysis builds on Hoshi, Kashyap and Scharfstein (1991), who investigate a subsample of firms with investment opportunities above and below the median Tobin's Q ratio. We aim to disentangle the asymmetric-information and managerial-discretion problems by focussing on the differences between these subsamples. We also extend Vogt (1994), who assumes that in the full set of firms either the managerial-discretion or the asymmetric information problem is most relevant. He captures this by allowing for a linear interaction between investment opportunities and cash-flow. However, the degree of the asymmetric information and managerial discretion problem may differ within a subsample, i.e. firms with good or bad prospects. For instance, according to Myers and Majluf (1984), underinvestment increases in investment opportunities. This implies that the coefficient of the

[1] With respect to the asymmetric-information problem we do not expect strong differences between the Anglo-Saxon and the Dutch setting. However, two differences may be relevant. First, in the Netherlands, the accounting regulations are less strict, in comparison with rules in the US and UK. Second, although financial markets are well-developed in the Netherlands the public availability of firm-specific information in comparison with the US and UK is less. For example, the number of analysts and rating agencies that provide their opinions on firms is lower in

interaction of Tobin's Q and cash-flow may hinge on the level of Tobin's Q within the sample of firms with good prospects. We choose therefore to investigate the two approaches−subsamples distinguishing firms with good and bad prospects and interaction between investment opportunities and cash-flow−both separately and simultaneously. Moreover, while previous studies investigated a single characteristic (e.g. Hadlock (1998)), we investigate over ten firm characteristics that are expected to influence the cash-flow-investment sensitivity.

We find that cash-flow is an important determinant of investment expenditures. Its impact is significant for firms with good prospects as well as for firms with bad prospects. However, the impact of cash-flow is largest for firms with bad prospects, i.e. low Tobin's Q, suggesting that the managerial-discretion problem is most relevant in the Dutch setting. In the sample of low-Tobin's Q firms, with the managerial-discretion problem, we find that the cash-flow-investment sensitivity is higher for firms with lower shareholder influence. The agency problem is reduced by leverage and bank debt. In the high-Tobin's Q sample, the asymmetric-information problem is more relevant for smaller firms and firms in industries with many intangible assets, as these exhibit a larger cash-flow-investment sensitivity. In this subsample, firms with more bank debt display a higher cash-flow-investment sensitivity. In sum, we document that the cash-flow-investment sensitivity and its determinants differ between subsamples. Therefore, we provide evidence for the necessity to distinguish between the asymmetric-information and the managerial-discretion problems using subsamples defined on the firm's prospects.

The remainder of the paper is organized as follows. In Section 2 we further discuss the relation between investment and cash-flow and formulate explicit hypotheses. Section 3 describes our data set, while Section 4 presents the empirical tests of our hypotheses. Section 5 concludes.

2. Investment and cash-flow

the Netherlands. Again, it remains an empirical question to which extent these specifics cause underinvestment.

Investment opportunities fully determine investment in the absence of capital market frictions. The empirical literature starting with the seminal article of Fazzari, Hubbard and Petersen (1988), however, has repeatedly shown positive influence of cash-flow on firms' investment spending. Two explanations prevail for this evidence. A first one is the managerial-discretion problem, i.e. the relation is caused by overinvestment due to free cash-flow. A second explanation is financing constraints caused by asymmetric information. In this section we discuss the two theories in detail, develop testable hypotheses, review the empirical literature, and explain how we empirically discriminate between both hypotheses, respectively.

2.1. Overinvestment: the managerial-discretion problem

A first theory for a positive correspondence between cash-flow and investment relates to free cash-flow (Jensen (1986)). According to Jensen, managers maximize other objectives than shareholders do. They aim to increase firm size, because this increases their pay, status and power. The objective to maximize firm size conflicts with shareholders' interests in case firms have no valuable investment opportunities. The cash-flow that is at the discretion of managers, after valuable investments are carried out, is free cash-flow. Managers are likely to waste this free cash-flow and impute projects at the expense of the welfare of shareholders, resulting in overinvestment. That is, the available free cash-flow is invested in projects increasing firm size but with negative net present value. Cash-flow and investment may therefore be positively correlated.

Two assumptions underlie the managerial-discretion problem. First, for firms to overinvest, valuable investment opportunities are assumed to be absent. The overinvestment explanation for the cash-flow-dependence of investments is thus only relevant for firms without valuable investment opportunities. This results in the following hypothesis: *the managerial-discretion problem implies a positive cash-flow-investment sensitivity for firms without investment opportunities.*

The second assumption is that monitoring and incentive structures are imperfect. Managers would not overinvest if they were monitored perfectly, or if their interests were perfectly aligned with shareholders' interests. Corporate governance therefore is critical for the managerial-discretion problem. The reason is that aligning the interests of managers and shareholders reduces agency costs.

In the next paragraphs we formulate explicit hypotheses on how specific governance mechanisms are expected to affect the cash-flow-investment sensitivity.

Large shareholders try to maximize the return on their investment by governing the firm. They realize this by selecting the right managers and monitor their progress (Haid and Weigand (1998), Pound (1988)). However there are also costs of large shareholders (Shleifer and Vishny (1997)): collusion between the large shareholder and managers implies expropriation of other shareholders, stakeholders, investors and managers. We hypothesize that *large shareholdings decrease the cash-flow-investment sensitivity due to monitoring. However, large shareholdings may increase the cash-flow-investment sensitivity due to collusion.*

Limitations of shareholder influence on corporate decisions directly decrease the effectiveness of governance, because managers have more discretion to deviate from shareholder wealth maximization. In the Netherlands, the structured regime, priority shares and certificates are wide-spread legal devices that reduce the power of shareholders (In Section 3 we provide additional discussion of these devices). Moreover, these legal devices serve as takeover defenses. Preferred shares is another takeover defense in Dutch firms. Due to these defenses the disciplining role of the market for corporate control is virtually absent in the Netherlands. As a result managers of firms with these devices in place are entrenched, which increases their opportunities for overinvestment. We hypothesize that *limited shareholder influence and takeover defenses result in a higher cash-flow-investment sensitivity*.

Insider shareholdings align the interests of managers with those of other shareholders. Then insiders should internalize more of the financial consequences of their overinvestment decisions (Jensen and Meckling (1976)). Therefore, a decreased sensitivity of investment to cash-flow should appear. Managerial entrenchment resulting from high insider stakes, however, implies that the relation between managers' interest and shareholders is non-monotonic (Morck, Shleifer and Vishny (1988) and Hadlock (1998)). Consequently, we formulate the following hypothesis: *insider shareholdings decrease cash-flow-investment sensitivity due to improved incentives. At higher levels of*

insider shareholdings managerial entrenchment outweighs incentive effects and increases the cash-flow-investment sensitivity.

Dividends serve as a disciplinary mechanism because it subjects firms to the disciplining by the market for external funds (Easterbrook (1984)). Paying dividends commits free cash-flow reducing the opportunities of managers to overinvest (Vogt (1994)). Therefore, we hypothesize that *dividends decrease the cash-flow-investment sensitivity*.

