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The effect of social interaction between Dutch firms on their investment behavior

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ABSTRACT

This thesis aims to research the extent to which endogenous interactions between different firms in a certain area affect their decision-making regarding investment. The research method is based on the study of Dougal, Parson and Titman (2015), where they found a significant area effect on the investment expenditures of U.S. public firms. Performing the same regressions for the Dutch firms, I found ambiguous results. The first regression suggested that the area effect on investments is about one-fifth more than the industry effect. Moreover, a comovement in debt issuance suggest that firms located in the same area are inclined to raise debt together. Thus, a part of the area effect can be assigned to the fluctuations of real estate value since firms use real estate as collateral for new loans. When using the determinant of investment such as Tobin's q and cash flow as variables instead of the investment itself, the industry effect is stronger, contradicting the results of first regression. However, the results cannot be confirmed due to the statistical insignificance.

I. INTRODUCTION

For a long time, the prior literature has been researching the relationship between a firm's location and economic factors. Dougal, Parson and Titman (2015) found a partial correlation between firms' investment opportunities and investment rates and a persistent cross-city variation in investment opportunities. To be more precise, the effect of the city in which two firms are located was more than half as large as the effect of two firms' industry. Simply put, a firm's investment correlates strongly with the investment of its neighboring firms regardless of their industry discrepancies. This thesis attempts to conduct a similar research to explore the same effect for the Dutch market. Since the Netherlands is a much smaller country compared to the United States, the results of this study will contain information about the scale of the effect observed by Dougal, Parson and Titman (2015) and therefore will complement the literature on the relationship of social interactions and investment expenditure of different firms.

The main focus is to test for endogenous interaction effects between firms' investment expenditure, e.g., by knowledge spillover between the management firms. Thus, the research question is stated as follows. Does endogenous interaction between the top executive of different Dutch public firms in a certain area affect their investment behavior? The idea behind this is that the same investment opportunities will be available to firms that are headquartered in the same area because of the interaction between these firms.

As an illustration, consider the following example of the Utrecht based Ziggo NV and the Noord-Holland based TELE2. These are both firms in the telecommunication industry and thus compete in the same market, but are headquartered and managed in different provinces. For each year in the available data, the investment rate of Ziggo NV and TELE2 are observed and compared to the to see if they relate to the rate of other non-local telecommunication firms such as the Zuid-Holland based KPN NV (same industry, different area). The same is done to the investment rate of firms located in the same respective provinces but in different industries (different industry, same area). For instance, the investment rate of TELE2 is explained with the investment rate of other Noord-Holland companies such as the retail firms Ahold Delhaize and PROSUS NV.

With the result of the Dougal, Parson and Titman (2015) in mind, the first hypothesis of the thesis state that the investment of a firm has a positive effect on the investment of other firms that are located in the same area regardless of their industry. If that is indeed the case, an obvious sequential thought would be that the investment correlation between firms within the same industry as well as the same is even stronger. That paves the way for the second hypothesis, which states that the investments of firms in the same industry and the same area have a more significant effect on each other's investments than firms in a different industry.

The structure of this paper is as follows. Chapter II gives an overview of previous research related to this subject, followed by the data descriptions in chapter III. A more in-depth explanation of the research method that replicates the method used in Dougal, Parson and Titman's (2015) paper as precisely as possible will be provided in chapter VI. Naturally, there are inevitable differences that also will be discussed. The main empirical results will be addressed in chapter V. Lastly, chapter IV and V will consider the conclusion and discussion, respectively.

II. Investment and Location

There is no shortage of studies that link the location of a firm to various economic factors and then explore the potential relationship between them. Dougal, Parson and Titman (2015) found a partial correlation between investment opportunities and investment rates of firms and a persistent cross-city variation in investment opportunities. This correlation could be the result of exogenous effects as well as endogenous interactions. Examples of exogenous effects are area attributes such as infrastructure or good weather that attract certain types of firms. Endogenous interactions could be knowledge spillovers due to management interactions of different firms in the same area, also referred to as vibrancy. When ruling out the exogenous effect and focusing solely on the endogenous interactions, an important role is found for time-varying locational factor in determining the investment expenditure of a firm. More precisely, the area effect in which two firms are located is found to be more than half as large as the industry effect in which the two firms operate (Dougal, Parson & Titman, 2015). In other words, there is a strong correlation between a firm's investments with the investments of its neighboring peers irrespective of their industry dissimilarities.

These findings are not shocking since the spillover of private information in a particular area is a topic that has been studied earlier, and similar results were found. Coval and Moskowitz (2001) found a robust geological connection between performance and mutual fund investments. The abnormal return earned by the managers in their geographically nearby investments were significantly higher. These higher abnormal returns can be interpreted as a compensation for the efforts of acquiring information about other local firms (Coval & Moskowitz, 2001).

Extending these results Pirinsky and Wang (2006) found that the stocks of companies located in the same area showed a significant comovement. Even the firms that moved to a new location experienced an increase in the comovement of their stocks with the stocks of the new location while the comovement with the previous location faded away.

Even more impressive is the finding that the investment similarities between two firms decrease when an employee, who served as a connection between the two firms, dies (Fracassi, 2017). Social connections defined as characteristics such as employment and education among others, Fracassi (2017) found that more and stronger connections between two firms resulted in a more similar investment behavior between two firms. However, this study's social relations are not tied to a specific location, i.e., two firms could be located in a very different area but still show a correlation in investment expenditure through the mentioned social ties. In contrast, there is a strong emphasis on social interactions between two firms that are a product of their location in this paper.

Figure 1 shows the investment rate per year for all the firms located in the ten Dutch provinces. Provinces Friesland and Drenthe are not included since no public firm is headquartered in either of the two provinces. Hence Figure 1 only shows ten provinces instead of twelve. Note that there is not much difference between the highest quartile (blue line), medium quartile (orange line), and the lowest quartile (gray line) up until 2013.

From 2013 onward, there is a large difference evident between the highest quartile and the other two quartiles. This difference is persistent since the lines do not cross each other after 2013, whereas before 2013 the lines looked intertwined. Noteworthy is that from 2014 onward, the provinces Noord-Holland in the highest quartile shows an investment rate of approximately three times as the rate of cities in the lowest quartile, such as Zuid-Holland. This is surprising since Zuid-Holland has the second-highest firm concentration in the Netherlands after Noord-Holland (table 1 pane A and B).

Given that there is a relationship between investment rate and investment opportunities, Figure 1 shows a difference between investment opportunities and investment rates across the provinces, at least from 2013 to 2019. There are a few possible explanations for this existing difference. Dougal, Parson and Titman (2015) mentioned exogenous factors such as the difference in infrastructure, weather, or political setting as possible explanations. However, these factors do not apply to The Netherlands since it is a much smaller country. Contrary to the United States, the infrastructure, weather, and political setting regarding taxation are more or less the same across the whole country. Another endogenous effect is the spillovers that arise from the interaction of people who live in the same city and are somehow connected to different firms. The focus of the thesis is mainly on this endogenous factor.