Leverage is a disciplinary device as it implies that interest payments reduce free cash-flow. Moreover, the pressure of fixed obligations to debtholders, with the threat of bankruptcy, forces managers to invest in valuable projects (Jensen (1986) and Zwiebel (1996)). This allows us to formulate the following hypothesis: *leverage decreases the cash-flow-investment sensitivity*.

Finally, banks monitor investment decisions of firms (Diamond (1984)). They may have multiple relations with firms, e.g. as providers of debt and equity. If banks become informed through monitoring and dampen moral-hazard problems, they should reduce overinvestment. We formulate the hypothesis that *bank relations lower the cash-flow-investment sensitivity*.

2.2. Underinvestment: the asymmetric-information problem

Underinvestment only takes place in firms enjoying good prospects, i.e. valuable investment opportunities. For firms without investment opportunities, the absence of cash-flow cannot constrain investment. Asymmetric information between managers and capital markets implies that not all parties have the same access to information. It results in imperfect substitutability between internal and external finance.

Asymmetric information in debt financing may increase the cost of new debt or even restrict firms from borrowing due to credit rationing (Stiglitz and Weiss (1981) and Greenwald, Stiglitz and Weiss (1984)). The reason is that lenders do not know how the money they lend is being invested. For instance, increasing the interest rate may induce firms with valuable projects to drop out (adverse selection). Thus asymmetric information may hinder firms with growth opportunities. Firms then only

invest when internally generated funds are available stemming from equilibrium credit rationing by providers of external funds. This results in a positive dependence between cash-flow and investment.

One obvious way to obtain liquidity is to raise capital by issuing new equity. In the theory of Myers and Majluf (1984), insiders of the firm are better informed about firm value than capital markets are. The insiders, i.e. managers and informed current shareholders, aim to transfer wealth from new providers of capital to the existing shareholders. Due to the information asymmetry in comparison with insiders, providers of capital expect insiders to raise capital when this new capital is overvalued. The implication of this adverse selection is that managers and firms face a premium on external financing. Therefore, firms will initially fund investments from internal sources. However, if investment spending exceeds the internal funds, the premium on external financing becomes relevant. This premium causes a liquidity constraint for firms, such that cash-flow becomes an important determinant of investment expenditures. In addition, firms may reject positive net present value projects (underinvest) if the cash-flow is insufficient. Myers and Majluf (1984) show that firms' investment spending is not only affected by investment opportunities. The availability of internal funds also plays a role, as external funds are excessively costly.

The underinvestment theories of Greenwald, Stiglitz and Weiss (1984), Stiglitz and Weiss (1981) and Myers and Majluf (1984) assume that firms have good prospects. Moreover, the liquidity constraints are expected to increase with investment opportunities because investment opportunities induce information asymmetries. This results in the following hypothesis: *the asymmetric-information problem implies a positive cash-flow-investment sensitivity for firms with investment opportunities.*

Additional assumptions in the above-mentioned theories concern the interaction between asymmetric information and disaligned interests. According to Hadlock (1998), a key source for the premium in Myers and Majluf (1984), is share ownership by insiders. Internal shareholdings induce incentives to issue overvalued securities at the expense of new financiers by well-informed managers. For this reason the cash-flow-dependence of investment is expected to be higher for firms with higher insider

ownership. In sum, based on Hadlock (1998), we hypothesize that *insider shareholdings increase the cash-flow-investment sensitivity*.

Dividends are considered to transmit information, through their signaling role. Thus, dividends may reduce asymmetric information. Firms with profitable investment opportunities that are constrained from obtaining external finance because of adverse selection problems will adopt low-dividend policies (e.g. Fazzari, Hubbard and Petersen (1988), Van Ees and Garretsen (1994) and Vogt (1994)). Therefore we formulate the following hypothesis for dividends: *firms with higher dividends exhibit a lower cash-flow-investment sensitivity*.

Leverage generates interest and principle obligations and increases therefore the probability of financial distress. Consequently, the expected costs of financial distress augment costs of external funds (Fazzari, Hubbard and Petersen (1988)). Hence, we hypothesize that *leverage increases the cash-flow-investment sensitivity*.

Banks may reduce the impact of asymmetric information in debt markets. Diamond (1984) and Fama (1985) among others argue that banks enjoy an advantage in producing private information about firms. Therefore, banks reduce the agency costs of debt and may insure borrowers against credit rationing (Dell'Ariccia and Marquez (2000)). This should relax the cash-flow constraint. Bank-firm relationships, however, may also impose costs. Rajan (1992) shows that the production of private information gives the bank bargaining power over the firm's profits. This may increase the dependence of investment on internal funds. The hypotheses on banks are summarized as follows: *bank relations result in a lower cash-flow-investment sensitivity, because banks produce private information about borrowers. However, bank relations may results in a higher cash-flow-investment sensitivity due to increased bargaining power over firm's profits.*

As discussed before, asymmetric information is important in both the rationing model for debt and the adverse-selection model for equity. Both explanations predict that asymmetric information increases the premium for external capital. We noted that dividends and bank relations may mitigate information asymmetries. In the literature, several additional firm characteristics are found to be

associated to asymmetric information. First, firm size seems to be inversely related to asymmetric information (see e.g. Devereux and Schiantarelli (1990) and Kadapakkam, Kumar and Riddick (1998)). Information asymmetries are larger for small firms because the cost of gathering information is relatively high. This results, among others, in a lower number of analysts that follow the firm. Next to asymmetric information, size is also correlated to other factors that influence financial constraints. These include transaction costs and access to capital markets. We expect that *firm size decreases the cash-flow-investment sensitivity.* Second, the specifics of the firm's assets seem to be related to asymmetric information. More tangible assets allow for a more objective valuation and judgement of prospects, in comparison with intangibles. It also increase the potential for collateralizing assets, which reduces financial constraints. Normally, asset characteristics are approximated by the firm's industry. This proxy is used in Schaller (1993). We expect that *firms in industries with relatively many intangible assets have a higher cash-flow-investment sensitivity.* Third, the track record of a firm, which allows good firms to distinguish themselves from bad ones is inversely related to asymmetric information. This track record is approximated by the number of years the firm has been listed or firm age (see, e.g. Devereux and Schiantarelli (1990) and Schaller (1993)). We expect that *recently-listed firms have a higher cash-flow-investment sensitivity.*

2.3. Underinvestment or overinvestment?

The previous discussion shows that distinguishing firms with good or bad prospects is important to disentangle the managerial-discretion problem and the asymmetric-information problem. Investment opportunities can be gauged from Tobin's Q. Firms with good prospects have a Tobin's Q above one whereas firms with bad prospects have a Tobin's Q lower than one. Thus investment opportunities measured by Tobin's Q are important since they determine which of the two problems drives the cash-flow-dependence. It should be noted that the theory concerns marginal growth opportunities. The observed Q however measures average investment opportunities. Hayashi (1982) has derived conditions under which Tobin's average Q equals marginal Q, and thus is sufficient to assess how much a firm should invest. These conditions are that capital markets are perfect, firms do not have market power, and firms use a constant returns-to-scale technology in both production and installation. Marginal Q may be less than average Q when there are diminishing returns to scale in adjustment costs or if firms face a downward-sloping demand curve. If a firm owns outmoded

capital, marginal Q may exceed average Q (Romer (2001)). Throughout this paper we will assume that firms with low Q are subject to the managerial-discretion problem whereas firms with a high Q face an asymmetric-information problem. We will further detail our approach in the empirical section.