An exogenous factor that could affect firms investments in a city in the United States as well as in The Netherlands is the real estate prices. Even though The Netherlands is a small country, the real estate prices can differ drastically across different neighborhoods, let alone across different provinces. The real estate value can affect the debt capacities of firms since firms use assets like real estate as collateral in issuing additional debt to finance new investment projects. Collateral can be seen as an instrument to enforce new loans (Barro, 1976). An increase of 0.6% in investment is observed when the firm's real estate value appreciates with 10% (Chaney, Sraer & Thesmar, 2012). A similar result was found by Gan (2007), where the effect was most significant in the manufacturing industry (see also Tuzel (2010)). Naturally, this paper also conducts an analysis, which is explained in the latter parts, to eliminate the effect of real estate price fluctuations.

III. DATA

The data for this research comes from two primary sources. COMPUSTAT is used to obtain the company fundamental data for all listed public firms in The Netherlands. The stock prices and stock return data are obtained from EIKON. The fundamental data in COMPUSTAT was not complete until 1994; hence the data start from 1994 to 2019.

Using the 4-digit SIC code, each firm is assigned to an industry 'i' according to the French and Fama 12 industry classifications as listed in appendix A. The postal code is used to locate the province in which the firm is headquartered. These provinces are called economic area 'a' from now on. There is a total of twelve economic areas, but since there is no observation for Drenthe and Friesland, they are excluded. That leaves us a total of ten areas. After constructing the variables of the firm fundamentals, a winsorization is applied to minimize the outliers. 1% and 99% winsorization did not remove the outliers sufficiently, and thus a 2.5% and 97.5% winsorization is implemented.

Table I panel A demonstrates the firm distribution of the data. As mentioned earlier, the two economic areas with no observations are excluded, resulting in a total of ten areas. These areas are listed in the first column of the table in a descending order based on their total population in 2017. Next to that, the average number of firms is shown for each economic area. For example, Noord-Holland has housed on average 48 firms each year, which means that it has historically the highest firm concentrated among the provinces in the Netherlands according to our data. This is also shown by the 10th and 90th percentile. Furthermore, areas with a higher population, such as Zuid-Holland, Noord-Holland, Utrecht and also Noord-Brant, house on average more firms.

The following few columns show the aggregate market capitalization for each area. The last two columns present the rankings of the economic areas based on the number of firms and market capitalization. These two rankings do not differ much. The aggregate market capitalization for areas rich in energy is higher due to the firms' size, such as Zuid-Holland. For areas with an emphasis on manufacturing, the opposite is true, e.g., Flevoland.

Table I panel C breaks down the industry distribution for each area. For instance, the industry consumer non-durables (Non-Dur) represent on average 39% of the total market capitalization of the area Noord-Holland. It is evident that most of the areas show a significant industry clustering, i.e., nearly every area has a dominant industry. The most notable example is Limburg, with roughly 80% of the total market capitalization from the chemicals industry. However, these numbers are not surprising since the areas with the highest industry clustering are also the areas with the least number of firms. The Dutch market is characterized by a heavy firm concentration in the provinces Noord-Holland, Zuid-Holland and Utrecht (arguably also Noord-Brabant). These four areas host on average 81% of all firms in the Netherlands. Consequently, their industries are much more diversified in those areas.

Table II panel A gives an overview of the dependent and explanatory variables that we have constructed, divided into four panels. The first column of Panel A shows that in a standard year, the regression contains nearly 140 firms. Also, the standard deviation, minimum, 10th ,50th, 90th percentiles, and maximum are presented for the variables returns, cash flow, investment, debts issuance and Tobin's q. The same applies to panels B, C, and D, which gives the same summary for the three types of portfolios. These recurrent portfolios in this paper are comprised of firms in same industry-different are, different industry-same area and same industry-same area. Table II panel B presents the correlation matrix for the variables of the different portfolio types.

IV. METHOD

This paper aims to determine the relationship between the investments of different firms based in the same area in the Netherlands. First, an investment-investment (1) regression is constructed, which regresses firm investment on the investment of their area and industry rivals. In the second type of regression, the standard determinants of investment cashflow and Tobin's q are used as explanatory variables (2).

The first regression is as follows:

$$(1)$$

$$Investment_{j,t}^{i,a} = \sum_{K=0}^{2} \beta_{1,k}\, Investment_{p,t-k}^{i,-a} + \sum_{K=0}^{2} \beta_{2,k}\, Investment_{p,t-k}^{-i,a} + \sum_{K=0}^{2} \beta_{3,k}\, Investment_{p,-j,t-k}^{i,a} + \beta_4\ controls_t^{i,a} + \varepsilon_{j,t}^{a,i}$$

The output variable is the investment of a firm (j), defined by the capital expenditure in year 't' normalized by the last year's total assets (t-1). The firm j is headquartered in area 'a' in the year 't' and is operating in the field of 'i'.

Every firm j has a headquarter in one of the ten economic areas (described by the province names), denoted by the set a. The Fama-French 12 industry in which the firms operate is represented by the set 'i' and the time in years by the set 't'. The interpretation of the formula is best with the following example. Suppose that firm Heineken NV (j) in 2010 (t) is the observation unit. In this instance, 'a' would correspond with Noord-Holland, the headquarter of Heineken NV. The Fama-French industry #1, indicated by 'i', would refer to Consumer Non-Durables. This means that relative to Heineken NV, the other firms can be assigned to one of the following groups: same industry/same area (i, a), different industry/same area (-i, a), same industry/different area (i, -a) and different industry/different area (-i, -a).

Based in Overijssel, Grolsch NV (consumer non-durables industry) would be an example of a same industry/different area firm relative to Heineken NV. An example of a firm in the same industry/same area would be Numico NV, a consumer non-durable firm based in Noord-Holland. The telecommunication company based in Zuid-Holland is then an example of a different industry/different area company relative to Heineken NV. The purpose of structuring the regression in this way is to seclude the industry effects from area effects on the investment expenditures of a firm or its ability to raise capital from external sources.

Considering equation (1), the first regressor represents an equally weighted portfolio of firms in the same industry “i” as the firm “j” but in a different area (– a). Notice that the “p” refers to portfolio. This first regressor is in fact a control for the industry effect on the investment in the year “t” and the two preceding years t-1 and t-2. This makes it possible to obtain the year-to-year variation in the investment of the whole industry. For example, we can see if the investment rate of the consumer non-durable firms has increased between the years 2002 and 2003. β_1 is the coefficient that gives the sensitivity of the investment of firm “j” (in industry i and year t) to the variation in industry level. $\beta_{1,0}$ captures the sensitivity of the current year and $\beta_{1,1}$ and $\beta_{1,2}$ the sensitivities of the two previous years (t-1, t-2) respectively.

By the same token, the second explanatory variable's coefficient β_2 represents firm j's investment sensitivity to the investment attitude of neighboring firms (a) in a dissimilar industry (– i). For instance, β_2 estimates the investment sensitivity of Heineken NV (for the years t, t-1, and t-2) to that of AKZO Nobel NV, which operates in the chemicals industry and is located in Noord-Holland. This coefficient is of the main interest in this paper since it offers an estimate of the average area investment effect. Note that there are minor to no similarities in the products or services of corporations in dissimilar industries.