2.4. Empirical literature

The seminal empirical study analyzing the importance of financing constraints is Fazzari, Hubbard and Petersen (1988). The authors divide a sample of US firms into subsamples based on the dividend payout behavior. Dividends are assumed to relate to financial constraints. The hypothesis is that lower dividends indicate higher constraints. The results show that the impact of cash-flow on investment is larger for firms with low dividends, which confirms the hypothesis. Other studies have replicated and extended this approach. For example, Devereux and Schiantarelli (1990) test for a set of UK firms whether different cash-flow-investment sensitivities are found in subsamples based on proxies for agency costs of external capital. The proxies are firm size (capital stock and employees), the number of years since initial quotation, and the industry (growing or declining). The investments of large firms, newly-listed firms and firms in growth sectors exhibit higher cash-flow sensitivities. Later studies include Oliner and Rudebusch (1992), Schaller (1993) and Gilchrist and Himmelberg (1995).[2] The approach that was initiated by Fazzari, Hubbard and Petersen (1988) and that is also used in the above-mentioned studies has been criticized by Kaplan and Zingales (1997). They argue that, when examining in greater detail the data used by Fazzari, Hubbard and Petersen (1988), their results do not support the presence of financing constraints.[3]

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[2] Oliner and Rudebusch (1992) interact the cash-flow coefficient in an investment regression model with proxies for information asymmetry (firm age, listing at exchange, and stock trades by insiders), agency costs (insider shareholdings and ownership concentration) and transaction costs (firm size). The authors also include the dividend yield for comparison with Fazzari, Hubbard and Petersen (1988). Although for the set of US firms the individual interaction terms are insignificant, a compound measure of information asymmetry is significant and yields the predicted positive effect. The authors conclude that information problems worsen financial constraints. For Canadian firms, Schaller (1993) defines subsamples based on age (years of inclusion in a financial database), concentration of ownership, industry (manufacturing and other), and group or independent. The cash-flow constraints are most relevant for young firms, firms with dispersed ownership, independent firms and manufacturers. Gilchrist and Himmelberg (1995) investigate US firms and define subsamples on the basis of size, dividend payout ratio and the availability of rating for bonds and commercial papers.

[3] Kaplan and Zingales (1997) argue that the apparently financially constrained firms could have augmented their use of cash and lines of credit at a particular moment in time. Firms that according to an alternative classification of Kaplan and Zingales are most financially constrained show the lowest sensitivity of investment to liquidity. The discussion on the usefulness of cash-flow-investment sensitivities is continued in Fazzari, Hubbard and Petersen (2000) and Kaplan and Zingales (2000). Although the outcome of the discussion is indecisive, Kaplan and Zingales show that results of studies in which the approach of Fazzari, Hubbard and Petersen is applied, should be interpreted with caution.

Other contributions that are relevant for our paper are Hoshi, Kashyap and Scharfstein (1991), Vogt (1994), and Hadlock (1998). Hoshi, Kashyap and Scharfstein (1991) investigate the cash-flow-sensitivities for a sample of Japanese firms, which is divided into group and non-group firms. The latter ones, characterized by relatively weak ties with banks, have a higher cash-flow-coefficient. Hoshi, Kashyap and Scharfstein (1991) spot the importance of overinvestment through a differential impact of cash-flow for firms with good and bad prospects. The latter distinction is made by focussing on firms with a Tobin's Q above and below median respectively. They find no evidence for overinvestment. Vogt (1994) empirically discriminates between managerial discretion and asymmetric information by including an interaction term between Tobin's Q and cash-flow in the regression equation. For his sample of US firms, he finds strong evidence for the presence of managerial discretion while also the influences of asymmetric information cannot be dismissed. Dividends are found to reduce both problems. Hadlock (1998) studies the impact of insider ownership on the cash-flow-sensitivity of investment based on both free-cash-flow problems and asymmetric-information problems. An interaction term of cash-flow and insider ownership is found to be positive for insider ownership below 5% and negative above this threshold. Hadlock (1998) concludes that the findings are inconsistent with the free-cash-flow theory and consistent with asymmetric-information problems.

The emphasis in the literature on investment spending is on firms in the Anglo-Saxon countries, while Japanese firms are also studied. The European continent offers an interesting setting to consider determinants of investment under alternative structures. Kadapakkam, Kumar and Riddick (1998) study six OECD countries including France and Germany, next to the US, UK, Canada and Japan. Subsamples based on size show that the cash-flow-investment sensitivity is highest in the sample of large firms. This difference is most pronounced in the US and UK. France, Germany and Canada also show significant differences between the subsamples in most analyses. For Japan, the difference is insignificant in several analyses. For Austrian firms, Gugler (1998) empirically investigates whether the validity of the asymmetric-information problem and managerial-discretion problem depends on the ownership structure of the firms. His findings suggest that investment of bank-controlled firms is not positively related to cash-flow. Asymmetric-information problems prevail in family-owned firms, while overinvestment is more prominent in state-controlled firms and pyramidal groups. Haid and

Weigand (1998) focus on investment spending and corporate governance in Germany. Using sample splits, they report that liquidity positively affects investments in owner-controlled firms, while management-controlled firms show no cash-flow-investment dependency.

Van Ees and Garretsen (1994) study a sample of Dutch firms over the period 1984-1990. The authors define subsamples based on the dividend payout ratio, the year of the initial public listing, size (fixed assets) and interlocking directorates with banks.[4] They find that the cash-flow-investment sensitivity is significantly positive in Dutch firms. No significant differences are found between subsamples based on dividends, years listed and size. Interlocks with banks are found to reduce the cash-flow constraints. Firms with ties to banks have a significantly lower impact of cash-flow on investment. Van Ees and Garretsen (1994) conclude that in Dutch firms the asymmetric-information problem is reduced by bank relations.

3. Data

Our data set contains information on the investments in fixed assets and the financial, asset, and governance structure of all Dutch non-financial firms listed at the Amsterdam Stock Exchange from 1993 until 1998. The data for the investments and the financial and asset structure are obtained from a data set of Statistics Netherlands (*Centraal Bureau voor de Statistiek*). It contains data on listed firms, including the financial annual report data and an industry classification. The ownership-structure data is obtained from the leading Dutch financial daily newspaper, *Het Financieele Dagblad*, which publishes each year a list of exchange-listed firms and its stakeholders[5]. Technical takeover defenses and the year of the initial public offering are from the yearly overviews of all securities listed at the Amsterdam Stock Exchange (*Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs*). The data for board members of the non-financial and financial firms are from the

[4] An interlocking directorate with a bank occurs when a managerial board member of an industrial firm holds a position on the managerial or supervisory board of a bank or when a managerial board member of a bank holds a position on the managerial or supervisory board of an industrial firm.

[5] The notifications are mandatory according to the Law on Disclosure of Shareholdings (*Wet Melding Zeggenschap*). This law went into effect in 1992 and is the Dutch implementation of the EU Transparency Directive 88/627. See De Jong, Kabir, Marra and Röell (2001) for a description of Dutch ownership data from this source.