The third explanatory variable represents the portfolio that obtains the investment attitude of firms both in the same industry (i) and the same area as firm j. For instance, explaining the investment expenditure of Heineken NV by looking at the investment expenditure of the same industry/same area peer Numico NV. Since the first portfolio ($Investment_{p,t-k}^{i,-a}$) accounts for the aggregate industry effect and the second portfolio ($Investment_{p,t-k}^{-i,a}$) for the non-industry area effect, the coefficient β_3 can be seen as the interaction effect between area and industry. Moreover, it is not illogical to assume that the local information spillovers could be greater for firms in the same area when they also operate in the same industry.

Lastly, the control variable in the regression equation (1) covers firm, area, and year fixed effects. Including firm dummy variables both on the left and right side of the equation effectively diminishes the variables by the average values for each firm. Consequently, the time-series variation for each firm solely will identify the coefficient. The area dummies incorporate persistent discrepancies in investment rates between areas. At the same time these area dummies have little added value since all regressions contain firm fixed effects. The year fixed effects will absorb the average variation in the aggregated investment rates. These dummies are similar to market control.

The second equation is the investment-q regression, which is akin to equation (1). However, the explanatory variables in this regression are comprised of the standard determinants of investment, i.e., cashflow and Tobin's q, rather than the investment itself. Previous studies by Fazzari, Hubbard and Peterson (1988) have shown that the Tobin's q is a considerable investment rate determinant. Also, the same can be said about cash flow (Kaplan & Zingales (1997).

(2)

$$Investment_{j,t}^{i,a} = \phi + \sum_{K=0}^{1} \alpha_{1,k}\, q_{p,t-k-1}^{i,-a} + \sum_{K=0}^{1} \alpha_{2,k}\, q_{p,t-k-1}^{-i,a} + \sum_{K=0}^{1} \alpha_{3,k}\, q_{p,-j,t-k-1}^{i,a}$$
$$+ \sum_{K=0}^{1} \alpha_{4,k}\, cashflow_{p,t-k}^{i,-a} + \sum_{K=0}^{1} \alpha_{5,k}\, cashflow_{p,t-k}^{-i,a} + \sum_{K=0}^{1} \alpha_{6,k}\, cashflow_{p,-j,t-k}^{i,a}$$
$$+ \sum_{K=0}^{1} \alpha_{7,k}\, q_{j,t-k-1}^{i,a} + \sum_{K=0}^{1} \alpha_{8,k}\, cashflow_{j,t-k}^{i,a} + \alpha_9\, controls_t^{i,a} + \varepsilon_{j,t}^{a,i}$$

In this equation, the variables are also composed at the portfolio level and consequently estimate the same type of local or industry effects, or a combination of the two, as equation (1). The same kind of portfolio's q and portfolio's cash flow are shown successively in the first row respectively second row (2). There are merely two changes in this second equation. Instead of investment itself, the independent variables are now contemporaneous cash flow and lagged q.

The second change is the inclusion of q and cash flow for the firm itself, in addition to that of the area or industry neighbours. This is because in this equation, we use determinants as independent variables instead of investment itself. These firm-specific q and cash flow are presented by the variables with the coefficient α_7 respectively α_8 . The subscript j denotes that these variables are constructed at the firm-level, contrary to the other variables which are constructed at the portfolio level (p).

V. RESULTS

The result of regression (1) are presented in table III. The first column, investment (1), shows the result of a regression that includes only the first explanatory variable, i.e., using the average investment rates of a firm's industry to explain the firm's investment expenditure. The point estimate of 0.0194 $(t = 1.23)$ states that the typical firm's investment rate increases by about 0.0194% whenever the industry average investment rate increases by 1% relative to the long-term average.

The second column, investment (2), shows the results of the regression with only the second explanatory variable, which represents a firm's investment sensitivity to the investment behavior of neighboring firms (a) in a dissimilar industry (– i). The point estimate of 0.0250 $(t = 0.81)$ indicates that the investment sensitivity of a firm to the average investment-to-asset ratio of firms in the same area but different industry is about one-fifth more than the industry effect. When both the first and second explanatory variables are included in the third column, investment (3), the size of the area investment portfolio coefficient decreases slightly to 0.0222 $(t = 0.72)$ while the industry portfolio coefficient stays roughly the same 0.0196 $(t = 1.24)$.

The investment rate of the third and last portfolio is added to the regression in the fourth column, investment (4). This third portfolio includes firms in the same industry as well as the same area. Since the regression has already accounted for the firm's industry and area investment rate separately, it is convenient to see this third portfolio as the industry-area interaction term. A noteworthy consequence is that the magnitude of the different industry same area portfolio decreases and becomes negative -0.123 $(t = -2.57)$ with higher statistical significance. Also, the magnitude of the 'pure' industry portfolio (same industry-different area) increases both economically and statistically to 0.0427 $(t = 2.34)$ after including the third portfolio.

In other words, these results indicate that in estimating the change in a firm's investment rate, the investment expenditures of firms in the same area are, on the margin, less significant than the investment behavior of the firms in the same industry, even if they are headquartered in a different area. Firms within the same area are responsible for about one-fourth of the total industry effect, with the other 75% of the effect coming from the firms in different areas.

The one-year and two-year lag for every portfolio is shown in the fifth and sixth columns, investment (5) respectively investment (6). Consider the first three rows of column 6 for the same industry different area portfolio. It is apparent that none of the values are significant at a 5% significance level. Nevertheless, the lagged values are too small and insignificant compared to the contemporaneous value 0.0301 $(t = 1.10)$. That is to say, any information about investment opportunities that are revealed by the investments of firms in the same industry but different area as a firm, it is incorporated in that firm's investment plan expeditiously.

Conversely, the effects of a company's same area same industry peers materialize more slowly. The ninth row demonstrates that for this portfolio, the lagged investment rates with a point estimate of 0.0231 $(t = 1.24)$ are significant when compared with the contemporaneous value 0.0301 $(t = 1.16)$. This implies that approximately 70% of the total same industry same area effect manifests itself with a two-year delay.

Consider the results of the investment-q regression (2) in table IV. In the first column, investment (1), only the company's own lagged q and the contemporaneous cashflows are included. The same quantities but averaged over a firm's non-regional industry rivals are added in the second column, investment (2). The industry coefficient for q has a positive sign and it is statistically much stronger than the firm's own estimate for q. For instance, the value on industry q is 0.00122 $(t = 2.38)$ compared to the firm's own q 0.00117 $(t = 1.21)$. The coefficient on the own firm's cashflow has a greater estimate (0.0458). However, it is complicated to gauge the size of the real effect since it is inaccurately estimated $(t = 0.82)$.

In the third column, investment (3), the average q and cashflow are added for the company's regional peers headquartered outside its industry. Both the q and the cash flow estimates have negative values with a low t-statistics, which makes them statistically insignificant. Moving on to the fourth column, investment (4), contains both the average q and cash flow for the company's industry peers, inside as well as outside its operating area. It is evident in the fifth row of column four that the same industry average q has a positive point estimate. In contrast, the same area point estimate had a negative value (ninth row of column four).

Suffice to state that these estimates are of small magnitude, which makes them economically insignificant. Row thirteen of the fourth column denotes that the average q and of a company's industry and area peer matters to a certain extent relative to the other variables. The same can be partially said about the average cash flow (row fifteen), but the statical significance lower.

In the last column, investment (5), the same specification is repeated as the fourth column, with the addition of a one-year lag for both explanatory variables. It is conspicuous that in almost all cases, the two-year lagged q and the one-year lagged cash flow drop in value and statistical significance except for the firm's own cash flow. These findings are the most significant result of this regression with a value of 0.0870 $(t = 3.92)$ and 0.0656 $(t = 3.24)$ for the contemporaneous and one-year lagged cash flow respectively. This indicates that the lagged coefficient is roughly 75% as strong as the contemporaneous value. In other words, cash flow fluctuations impact is evidently not restricted to the current investments but influences futures investment also. This is consistent with the finding of previous studies in which a firm's own cash flow appears to be a reliable predictor of its investments (Fazzari, Hubbard & Peterson, 1988).

AREA SHOCKS

Tables III and IV imply a mild comovement in the cross-industry investments of nearby firms and a much stronger correlation in the investment of firms in the same industry. However, these correlations could be caused by time-varying exogenous area shocks without involving endogenous interactions. Examples of these exogenous shocks could be anything from turmoil in local politics to extreme weather. Although the beforementioned examples are rare in the Netherlands, it is still reasonable to carry out the additional test since it also rules out other external area shocks. Therefore, the following section presents a test to differentiate endogenous interactions from exogenous shocks.

This test starts by identifying the provinces where a regional dominant industry distinctly exists. In this paper, three provinces have a dominant industry, where historically more than 30% of market capitalization is concentrated and which also has a sufficient number of firms outside the dominant industry. These provinces are unsurprisingly Noord-Holland (Industry 1 - Consumer Non-durables), Utrecht (Industry 9 – Retail), and Zuid-Holland (Industry 4 – Energy).

The next step is to assess local vibrancy through industry-level fluctuations in the dominant industry of the provinces. For instance, the energy sector fluctuation for the entire economy will be used as an indicator of Zuid-Holland's vibrancy. The main point is to see if the non-energy companies in the province Zuid-Holland respond disproportionately to the energy industry fluctuation in the Netherlands, in comparison with other non-energy companies headquartered in provinces in which energy is of lesser importance.

The results of these tests are presented in Table 5A. The approach of these area-level regressions is comparable to all the earlier regressions. The only difference is that now the local vibrancy is measured through a single, dominant industry. It is evident in the second row that the local, dominant portfolio seems to be important for measuring the investment rate of neighboring firms, even after controlling for the firm’s industry investment rate. This is mostly the case for the provinces Noord-Holland and Utrecht. The latter province provides the most statical significant results, which indicate that the local portfolio and the industry effect are very comparable. The locally dominant portfolio for Zuid-Holland contains only four firms and therefore does not meet the requirement of at least ten firms. For that reason, not a lot of emphasis is put on the results of province Zuid-Holland as these results can be heavily influenced by one or two firms.

Table 5B rules out the possibility of time-varying area shocks impacting both the province’s dominant industries as well as other regional firms. Here, every same area dominant industry portfolio is replaced with an industry portfolio that contains firms from outside the area. For instance, the consumer non-durable (industry 1) portfolio does not contain any Noord-Holland based firm in the first column. It simply presents the correlation of firms located in Noord-Holland that are not in the non-durables industry with the market’s non-durable portfolio. Since there are no local independent variables, time-varying area shocks cannot impact the results.

The first and second column of table 5B indicates that in predicting Noord-Holland and Utrecht's investment rates, the market-wide industry performance of the province’s most dominant industry is an even more significant determining factor of investments than the firm’s industry itself (row 1). This is most evident in the second column for the area Utrecht as both of its results are statistically significant. The investment predicting power of the area’s most dominant industry portfolio is weaker in Zuid-Holland, but those results are statistically insignificant.

Real estate value

When assessing investments in an area, the price fluctuation of the real estate in that area could have a critical effect that can be overlooked. The general concept is that real estate owning firms in the same area may face similar fluctuation in their debt raising capacity. This would be due to the fact that real estate can be used as collateral in raising debt (Chaney, Sraer & Thesmar, 2011). These fluctuations in the real estate prices can be caused by exogenous shocks such as bad weather or natural calamities. However, there are highly unlikely in the case of a small country that is the Netherland. A natural catastrophe would affect the whole country more or less the same, and the weather does not differ much from one province to another.

The mere presence of successful firms in an area and their demand for property can also affect the real estate price. Subsequently, the neighboring firms can benefit from this extra demand as it eases the financial constraint. This can be seen as a special form of endogenous interaction between firms located in the same area. The magnitude of this interaction can be interpreted by analyzing the debt issuance of the firms in the same manner as analyzing the investments. This results in the following equation:

$$(3)$$

$$Debt\ iss._{j,t}^{i,\,a} = \sum_{K=0}^{2} \lambda_{1,\ k}\, Debt\ iss._{p,t-k}^{i,-\,a} + \sum_{K=0}^{2} \lambda_{2,\ k}\, Debt\ iss._{p,t-k}^{-i,\,a} + \sum_{K=0}^{2} \lambda_{3,\ k}\, Debt\ iss._{p,-j,t-k}^{i,\,a} + \lambda_4\, controls_t^{i,\,a} + \varepsilon_{j,\ t}^{a,i}$$

The results of this regression, where investments are substituted by debt issuance, are presented in table 6. The first column, debt issuance (1), implies that same industry firms do not raise debt together. With a point estimate of -0.0103 ($t = -1.13$), there is in fact a negative relationship between the debt issuance of firms in the same industry. However, this relationship is very small and thus insignificant. The correlation between a firm's debt issuance rate and the debt issuance rate of its non-industry local neighbors is economically significant (column 2). A coefficient of 0.244 implies that the firms located in the same area raise debt contemporaneously. This relationship remains more or less the same when the industry effect is added (column 3).

The fifth and sixth column adds the 1-year and 2-year lags of the independent variables. This shows the importance of debt issuance in the next two years due to the delayed effect. However, the statistical insignificant of the founded coefficient also must be taken into account. In other words, the results are imprecisely estimated, which makes it challenging to gauge the magnitude of the true effects. Broadly, considering the existence of a comovement in the debt issuance of local firms, you could argue that the investment effect at least partially can be caused by fluctuation in collateral value. That is, of course, given that the results are also statistically significant.

VI. CONCLUSION

This paper's main point is to study the extent to which top executives of Dutch public firms share information and influence each other's investment decisions in a certain area. The idea is that the employees of different firms located in the same area interact with each other through social networks and consequently share ideas about certain investment opportunities. Accordingly, the first hypothesis stated that the investment expenditures of firms located in the same area positively correlate regardless of their industry. Secondly, this paper hypothesized that the investment effect is stronger for firms that operate in the same industry and share the same headquarter location.

Considering merely the economic significance of the results, the investment-investment regression suggests that there is an area and industry effect evident. The investment sensitivity of a firm to the investment rate of firms in the same area but different industry is about one-fifth more than the industry effect. This higher area effect can partially be attributed to the fluctuations in the collateral value since a comovement was detected in the debt issuance of a firm located in the same area.

However, when instead of using investment on both sides of the equation, we use investment determinant, i.e., Tobin's q and cash flow, as the independent variables, slightly different results are found. In that case, the industry effect is stronger whereas as the area effect and even the firm's own estimate for q is less pronounced. In other words, in estimating the change of a firm's investment rate, the investment expenditure of firms in the same area is less important than the investment behavior of the firms in the same industry, even if they are headquartered in a different area.