Yearbook of Dutch Firms (*Jaarboek Nederlandse Ondernemingen*). The data on the structured regimes for 1997 is obtained from the Monitoring Report 1998 (which contains data over 1997) and the firm's annual reports for 1992.[6] In order for a firm-year to be included in our set, we require that data is available for all items we discussed.[7] Our final data set contains an unbalanced panel of 132 firms, and 697 firm-years of data.

For the replacement value of fixed assets and total assets we use the approximation described by Perfect and Wiles (1994). In the Netherlands, firms either present replacement values directly in their annual reports, or they present historical costs. If replacement values are presented, they are equal to the book values. In case of historical costs we have to adjust the value to approximate the replacement value. This is relevant for plant and equipment. We assume that in a base year the replacement value equals the historical costs. For each subsequent year we adjust this replacement value by adding new investments and corrections for the growth in capital good prices and subtracting depreciation. Growth in capital good prices is based upon the price index of investment goods, as provided by Statistics Netherlands. The replacement value of the (fixed) assets is the book value of (fixed) assets plus the difference between the replacement value and the historical value of plant and equipment.[8]

The definitions of our variables and summary statistics for the full sample are presented in Table 1.

[Please insert Table 1 here]

The summary statistics in Table 1 emphasize several characteristics that are relevant in the Dutch institutional setting.[9] On average firms have a dividend payout ratio of 36% and the debt ratio is

[6] In case we found a difference between 1992 and 1997, we investigated all annual reports over 1992-1997. The annual reports allowed us to investigate (1) whether the supervisory board established (*vaststellen*) or approved (*goedkeuren*) the annual accounts, and (2) whether the firms met the criteria for the structured regime. Under the structured regime, the supervisory board establishes the annual accounts. In cases of inconsistency, we contacted the firm.

[7] Because we include lagged variables, the data for each year consists of data that year and the previous year. Firm-years are excluded when the firm is not included in one of our sources. This may be due to a merger, delisting or absence of data.

[8] The impact of the adjustment of replacement values is modest. For example, the correlation between the replacement value of fixed assets and the book value of fixed assets is 0.99.

[9] See Kabir, Cantrijn and Jeunink (1997) and De Jong, DeJong, Mertens and Wasley (2001) for detailed

19%. The latter contains interest-bearing debt and is composed of long-term debt and short-term bank debt. Our definition excludes trade credit, because this short-term financing is most likely driven by practices within the firm's industry.

In continental-European countries a major role in corporate governance and the mitigation of asymmetric information is attributed to banks. We find that bank debt is 12.5% of total assets.[10] Banks own on average 7.7% of the firm's equity. Interlocking directorates are board members of the firms who are also a board members with one of the four leading Dutch banks (Abn-Amro, ING, Rabo and Fortis). The number of interlocking directorates is measured relative to the total number of board members. In the Netherlands, we find that the relative number of interlocking directorates is 11.4%. The ownership structure of Dutch firms reveals the presence of substantial blockholdings. The average largest blockholder owns 25.9% of the firm's equity. The median of the largest block is 18.9%. Ownership by members of both boards is on average low (on average 6%). The boards of Dutch firms are two-tier boards, i.e. a managerial (*Raad van Bestuur*) and a supervisory board (*Raad van Commissarissen*) is present. According to Dutch company law, supervisory board members have to be independent from the management and serve the firm's interest, which includes all stakeholders. This implies that the monitoring role of the supervisory board does not necessarily benefit the shareholders' interests. Moreover, several firms have adopted the structured regime (*structuurregime*), which provides the supervisory board with additional powers and limits shareholders' influence. Examples are establishing the annual accounts, election of management, election of supervisory board and authority over major decisions by the management. Table 1 shows that 62% of the Dutch firms are required to have the structured regime because they meet specific size-related requirements.[11] In addition to the structured regime, three other limitations of shareholders' influence are widely used in Dutch firms. The first are priority shares; shares that carry superior voting rights for instance with regard to takeover attempts. Priority shares are issued by

descriptions of the Dutch corporate governance setting.

[10] For bank debt we have 639 observations, because in 58 firm-years no distinction was made in the composition of long-term debt. Next to long-term bank debt, firms may have public debt and private debt from other sources than banks, such as institutional investors. For short-term debt, the annual reports present trade credit separately from other short-debt. We assume that short-term debt is bank debt in case this is not explicitly mentioned.

[11] Another 8% of the firms has the structured regime voluntarily. Each of these firms initially were required to adopt the regime, but were later exempted afterwards because of increases international activities. The exemption arise when 50% of the employees are abroad. De Jong, DeJong, Mertens and Wasley (2001) show that these voluntarily structured regime firms are disciplined by international competition and capital markets.

39% of the firms. The second limitation is certificates, also called depository receipts. These certificates only carry the cash-flow rights. The voting rights remain with a trust that owns the shares and issued the receipts. About 37% of the firms has certificates. The limitations mentioned before are permanent and serve both to limit shareholder influence in general and as a takeover defense. The third limitation is preferred shares. They are mainly a takeover defense that limits shareholder influence in case of a threat of a hostile takeover. Firms that have preferred shares have an arrangement that allows an issue of preferred shares without further approval of shareholders and for which only 25% of the nominal value has to be paid up. In case of a takeover attempt, the firm can place these shares with a befriended party and have the shares paid with debt. The dilution creates an effective takeover defense. Preferred shares are present as takeover defense at 63% of the firms. On average, firms have 2.0 takeover defenses.

The degree of asymmetric information is proxied by size, industry and the time elapsed since the firm's initial public offering. On average, the replacement value of total assets is 3627 million Dutch guilders. About 10.5% of the firms are in information-sensitive industries. These industries are automation, software and media. For 24.4% of the firms the initial public offering is less than 10 years ago.

4. Regression evidence

Our regressions analyse several aspects of cash-flow-investment sensitivity. In a first subsection, we check whether cash-flow is important in explaining investments in fixed assets. The second subsection tries to distinguish between the asymmetric-information problem and the managerial-discretion problem. The third subsection discusses how governance affects the degree of managerial discretion through the cash-flow coefficient. Additionally, it investigates how information asymmetries shape the importance of the asymmetric-information problem.

4.1. Is cash-flow important in explaining investment?

We analyze the relationship between fixed-investment expenditures and cash-flow. We include Tobin's Q to capture investment opportunities and control for firm-specific fixed effects and time-fixed effects. In sum, we estimate the following relationship:

$$I_{it} = \beta Q_{it} + \gamma CF_{it} + \mu_t + \lambda_i + \nu_{it} \qquad (1)$$

The variable I_{it} represents investment in plant and equipment for firm i during year t, scaled by the firm's beginning of period replacement value of fixed assets. Tobin's Q at the beginning of year t (Q_{it}) controls for changes in investment demand due to investment opportunities. The impact of cash-flow (CF) on investment is reflected by the coefficient γ. To neutralize potential heteroskedasticity, the firm's beginning of period replacement value of fixed assets scales both investment (I) and cash-flow (CF). Time-fixed effects (μ_t) and firm-fixed effects by (λ_i) enter all specifications. We present the regression results for various alternatives of equation (1) in Table 2.

[Please insert Table 2 here]

In model (1) we report the OLS-estimates of equation (1). The result shows that the cash-flow coefficient is positive and significantly different from zero at the 1-% level, conform findings reported in other studies. The coefficient of Tobin's Q is also positive and significant.

In spite of the well-developed micro-foundations of the Q-theory of investment, two other variables typically have explanatory power in Q-equations. A first is the change in working capital (working-capital investment) scaled by the replacement value of fixed assets (ΔNWC). The motivation for this variable is that firms may reduce their working capital (current assets minus current liabilities) to smooth fixed investments (Fazzari and Petersen (1993)). Including ΔNWC allows to isolate the liquidity effect from the informational part of cash-flow (see also Haid and Weigand (1998)). In other words, a negative coefficient accompanied by an increase in the cash-flow-coefficient suggests that cash-flow does not capture investment opportunities. The results of model (2) in Table 2 are not contradicting this: the change in net working capital (ΔNWC) has the predicted negative coefficient

(though not significantly different from zero) and the cash-flow coefficient increases slightly.[12] The second variable with explanatory power in Q-equations is current sales, scaled by beginning-of-year replacement value of fixed assets (SLS). In model (3) of Table 2, we display the results of equation (1) including ΔNWC and SLS. As in Fazzari and Petersen (1993), we apply two-stage least-squares regression (2SLS). We instrument the change in the net working capital ratio with the working capital stock at the beginning of the period scaled by beginning-of-year fixed assets. The firm's choice of working-capital investment should depend negatively on the size of the initial stock because the marginal valuation of working capital falls as its stock rises. Also sales has been instrumented by its lagged value to take care of potential endogeneity problems. The results in column (3) show that the coefficient of working-capital investment is negative and highly significant. SLS appear with a positive significant coefficient.[13] In the remainder of the paper we continue to report the results of the 2SLS regressions in which we instrument the change in the net-working-capital ratio with the level of the working capital at the beginning of the period, and sales with its lagged value.

4.2. Asymmetric information and/or managerial discretion?

Our theoretical discussion revealed that the asymmetric-information problem is relevant for firms with good prospects whereas the managerial-discretion problem applies for firms with bad prospects. As previously argued, we capture a firm's prospects via its Tobin's Q. We follow Hoshi, Kashyap and Scharfstein (1991) to distinguish between firms with good and bad prospects. They allow for two separate cash-flow coefficients: one for firms with a Tobin's Q below the median and one for firms with Q above the median. In our sample, median Q is substantially above one (1.20) whereas theory suggests a value of one. More specific, Hayashi (1982) and Vogt (1994) have shown that under certain assumptions the asymmetric-information problem applies for firms with Q larger than one whereas the managerial-discretion problem applies for firms with a Q smaller than one (see Subsection 2.3). We incorporate this theoretical consideration by dividing the sample into the one-

[12] Note that working-capital investment may be endogenous, as it is a decision variable of the firm. Later on, we instrument the change in net-working-capital ratio.

[13] Even after controlling for other factors often being important in explaining investment, we run the risk that these proxies are less than perfect for investment opportunities. These proxy measures may introduce measurement bias; that is a positive estimated coefficient of cash flow may indicate shifts in investment demand and future profitability, and not pointing at financing constraints. However, this concern should not be exaggerated, as shown by the results of introducing net-working capital in our regressions.

third of firms with lowest average Q (low-Q firms) and the other firms (high-Q firms).[14] The cut-off value between low-Q and high-Q firms is 1.07. We motivate this decision as follows. First, if firms face a downward sloping demand curve or decreasing returns to scale in adjustment costs, then marginal Q is lower than average Q. Therefore a value of average Q somewhat higher than one may be preferred. Second, choosing for the one-third low-Q firms leaves enough observations to maintain sufficient heterogeneity within the low-Q sample. In the Appendix we provide summary statistics for each of the two subsamples. Compared to the variables used in the previous regression, we substitute CF by two interaction terms: (1) cash-flow times a dummy variable which equals one if average Q is low (LQ*CF) and (2) cash-flow times a dummy variable if average Q is high (HQ*CF). The results of Model (4) in Table 2 display that the cash-flow-coefficient of the lowest Q-firms (LQ*CF) is 0.558. This is significantly higher than the firms with an high average Q (0.161).[15] This result implies that in the Netherlands the managerial-discretion problem is highly relevant, in comparison with the asymmetric-information problem.

To investigate further whether managerial discretion or asymmetric information is at work, we apply the strategy initiated by Vogt (1994). The author shows that discriminating between these two problems is possible by investigating the interaction between Tobin's Q and cash-flow. We include the interaction term of Q and cash-flow (Q*CF). A positive sign of its coefficient implies that firms with a higher Tobin's Q embody a higher cash-flow coefficient. This compares with higher liquidity constraints which is in line with the asymmetric-information problem. A negative coefficient is in line with managerial discretion, as the cash-flow-coefficient for lower Q-firms becomes higher. Model (5) of Table 2 summarizes the results of this exercise. The coefficient for Q*CF is slightly negative, though not statistically different from zero. Thus, in our sample this technique does not help in discriminating between the two problems.

Model (6) combines the methodologies of Hoshi, Kashyap and Scharfstein (1991) and Vogt (1994). That is, we allow for two separate intercepts for the cash-flow coefficient as in model (4), and

[14] We use the average value of Tobin's Q over the years for which we have observations in order to avoid a bias towards observations in years with higher market values.

[15] We also replicated the results in Hoshi, Kashyap and Scharfstein (1991). We divided the sample into firms with average Q above and below the median. The cash-flow coefficients are 0.225 (*t*-value 2.15) in the below-median sample and 0.172 (*t*-value 2.33) in the above-median sample. These coefficients are not statistically different from

interact Q and cash-flow for the two groups (LQ*CF*Q and HQ*CF*Q) as in model (5). The coefficients of LQ*CF*Q and HQ*CF*Q are not statistically different from zero. This finding implies that investment opportunities do not significantly influence the cash-flow coefficient in both the low-Q sample and the high-Q sample. Apparently, the variation in Q does not affect the cash-flow sensitivity in either of the subsamples. Therefore, we conclude that this addition to Vogt (1994) does not turn out to be relevant in our samples. In the remainder of the paper, we take model (4) of Table 2 as our preferred specification. Since none of the models significantly outperforms other ones.[16], we take model (4) as our base specification because it builds both on theoretical considerations and previously used empirical methodology (Hoshi, Kashyap and Scharfstein (1991)).

4.3. Do governance and/or asymmetric information variables influence cash-flow-sensitivities?

In this subsection we relate firm characteristics that are hypothesized to influence the cash-flow-investment sensitivities to the cash-flow coefficient. This test allows us to investigate which factors aggravate or mitigate the managerial-discretion and asymmetric-information problems. Table 3 displays the results. Panel A contains the corporate-governance variables that affect the managerial-discretion problem only. Panel B summarizes the results for the explanatory variables that act both as governance mechanisms for the managerial-discretion problem and as asymmetric-information variables for the asymmetric-information problem. Finally, Panel C contains the variables that only serve as asymmetric-information variables. We first discuss the results on managerial discretion, i.e. the low-Q firms. Subsequently, we turn to the analysis of the asymmetric information hypothesis, i.e. to the high-Q firms. In our discussion, we follow the order of formulation of hypotheses in Subsections 2.1 and 2.2.