The findings of the investment-q regression are also statistically much stronger than the results of the investment-investment regression. It is noteworthy that the industry effect through the investment determinant q marks the only statistically significant result at a 5% significance level of this research. In neither regression is there a stronger area effect for local firms that also operate in the same industry, which is not in line with the second hypothesis. There is some evidence for the first hypothesis, especially in the first regression. However, the results are statistically insignificant due to the small size of the data and therefore, cannot provide reliable information about the true effect.

VII. Discussion

As mentioned before, this research was conducted using Dutch public firm fundamental data retrieved from COMPUSTAT. However, there are some serious limitations that need to be addressed. First of all, the biggest issue is the sample size. On average, there are less than 140 firms per year to analyze since The Netherlands is a relatively small country and naturally host fewer firms than a country like the United States. Also, COMPUSTAT only provided reliable data starting from 1994 to 2019, i.e., a period of 25 years. In comparison, the research of Dougal, Parson and Titman (2015) have on average close to 3000 firms per year from 1970 to 2009, which is a period of almost 40 years.

Not only is the sample size much smaller in the Netherlands, but company locations are also not evenly distributed evenly across the country. For example, the provinces Noord-Holland and Zuid-Holland are home to more than fifty-five percent of the public firms. Including Utrecht increases that percentage to 70%. To ensure that the portfolios are reasonably diversified, all portfolios require more than five firms. However, that is not feasible in this research.

Therefore, the regressions are based mainly on the data from a few firms that are situated in areas with many firms. That is because finding a company outside a region is possible, but finding a company from the same industry (different area) inside many other regions is not possible, which means that the results are based on just a few regions. The panel is for that reason short, which was to be expected since the number of companies in a developed, but small economy is low. In order to have a good estimate on area effects for further research, a larger sample size is needed in a market where the firms are somewhat evenly spread. Consulting a database that contains information for a longer period could also help the accuracy of the research.

REFERENCE

Barro, R. J. (1976). The loan market, collateral, and rates of interest. *Journal of money, Credit and banking, 8*(4), 439-456.

Chaney, T., Sraer, D., & Thesmar, D. (2012). The collateral channel: How real estate shocks affect corporate investment. *American Economic Review, 102*(6), 2381-2409.

Coval, J. D., & Moskowitz, T. J. (2001). The geography of investment: Informed trading and asset prices. *Journal of political Economy, 109*(4), 811-841.

Dougal, C., Parsons, C. A., & Titman, S. (2015). Urban vibrancy and corporate growth*. The Journal of Finance*, *70*(1), 163-210.

Foucault, T., & Fresard, L. (2014). Learning from peers' stock prices and corporate investment. *Journal of Financial Economics, 111*(3), 554-577.

Fracassi, C. (2017). Corporate finance policies and social networks. *Management Science, 63*(8), 2420-2438.

Frick, S. A., & Rodríguez-Pose, A. (2017). Big or Small Cities? On city size and economic growth. *Growth and Change*, *49*(1), 4-32.

Gan, J. (2007). Collateral, debt capacity, and corporate investment: Evidence from a natural experiment*. Journal of Financial Economics, 85*(3), 709-734.

Pirinsky, C., & Wang, Q. (2006). Does corporate headquarters location matter for stock returns?. *The Journal of Finance*, *61*(4), 1991-2015.

Tuzel, S. (2010). Corporate real estate holdings and the cross-section of stock returns. *The Review of Financial Studies, 23*(6), 2268-2302.

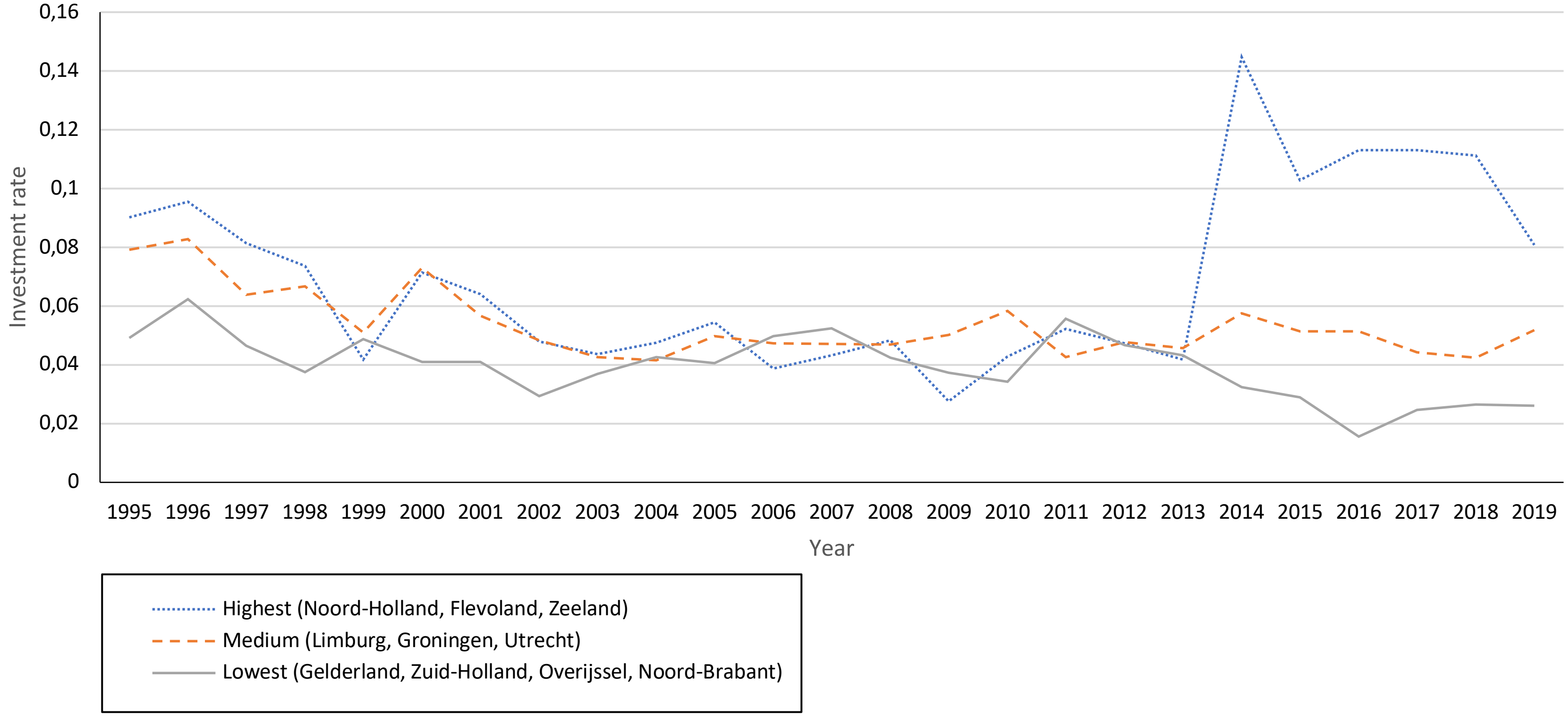

Figure 1. Average investment rate per area. This figure shows the annual average investment rate (capital expenditure normalized by the last years assets) for three sets of grouped provinces. The blue line consists of the three provinces with the highest aggregate average investment rate over the entire period. The gray line represents the four provinces with the lowest average investment rates. Provinces Friesland and Drenthe are excluded since there is no observations in those provinces.