The results for the largest shareholder (C1_EQ) are displayed in model (1) of Panel A. Large shareholdings do not significantly modify the cash-flow coefficient (-0.007 with a *t*-value of –0.83; see sixth column denoted 'LQ*CF**CG*'). The hypothesis was that larger shareholders increase monitoring reducing the cash-flow-investment sensitivity. However, entrenchment may magnify the managerial-discretion problem. Our results suggest that the two effects outlined in our hypothesis are

each other.

[16] The adjusted R^2 of the different models are very similar.

absent or neutralizing each other.[17] Models (2) and (3) in Panel A detail the results of the limitation of shareholder influence and the presence of takeover defenses. A first proxy is the structured regime (SR). Firms with the structured regime have a significantly higher cash-flow-investment sensitivity than firms operating without it. Clearly, the structured regime enlarges the managerial discretion. Apparently, the typical Dutch board system in which shareholder influence is given to supervisory board members has negative effects. This finding is consistent with De Jong, DeJong, Mertens and Wasley (2001) in which the structured regime is found to have a negative effect on firm value. The impact of takeover defenses is presented in Model (3). We take the natural logarithm of one plus the number of defenses to account for potential non-linearity. We observe that these defenses also increase the cash-flow-investment sensitivity.[18] In sum, the results of the limitation of shareholder influence and takeover defenses are in line with our hypothesis.

Panel B of Table 3 presents the results for the variables that are important for both the managerial-discretion and the asymmetric-information problem. We first discuss the results concerning the managerial-discretion problem. Subsequently we turn our attention to the asymmetric-information problem. Model (4) in Panel B highlights the results for managerial shareholdings (INS_EQ). The cash-flow coefficient for low-Q firms increases significantly in managerial shareholdings (0.026 with a *t*-value of 2.31). This suggests that managerial entrenchment offsets incentive effects and increases the cash-flow-investment sensitivity. A potential explanation concerns the minimum reporting level of 5%. This minimum level may be too high to identify the incentive effects. Model (5) in Panel B exhibits the effects of dividends. Low-Q firms with an above-median dividend payout ratio have no statistically different cash-flow-investment sensitivity. Thus dividends do not seem to be an effective governance mechanism in the Netherlands. These results differ from Vogt (1994), but are in line with Van Ees and Garretsen (1994). One explanation is that our explanatory variable does not fully capture this governance mechanism. In particular, Dutch firms have dividend payout ratio's exceeding cut-off levels applied in other studies. The effects of leverage are presented in Model (6) of Panel B. Higher leverage reduces significantly the cash-flow-investment sensitivity of the low Q firms. This finding is in line with our hypothesis. Leverage is the only governance mechanism in Dutch

[17] We investigated whether relatively high or low blockholdings have different effects. No significant effects are found when blockholdings below or above 40%, 50% or 60% are included separately.

[18] In addition, we investigated the impact of the structured regime including the voluntarily structured regime and

firms reducing managerial discretion. Model (7) shows that leverage works via bank debt, because the effect for bank debt is similar but stronger and the debt measure encompasses the bank debt measure. Models (8) and (9) in Panel B reveal that banks govern only via leverage. Governance through bank shareholdings or interlocking directorates is absent. These findings imply a role for banks in the governance of firms that works through credit while other channels are left aside. An explanation for this effect is the power of banks; they can deny loan renewals and threaten with bankruptcy in case of default. Apparently, these powers are stronger than voting in shareholders and board meetings.

Panel B also displays some of our asymmetric-information variables. Asymmetric-information problems are expected in high-Q firms. Table 2 already revealed that the asymmetric-information problem seems to be less prevalent compared to managerial discretion. Model (4) in Panel B presents the impact of insider shareholdings. The coefficient of INS_EQ is insignificant, while we hypothesized that more managerial shareholdings would increase the cash-flow-investment sensitivity (-0.0003 with a *t*-value of –0.24; see eighth column denoted 'LQ*CF**AI*'). Our result is in contrast to Hadlock (1998). The hypothesis that low-dividend firms face more severe financing constraints is also not confirmed by the data. Model (5) of Panel B demonstrates that firms with higher than average dividend payout ratio do not display a significantly different cash-flow-investment sensitivity than low-dividend firms do (coefficient is 0.053 with a *t*-value of 0.54). These findings confirm the results for Dutch firms in Van Ees and Garretsen (1994). Model (6) shows that more levered high-Q firms do not exhibit a statistically higher cash-flow-investment sensitivity. Nevertheless, the coefficient has the expected positive sign. However, bank debt significantly increases the cash-flow coefficient, pointing out the previous leverage effect. The evidence contradicts the role of banks as producers of private information about firms. The findings are in line with Rajan's (1992) model, in which bank relations induce constraints as the production of private information gives the bank bargaining power. The additional impact of banks can be gauged from models (7) to (9). Banks seem unable to reduce asymmetric information problems via bank equity (model (8)) or via bankers on the board (model (9)).

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we tested for the impact of individual takeover defenses. The findings corroborate our findings in Table 3.

Panel C of Table 3 displays the results for variables that are pure asymmetric information variables. We consider three variables, i.e. size (LN(RVTA)), industries with many intangible assets (INDUSTRY) and recently-listed firms (IPO) in models (10), (11) and (12) respectively. Smaller firms show significantly larger cash-flow-investment sensitivity. Confirming our expectations, small firms seem to be more prone to asymmetric information problems. These results contrast the findings of Kadapakkam, Kumar and Riddick (1998) who find that larger firms exhibit significantly larger cash-flow-investment sensitivities. Model (11) of Panel C reveals the results for industries with many intangible assets. In line with our hypothesis, these high-Q firms exhibit higher cash-flow-investment sensitivity suggesting that these drive the sample cash-flow-investment sensitivity. Recently-listed firms (model (12)) do not demonstrate a significantly higher cash-flow coefficient.

4.4. Summary of empirical results

The empirical results show the importance in Dutch firms of the managerial-discretion problem. The sample of low-Q firms for which theory predicts this problem to be relevant shows a significant cash-flow coefficient of 0.558. Moreover, the structured regime, takeover defenses, inside equity and (bank) debt are governance characteristics that influence this cash-flow coefficient. The findings for the limitations on shareholder influence and bank debt clearly represent typical Dutch and continental-European governance aspects that are hardly observable in the Anglo-Saxon setting. Blockholders, dividends and bank equity and interlocks are not found to influence managerial discretion. The hypothesis that the asymmetric-information problem is relevant cannot be rejected for Dutch firms, but this problem has a much smaller impact. The coefficient is 0.161 for high-Q firms and this coefficient is significantly smaller than the coefficient in the low Q set. Bank debt, firm size and the industry influence the cash-flow constraint. No significant effects are found for inside equity, dividends, non-bank debt, bank equity and interlocks and the post-IPO track record.