Table I
General area statistics

This table present the statistic for the ten economic areas (provinces), listed in descending order based on their population in 2017. The following column after population in panel A show the mean, standard deviation, 10th, 50th and 90th percentiles for the number of firms and market capitalization per area. The market capitalization is in billions of Euro's. The last two columns rank the provinces based on the number of firms and market capitalization respectively. Panel B displays the same characteristics as panel A without the inclusion of missing market capitalization. Panel C show for each province the average market capitalization per industry relative to the total market capitalization. The industry abbreviations are in accordance to table VII.

Panel A: Area statistics including firms with missing market capitalization

		Number of firms					Market capitalization						
Economic Area	Population	Mean	Sd	10th	50th	90th	Mean	Sd	10th	50th	90th	Rank by number of firms	Rank by capitalization
Zuid-Holland	3,650,222	29	7	20	28	39	130	93	56	107	244	2	1
Noord-Holland	2,809,483	48	8	39	49	57	109	62	38	93	203	1	2
Noord-Brabant	2,512,531	15	5	11	14	21	37	26	2	40	67	4	3
Gelderland	2,047,901	8	4	4	7	15	1	2	0	1	3	5	9
Utrecht	1,284,504	19	8	12	17	32	11	6	6	10	20	3	5
Overijssel	1,147,687	7	2	5	7	9	2	2	0	1	4	6	7
Limburg	1,117,546	5	2	4	5	8	7	5	1	7	13	7	6
Groningen	583,581	1	0	1	1	1	0	0	0	0	0	10	10
Flevoland	407,818	3	1	2	3	4	2	1	0	1	3	8	8
Zeeland	381,568	2	1	1	2	2	15	24	0	9	33	9	4

correlation between ranks 0,650

Table I

General area statistics – continued

Panel B: Area statistics excluding firms with missing market capitalization

Economic Area	Population	Number of firms					Market capitalization					Rank by number of firms	Rank by capitalization
		Mean	Sd	10th	50th	90th	Mean	Sd	10th	50th	90th		
Zuid-Holland	3,650,222	24	7	18	22	34	130	93	56	107	244	2	1
Noord-Holland	2,809,483	32	5	27	33	37	109	62	38	93	203	1	2
Noord-Brabant	2,512,531	14	4	10	13	20	37	26	2	40	67	4	3
Gelderland	2,047,901	7	4	4	6	14	1	2	0	1	3	5	9
Utrecht	1,284,504	16	6	10	16	27	11	6	6	10	20	3	5
Overijssel	1,147,687	6	1	4	6	7	2	2	0	1	4	6	7
Limburg	1,117,546	3	1	2	3	5	7	5	1	7	13	7	6
Groningen	583,581	0	0	0	0	0	0	0	0	0	0	10	10
Flevoland	407,818	2	1	1	2	3	2	1	0	1	3	8	8
Zeeland	381,568	1	1	1	2	2	15	24	0	9	33	9	4
correlation between ranks			0,636										

Table I
General area statistics – continued

Panel C: Market capitalization in percent per industry

	Industry											
Economic Area	Non-Dur	Durbl	Manuf	Energy	Chems	BusEq	Telcm	Utils	Retails	Health	Finance	Others
Noord-Holland	**39,03**	0,58	3,55	1,42	11,06	4,16	0,64	0,00	15,19	17,77	0,00	6,59
Flevoland	0,00	0,00	70,59	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	29,41
Zeeland	0,00	0,00	38,74	0,00	0,00	61,26	0,00	0,00	0,00	0,00	0,00	0,00
Limburg	0,00	0,00	9,55	0,00	79,83	0,00	7,17	0,00	2,83	0,62	0,00	0,00
Groningen	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Utrecht	5,07	10,30	17,47	0,00	0,25	14,74	8,91	0,08	**31,39**	0,00	0,00	11,79
Gelderland	9,72	1,22	26,81	0,00	2,52	55,59	0,00	0,00	3,37	0,00	0,40	0,37
Zuid-Holland	0,14	0,00	18,61	**42,44**	2,28	13,02	7,07	0,00	0,95	0,84	0,00	14,65
Overijssel	25,57	10,38	63,45	0,00	0,00	0,60	0,00	0,00	0,00	0,00	0,00	0,00
Noord-Brabant	0,01	0,02	99,91	0,00	0,00	0,01	0,00	0,00	0,02	0,01	0,00	0,03

Table II
Portfolio statistics

Panel A of this table shows the annual statistics mean, standard deviation, minimum, 10^{th}, 50^{th}, and 90^{th} percentiles, and maximum for firm and portfolio level variables. The variables consist of Returns, cash flow, investment, debt issuance and Tobin's q. The formula for constructing these variables are listed in Appendix A. The total number of firm's per year (observation per year) and the number of firms per portfolio (#firms per portfolio) are also provided in panel A. Panel B shows the correlation matrix for the different types of portfolios.

Panel A: Portfolio level statistics

	Mean	Sd	Min	10^{th}	50^{th}	90^{th}	Max
Panel A: Firms							
# total firms	139,16	26,24	90,00	107,00	135,00	176,00	189,00
returns	0,09	0,21	-0,49	-0,20	0,12	0,38	0,41
Cash flow	0,10	0,02	0,04	0,07	0,09	0,13	0,15
investment	0,06	0,02	0,04	0,04	0,05	0,08	0,09
debt issuance	0,04	0,09	-0,05	-0,03	0,02	0,10	0,37
q	1,79	2,30	0,72	0,78	1,07	1,54	9,36
Panel B: Same industry, different area portfolios							
# firms per portfolio	10,44	9,82	0,00	1,00	5,00	25,00	42,00
returns	0,08	0,31	-0,57	-0,33	0,08	0,43	2,94
Cash flow	0,07	0,52	-0,17	0,03	0,08	0,17	0,97
investment	0,06	0,05	0,00	0,02	0,04	0,11	0,97
debt issuance	0,01	1,28	-0,20	-0,07	0,01	0,12	1,93
q	1,41	1,82	0,26	0,50	0,99	2,11	19,07
Panel C: Different industry, same area portfolios							
# firms per portfolio	13,92	15,16	1,00	1,00	8,00	39,10	60,00
returns	0,08	0,32	-0,70	-0,29	0,09	0,44	1,22
Cash flow	0,06	0,19	-0,90	0,01	0,08	0,15	0,40
investment	0,05	0,04	0,00	0,02	0,04	0,09	0,28
debt issuance	0,03	0,12	-0,19	-0,06	0,01	0,13	0,70
q	1,22	1,43	0,32	0,53	0,94	2,00	18,50
Panel D: Same industry, same area portfolios							
# firms per portfolio	1,16	2,25	0,00	0,00	0,00	3,00	16,00
returns	0,08	0,42	-0,73	-0,37	0,05	0,52	2,92
Cash flow	-0,11	2,44	-1,46	-0,02	0,09	0,17	2,01
investment	0,06	0,08	0,00	0,01	0,04	0,11	1,17
debt issuance	-0,04	1,95	-0,26	-0,08	0,00	0,15	1,93
q	1,28	1,49	0,19	0,37	0,90	2,41	19,07