The findings illustrate the relevance of our sample split of low-Q and high-Q firms. In different samples, different problems seem to determine the cash-flow sensitivity of investment. These different effects are not only visible in the significantly different cash-flow coefficients, but also in the differences between the impact of governance and information asymmetry variables in the samples. The coefficients for bank debt have opposite signs that are both significant. The coefficients for inside

equity and debt are only significant in the low Q sample and have opposite (insignificant) signs in the high Q sample.

5. Concluding remarks

A hotly-debated issue in the investment literature is whether and why investment depends on cash-flow. Theory offers two competing explanations. Either managers are wasting free cash-flow (managerial discretion) resulting in overinvestment. Or asymmetric information between and among owners and external fund providers induces an external finance premium yielding underinvestment (asymmetric-information problem).

We find that cash-flow is a significant variable in explaining fixed investments in the Netherlands. We empirically discriminate between the asymmetric-information problem and the managerial-discretion problem by distinguishing firms with good and bad prospects. Our analysis shows that both firms with good and bad prospects−firms with an average Q above and below one−posit a positive cash-flow dependence. However, low-Q firms have a significantly higher cash-flow-coefficient than high-Q firms. The interaction term between Tobin's Q and cash-flow within these subgroups is not significant suggesting that two groups−low-Q and high-Q firms− should be considered. The level of the cash-flow coefficient is larger in the low-Q group pointing out the importance of managerial discretion.

The characteristics of the Dutch institutional setting allow for an interesting analysis of the impact of corporate governance on the relevance of the managerial-discretion problem, which is not possible for US-data. For the managerial-discretion problem we find that in low-Q firms the cash-flow-coefficient increases in the structured regime, takeover defenses and substantial managerial shareholdings. The cash-flow-investment sensitivity decreases in leverage and bank debt. As the governance characteristics of Dutch firms are also found in other continental-European countries, our evidence is also relevant outside the Dutch setting. In the asymmetric-information subsample, i.e. for high-Q firms, we find that smaller firms and firms in industries with many intangible assets exhibit a

larger cash-flow-investment sensitivity. Firms with more bank debt also display a higher cash-flow-investment sensitivity. These results confirm that the variables affecting managerial discretion and asymmetric information differ. This illustrates that our empirical methodology adds to the literature.

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Table 1: Definitions and descriptive statistics of the variables

Definitions and descriptive statistics for the full sample of the variables used. The sample consists of 697 observations for 132 firms in the 1993 to 1998 period, unless mentioned otherwise. The data for the investments and the financial structure are obtained from Statistics Netherlands. The ownership structure data are from *Het Financieele Dagblad*. Technical takeover defenses and initial quotations are from the *Gids bij de Officiële Prijscourant van de Amsterdamse Effectenbeurs*. The data for board members of the non-financial and financial firms are from the *Jaarboek Nederlandse Ondernemingen*. The data on the structured regimes for 1997 is obtained from the Monitoring Report 1998 and the firm's annual reports. In order for a firm-year to be included in the data set, we require that data is available for all items. Blockholdings are defined as stakes of 5% and more and expressed as a percentage of the firm's equity. The items denoted *t* are measured over or in the current year or at the beginning of the current year, while the items denoted *t-1* refer to the previous year and items denoted *t+1* refer to the next year.

Variable	Description	Code	Mean	Median	Std.Dev.
Investment fixed assets	Fixed-investment expenditures (t)/replacement value of fixed assets (t)	I	0.220	0.161	0.324
Tobin's Q	Market value of total assets (t)/replacement value of total assets (t)	Q	1.406	1.195	0.764
Cash-flow	Cash-flow (t)/replacement value of fixed assets (t)	CF	0.413	0.265	0.584
Change net working capital	(Net working capital (t+1)-net working capital (t))/replacement value of fixed assets (t)	ΔNWC	0.092	0.035	0.639
Sales	Sales (t)/replacement value of fixed assets (t)	SLS	7.657	4.012	13.155
Total assets	Replacement value of fixed assets + book value of other assets; in million Dutch guilders	TA	3626.76	457.31	14085.76
Dividend	Dividend payout ratio (t-1)	DIV	0.363	0.350	0.803
High dividend	Dummy with value of 1 for firms with average dividend above median (t-1), 0 otherwise	HIGH_DIV	0.509	1	0.500
Debt	(Long-term debt (t)+short-term bank debt (t))/replacement value of total assets (t)	DEBT	0.194	0.179	0.155
Bank debt	(Long-term bank debt (t)+short-term bank debt (t))/replacement value of total assets (t); 639 observations	BNK_DEBT	0.125	0.080	0.139
Bank blockholdings	Blockholdings by banks (t-1)	BNK_EQ	7.711	5.140	10.394
Bank interlocks	Number of bank interlocks (t-1)/ /number of board members (t-1)	BNK_IL	0.114	0	0.164
Largest blockholding	Stake of the largest blockholder (t-1)	C1_EQ	25.886	18.890	21.215
Insider blockholdings	Blockholdings by members of managerial and supervisory boards (t-1)	INS_EQ	6.014	0	18.278
Structured regime, compulsory	Dummy with value of 1 for compulsory presence of structural regime (t-1), 0 otherwise	SR	0.620	1	0.486
Priority shares	Dummy with value of 1 for presence of priority shares (t-1), 0 otherwise	PRIO	0.39	0	0.49
Certificates	Dummy with value of 1 for presence of certificates (t-1), 0 otherwise	CERT	0.37	0	0.48
Preferred shares	Dummy with value of 1 for presence of preferred shares (t-1), 0 otherwise	PREF	0.63	1	0.48
Takeover defenses	Sum of Structured regime (compulsory), Priority shares, Preferred shares and Certificates	DEF	2.012	2	1.004
High information industry	Dummy with value of 1 for firms in automation, software and media industries (t-1), 0 otherwise	INDUSTRY	0.105	0	0.306

Variable	Description	Code	Mean	Median	Std.Dev.
Recent public offering	Dummy with value of 1 for firms with initial public offering less than 10 years ago (t-1), 0 otherwise	IPO	0.244	0	0.430

Table 2: Regression analysis of determinants of investment

Regression results for the basic variables and interaction between cash-flow and Tobin's Q. The sample consists of 697 observations for 132 firms in the 1993 to 1998 period. The definitions and data sources of the variables are in Table 1. The explained variable is investment in fixed assets over replacement value of fixed assets (I). The regressions contain firm and year dummies (results not reported). Model (1) and (2) are OLS regressions. The other models are 2SLS regressions in which ΔNWC is instrumented by the beginning-of-the-period net working capital and SLS is instrumented by one-period lagged SLS. LQ is 1 for the one-third of the firms with lowest average Tobin's Q, and 0 otherwise; HQ is 1 for the two-thirds of the firms with highest average Tobin's Q, and 0 otherwise. The *t*-values are in parentheses. Significant coefficients are indicated by * (10% level), ** (5% level), and *** (1% level).