Table II
Portfolio statistics – continued

Panel B: Correlation matrix

		Same industry / different area					Different industry / same area					Same industry / same area				
		Ret	Cash	Inv	Debt	q	Ret	Cash	Inv	Debt	q	Ret	Cash	Inv	Debt	q
Same Ind./ same Area	Return	1,00														
	Cash flow	0,04	1,00													
	Investment	0,00	0,07	1,00												
	Debt iss.	-0,01	0,01	0,05	1,00											
	q	0,15	-0,18	-0,02	0,17	1,00										
Same ind./ diff. area	Return	0,35	0,05	-0,02	0,01	0,05	1,00									
	Cash flow	0,11	-0,01	0,02	0,00	0,07	0,05	1,00								
	Investment	-0,02	-0,01	0,07	-0,02	0,03	0,02	0,10	1,00							
	Debt iss.	-0,01	0,00	-0,02	0,00	0,00	-0,01	0,02	0,06	1,00						
	q	0,02	0,04	0,03	0,02	0,12	0,09	-0,03	0,01	0,06	1,00					
Diff. Ind./ same area	Return	0,62	-0,01	-0,02	0,01	0,06	0,38	0,09	-0,01	-0,01	0,04	1,00				
	Cash flow	0,14	0,04	0,12	0,01	-0,03	0,00	0,00	0,03	0,00	0,03	0,28	1,00			
	Investment	-0,02	0,01	0,32	0,02	-0,07	0,05	0,02	0,02	-0,03	0,03	0,05	0,29	1,00		
	Debt iss.	-0,04	-0,02	0,09	0,04	0,04	0,02	0,01	0,00	0,00	0,00	-0,07	-0,21	0,27	1,00	
	q	0,00	0,01	-0,04	0,01	0,11	-0,01	0,01	-0,02	0,04	0,03	0,03	-0,13	-0,11	0,08	1,00

Table III
Investment – investment regression

This tables show the results of regression (1), listed in appendix B. The dependent variable is the investment at time t for firm j, operating in industry i and located in area a. In addition to the contemporaneous values, the 1-year and 2-year lagged values are included too, alongside the year and area fixed effects. Standard errors are clustered by industry.

	(1) Investment	(2) Investment	(3) Investment	(4) Investment	(5) Investment	(6) Investment
Same industry / different area						
Investment (contemp.)	0.0194 (1.23)		0.0196 (1.24)	0.0427* (2.34)	0.0519 (1.95)	0.0301 (1.10)
Investment (1 year lag)					-0.0109 (-0.53)	0.00930 (0.34)
Investment (2 year lag)						-0.00886 (-0.42)
Different industry / same area						
Investment (contemp.)		0.0250 (0.81)	0.0222 (0.72)	-0.123* (-2.57)	-0.0841 (-1.36)	-0.0956 (-1.43)
Investment (1 year lag)					-0.0969 (-1.58)	-0.0674 (-1.03)
Investment (2 year lag)						0.0228 (0.35)
Same industry / same area						
Investment (contemp.)				0.0117 (0.66)	0.0102 (0.44)	0.0301 (1.16)
Investment (1 year lag)					0.00191 (0.10)	-0.0172 (-0.67)
Investment (2 year lag)						0.0231 (1.24)
Constant	0.0635*** (11.47)	0.0611*** (9.63)	0.0604*** (9.27)	0.0922*** (9.66)	0.104*** (10.25)	0.0885*** (7.50)
N	3111	3117	3099	2555	2449	1952
R^2	0.187	0.187	0.187	0.187	0.180	0.143
adj. R^2	0.175	0.176	0.175	0.173	0.164	0.123

t statistics in parentheses
** p < 0.05, ** p < 0.01, *** p < 0.001*

Table IV
Investment – q regression

The table in the next page show the results of regression (2), listed in appendix B. The dependent variable is the investment at time t for firm j, operating in industry i and located in area a. In this regression the firm j's own q and cash flow are included also alongside the year and area fixed effects. Standard errors are clustered by industry.

Table IV
Investment–q regression – continued

	(1) Investment	(2) Investment	(3) Investment	(4) Investment	(5) Investment
Own firm					
q (1 year lag)	0.00146	0.00117	0.00137	0.00120	0.000121
	(1.24)	(1.21)	(1.13)	(0.88)	(0.09)
2 year lag					-0.000405
					(-0.25)
Cashflow	0.0472	0.0458	0.0456	0.0375	0.0870**
	(0.85)	(0.82)	(0.82)	(0.70)	(3.92)
1 year lag					0.0656*
					(3.24)
Same industry / Different area					
q (1 year lag)		0.00122*		0.000614	0.000325
		(2.38)		(1.63)	(0.73)
2 year lag					-0.000659
					(-1.11)
Cashflow (contemp.)		-0.0265		-0.0435	0.0215
		(-0.92)		(-1.07)	(0.91)
1 year lag					-0.0379
					(-1.15)
Different industry / same area					
q (1 year lag)			-0.00346	-0.00825	-0.00285
			(-0.80)	(-1.24)	(-0.47)
2 year lag					-0.00428
					(-0.86)
Cashflow (contemp.)			-0.0292	-0.179	-0.0758
			(-0.48)	(-1.19)	(-0.54)
1 year lag					-0.0548
					(-0.45)
Same industry / same area					
q (1 year lag)				0.00115	0.00244
				(1.55)	(1.67)
2 year lag					-0.00171
					(-1.37)
Cashflow (contemp.)				0.0181	0.000383
				(0.98)	(0.02)
1 year lag					0.0265
					(1.38)
Constant	0.0936***	0.0996***	0.103**	0.252**	0.265***
	(5,71)	(5,12)	(4.06)	(3.34)	(4.93)
N	2192	2076	2130	1561	1290
R^2	0.123	0.123	0.123	0.154	0.228
adj. R^2	0.105	0.104	0.104	0.128	0.194

t statistics in parentheses
$* p < 0.05$, $** p < 0.01$, $*** p < 0.001$

Table V
Exogenous area shocks

Panel A of this table reports the results of the regression where the independent variables are the investments of the firms in the same industry-different area portfolio and in the dominant industries of the three provinces with the highest numbers of firms, i.e. Noord-Holland (NH), Zuid-Holland (ZH) and Utrecht (UT). The dependent variables are the investments of firms in outside the dominant industries of those provinces. The Panel B reports the results of a similar regression as panel A, with only one difference. In Panel B the overall market dominant industry is used instead of area dominant industry as the independent variables.

Panel A: Area dominant industry investment

	(1) Investment Non-dominant NH (outside ind. 1)	(2) Investment Non-dominant UT (outside ind. 9)	(3) Investment Non-dominant ZH (outside ind. 4)
Investment – Same industry / different area	-0.00443 (-0.13)	0.628*** (7.56)	0.166 (1.18)
Investment – NH dom. industry (Non-Dur)	1.150*** (6.42)		
Investment – UT dom. Industry (Retail)		0.433*** (6.11)	
Investment – ZH dom. Industry (Energy)			0.0314 (1.26)
Constant	-0.0123 (-1.19)	-0.0545*** (-6.28)	-0.0317 (-1.18)
N	1089	351	613
R^2	0.336	0.508	0.489
adj. R^2	0.269	0.439	0.439

t statistics in parentheses
** p < 0.05, ** p < 0.01, *** p < 0.001*

Table V
Exogenous area shocks – continued

Panel B: Market dominant industry investment

	(1) Investment Non-dominant NH (outside ind. 1)	(2) Investment Non-dominant UT (outside ind. 9)	(3) Investment Non-dominant ZH (outside ind. 4)
Investment – Same industry / different area	0.0187	0.491***	0.120
	(0.60)	(5.24)	(0.92)
Investment – Non-durables (market)	0.730**		
	(3.96)		
Investment – Retail (market)		0.685***	
		(6.33)	
Investment – Energy (market)			0.0148
			(1.37)
Constant	0.00113	-0.0792***	-0.0257
	(0.08)	(-5.91)	(-1.01)
N	1089	425	678
R^2	0.331	0.474	0.485
adj. R^2	0.263	0.413	0.439

t statistics in parentheses
** p < 0.05, ** p < 0.01, *** p < 0.001*

Table VI
Debt issuance

This table reports the results of regression (3), listed in appendix B. The dependent variable is the debt issuance at time t for firm j, operating in industry i and located in area a. The independent variables are the debt issuance for the equally weighted portfolios. Lagged values are also included alongside the contemporaneous values of these regressors and lastly, year and area fixed effects are included as additional regressors.

	(1) Debt iss.	(2) Debt iss.	(3) Debt iss.	(4) Debt iss.	(5) Debt iss.	(6) Debt iss.
Same industry / different area						
Debt issuance (contemp.)	-0.0103		-0.0922	-0.0322	-0.0330	-0.0291
	(-1.13)		(-1.09)	(-1.64)	(-1.79)	(-1.50)
1 year lag					0.00996	0.0585
					(0.34)	(1.00)
2 year lag						-0.0399
						(-0.85)
Different industry / same area						
Debt issuance (contemp.)		0.244	0.233	-0.0238	-0.0346	-0.0699
		(0.95)	(0.93)	(-0.88)	(-1.19)	(-1.53)
1 year lag					-0.0498	-0.0200
					(-1.03)	(-0.47)
2 year lag						-0.103
						(-2.09)
Same industry / same area						
Debt issuance (contemp.)				0.0426	0.0452	0.0731
				(0.79)	(0.85)	(1.55)
1 year lag					0.00193	0.0132
					(0.08)	(0.33)
2 year lag						-0.0269
						(-1.48)
Constant	-0.0574	-0.0679	-0.0667	0.151***	0.167**	0.154***
	(-0.41)	(-0.47)	(-0.46)	(5.49)	(4.78)	(10.85)
N	3208	3204	3186	2637	2528	2259
R^2	0.087	0.087	0.088	0.020	0.020	0.026
adj. R^2	0.074	0.075	0.074	0.004	0.002	0.005

t statistics in parentheses
** p < 0.05, ** p < 0.01, *** p < 0.001*

Appendix A

List of industry abbreviation[1]

Industry 1. NoDur Consumer NonDurables -- Food, Tobacco, Textiles, Apparel, Leather, Toys

Industry 2. Durbl Consumer Durables -- Cars, TV's, Furniture, Household Appliances

Industry 3. Manuf Manufacturing -- Machinery, Trucks, Planes, Off Furn, Paper, Com Printing

Industry 4. Enrgy Oil, Gas, and Coal Extraction and Products

Industry 5. Chems Chemicals and Allied Products

Industry 6. BusEq Business Equipment -- Computers, Software, and Electronic Equipment

Industry 7. Telcm Telephone and Television Transmission

Industry 8. Utils Utilities

Industry 9. Shops Wholesale, Retail, and Some Services (Laundries, Repair Shops)

Industry 10. Hlth Healthcare, Medical Equipment, and Drugs

Industry 11. Money Finance

Industry 12. Other Other -- Mines, Constr, BldMt, Trans, Hotels, Bus Serv, Entertainment

For more information see http://mba. tuck.dartmouth.edu/pages/faculty/ken.french/Data˙Library/det˙12˙ind˙port.html.

Appendix B

List of regression equations

Investment – Investment regression:

$$Investment_{j,t}^{i,a} = \sum_{K=0}^{2} \beta_{1,\ k}\, Investment_{p,t-k}^{i,-a} + \sum_{K=0}^{2} \beta_{2,\ k}\, Investment_{p,t-k}^{-i,a} + \sum_{K=0}^{2} \beta_{3,\ k}\, Investment_{p,-j,t-k}^{i,a} + \beta_4\ controls_t^{i,a} + \varepsilon_{j,\ t}^{a,i} \qquad (1)$$

Investment – q regression:

$$Investment_{j,t}^{i,a} = \phi + \sum_{K=0}^{1} \alpha_{1,\ k}\, q_{p,t-k-1}^{i,-a} + \sum_{K=0}^{1} \alpha_{2,\ k}\, q_{p,t-k-1}^{-i,a} + \sum_{K=0}^{1} \alpha_{3,\ k}\, q_{p,-j,t-k-1}^{i,a} + \sum_{K=0}^{1} \alpha_{4,\ k}\, cashflow_{p,t-k}^{i,-a} + \sum_{K=0}^{1} \alpha_{5,\ k}\, cashflow_{p,t-k}^{-i,a} + \sum_{K=0}^{1} \alpha_{6,\ k}\, cashflow_{p,-j,t-k}^{i,a} + \sum_{K=0}^{1} \alpha_{7,\ k}\, q_{j,t-k-1}^{i,a} + \sum_{K=0}^{1} \alpha_{8,\ k}\, cashflow_{j,t-k}^{i,a} + \alpha_9\ controls_t^{i,a} + \varepsilon_{j,\ t}^{a,i} \qquad (2)$$

Debt issuance regression:

$$Debt\ iss._{j,t}^{i,a} = \sum_{K=0}^{2} \lambda_{1,\ k}\, Debt\ iss._{p,t-k}^{i,-a} + \sum_{K=0}^{2} \lambda_{2,\ k}\, Debt\ iss._{p,t-k}^{-i,a} + \sum_{K=0}^{2} \lambda_{3,\ k}\, Debt\ iss._{p,-j,t-k}^{i,a} + \lambda_4\ controls_t^{i,a} + \varepsilon_{j,\ t}^{a,i} \qquad (3)$$

Appendix C
Variable construction with COMPUSTAT abbreviations

Cashflow = income before extraordinary items plus depreciation and amortization normalized by last years assets

Cashflow (t) = [IB(t) + DP(t)] / AT(t-1)

Investment = capital expenditures normalized by last years assets

Investment (t) = CAPX(t) / AT(t-1)

Debt issuance = change in total long-term debt plus the change in long-term debt due in one year plus notes payable divided by last years assets

Debt issuance (t) = [d.DLTT(t) + d.DD1(t) + NP(t)] / AT(t-1)

Tobin's q = long-term debt plus debt in current liabilites plus market equity all divided by current assets

q (t) = [DLTT(t) + DLC(t) + CSHO(t) * PRCC F(t)] / AT(t)