Variable	(1)	(2)	(3)	(4)	(5)	(6))
Q	0.099 (3.24)***	0.099 (3.24)***	0.111 (3.55)***	0.123 (3.84)***	0.137 (3.32)***	0.140 (3.24)***
ΔNWC		-0.018 (-0.90)	-0.160 (-3.15)***	-0.186 (-3.29)***	-0.153 (-2.99)***	-0.178 (-2.94)***
SLS			0.021 (4.29)***	0.022 (4.40)***	0.021 (4.17)***	0.021 (4.17)***
CF	0.221 (4.71)***	0.236 (4.73)***	0.190 (2.51)**		0.228 (2.68)***	
LQ*CF				0.558 (2.93)***		0.399 (0.60)
HQ*CF				0.161 (2.14)**		0.190 (2.18)**
Q*CF					-0.013 (-0.96)	
LQ*CF*Q						0.162 (0.25)
HQ*CF*Q						-0.009 (-0.58)
Adj. R^2	0.242	0.242	0.253	0.247	0.256	0.249

Table 3: Regression analysis of determinants of investment including governance and asymmetric-information characteristics

Regression results for the basic variables and interaction between cash-flow and Tobin's Q. The sample consists of 697 observations for 132 firms in the 1993 to 1998 period. The regression results in the row denoted BNK_DEBT are based on 639 observations. The definitions and data sources of the variables are in Table 1. The explained variable is investment in fixed assets over replacement value of fixed assets (I). The 2SLS regressions are presented in rows and contain firm and year dummies (results not reported). ΔNWC is instrumented by the beginning-of-the-period net working capital and SLS is instrumented by one-period lagged SLS. Explanatory variables are in second column until the eighth column. *CG* and *AI* refer to the proxies in the first column that are relevant in, respectively the managerial-discretion problem and the asymmetric-information problem. LQ is 1 for the one-third of the firms with lowest average Tobin's Q, and 0 otherwise; HQ is 1 for the two-thirds of the firms with highest average Tobin's Q, and 0 otherwise. The *t*-values are in parentheses. Significant coefficients are indicated by * (10% level), ** (5% level), and *** (1% level).

Panel A: Managerial-discretion problem

CG:	Q	ΔNWC	SLS	LQ* CF	LQ* CF**CG*	HQ* CF		Adj. R^2
(1) C1_EQ	0.124 (3.85)***	-0.187 (-3.30)***	0.022 (4.41)***	0.703 (2.61)***	-0.007 (-0.83)	0.161 (2.14)**		0.245
(2) SR	0.126 (3.91)***	-0.187 (-3.30)***	0.024 (4.70)***	-0.031 (-0.09)	0.682 (1.65)*	0.146 (1.98)**		0.247
(3) LN(1+DEF)	0.126 (3.90)***	-0.189 (-3.30)***	0.023 (4.64)***	-0.105 (-0.27)	0.580 (1.66)*	0.151 (2.04)**		0.246

Panel B: Managerial-discretion and Asymmetric-information problems

CG/AI:	Q	ΔNWC	SLS	LQ* CF	LQ*CF* *CG*	HQ* CF	HQ*CF* *AI*	Adj. R^2
(4) INS_EQ	0.127 (3.81)***	-0.205 (-4.62)***	0.024 (4.76)***	0.171 (0.78)	0.026 (2.31)**	0.158 (2.03)**	-0.0003 (-0.24)	0.253
(5) HIGH_DIV	0.123 (3.72)***	-0.197 (-3.93)***	0.024 (4.70)***	0.628 (3.19)***	-0.430 (-0.98)	0.173 (2.20)**	-0.053 (-0.54)	0.247
(6) DEBT	0.133 (4.07)***	-0.198 (-3.23)***	0.022 (4.15)***	1.128 (4.13)***	-3.972 (-3.81)***	0.135 (1.83)*	0.345 (1.18)	0.258
(7) BNK_DEBT	0.069 (1.86)*	-0.238 (-4.39)***	0.019 (3.51)***	1.253 (4.99)***	-4.944 (-4.28)***	0.249 (2.90)***	0.606 (1.85)*	0.296
(8) BNK_EQ	0.124 (3.84)***	-0.193 (-3.39)***	0.022 (4.39)***	0.612 (2.99)***	-0.010 (-0.77)	0.147 (1.86)*	0.002 (0.62)	0.242
(9) BNK_IL	0.122 (3.74)***	-0.184 (-3.24)***	0.022 (4.39)***	0.555 (2.86)***	-0.004 (-0.04)	0.162 (2.16)**	-0.021 (-0.37)	0.245

Panel C: Asymmetric-information problem

AI:	Q	ΔNWC	SLS	LQ* CF		HQ* CF	HQ* CF**AI*	Adj. R^2
(10) LN(RVTA)	0.155 (4.77)***	-0.143 (-2.82)***	0.025 (5.23)***	0.437 (2.47)**		0.506 (3.63)***	-0.093 (-3.44)***	0.272
(11) INDUSTRY	0.102 (3.01)***	-0.212 (-3.68)***	0.025 (4.80)***	0.601 (3.11)***		0.061 (0.69)	0.232 (2.34)**	0.242
(12) IPO	0.111 (3.11)***	-0.186 (-3.29)***	0.022 (4.38)***	0.558 (2.93)***		0.171 (2.17)**	-0.042 (-0.76)	0.246

t-values for the differences between subsamples are in parentheses and are based on an independent samples *t*-test. Significant differences are indicated by * (10% level), ** (5% level), and *** (1% level).

	(1) Low Tobin's Q sample		**(2) High Tobin's Q sample**		**Difference between column (1) and (2)**	
Variable	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Diff.**	***t*-value**
I	0.161	0.325	0.249	0.321	-0.088	(-3.37)***
Q	0.923	0.136	1.645	0.832	-0.721	(-18.24)***
CF	0.190	0.186	0.523	0.676	-0.332	(-9.88)***
ΔNWC	0.072	0.482	0.134	0.701	-0.127	(-2.80)***
SLS	4.494	7.350	9.225	14.996	-4.731	(-5.59)***
TA	1700.24	3581.41	4581.76	16966.76	-2881.51	(-3.51)***
DIV	0.278	0.221	0.405	0.967	-0.127	(-2.69)***
HIGH_DIV	0.455	0.499	0.537	0.499	-0.082	(-2.04)**
DEBT	0.233	0.173	0.174	0.141	0.060	(4.54)***
BNK_DEBT	0.161	0.166	0.106	0.119	0.055	(4.34)***
BNK_EQ	9.293	11.258	6.927	9.856	2.367	(2.72)***
BNK_IL	0.119	0.175	0.112	0.158	0.007	(0.48)
C1_EQ	26.112	17.924	25.774	22.687	0.338	(0.21)
INS_EQ	5.273	17.219	6.382	18.788	-1.109	(-0.78)
SR	0.81	0.39	0.52	0.50	0.29	(8.40)***
PRIO	0.33	0.47	0.41	0.49	-0.08	(-2.10)**
CERT	0.36	0.48	0.38	0.49	-0.02	(-0.42)
PREF	0.65	0.48	0.62	0.49	0.04	(0.92)
DEF	2.165	0.899	1.934	1.045	0.229	(3.00)***
INDUSTRY	0.026	0.159	0.144	0.351	-0.118	(-6.09)***
IPO	0.113	0.317	0.309	0.463	-0.196	(-6.57)***
Observation	231		466			