Financing frictions: Collateral and its Effect on Firm Investment in Europe

Frej Andreassen[♦] Johan Möller[◊]

This thesis examines financing frictions in the European market by investigating how exogenous variation in firms' collateral through real estate value variation affects firm investment. Using a nine years dataset on European firms, we conclude that the collateral channel effect is as prominent in Europe as the one found in USA by other authors. A real estate value appreciation of one dollar indicates an increase in firm investments by five cents. The collateral effect on investments for large firms have been fairly well documented but the scarcity of private firm data has until now left this large part of the company population unexamined. Using data on private Swedish SME's between 1997 and 2008, we find that the collateral channel is of significant importance to explain investment behavior of smaller firms, extending the applicability of findings on large firm US data across firm location and size.

Keywords: Collateral, credit rationing, firm investment, financing frictions, real estate

Tutor: Ulf von Lilienfeld-Toal

Presentation date: May 30th 2013

Acknowledgements: We would like to thank Ulf von Lilienfeld-Toal for his advice and support throughout the work on this thesis.

♦ 21631@student.hhs.se
◊ 21768@student.hhs.se

Table of Contents

List of equations, figures, & tables. ii

1. Introduction 1

2. Theoretical framework 4

2.1. The trade off theory 4

2.2. The pecking order theory 7

2.3. Credit rationing and collateral 8

2.4. Tobin's Q as measure of investment opportunities 10

2.5. Weighted average cost of capital 11

2.6. Debt financing and signaling theory 12

3. Empirical tests of drivers of corporate investments 14

3.1. SME investments 16

3.2. Real estate as collateral in USA 16

4. Data and method 18

4.1. Revisiting Chaney et al. (2012) using European data 18

4.1. European house price index data 20

4.2. European accounting data 22

4.3. Swedish house price index data 24

4.4. Swedish SME accounting data 24

4.5. Method employed when examining the Swedish data 26

5. Results 30

5.1. Testing the specification on European firms 30

5.2. Testing the specification on Swedish SME firms 34

6. Conclusion 37

List of equations, figures, & tables.

Equation 1: Value maximization problem faced by firms with bankruptcy costs 5
Equation 2: Firm value according to the trade off theory 6
Equation 3: Gordon growth model 10
Equation 4: Tobins Q 11
Equation 5: Weighted average cost of capital 12
Equation 6: Hayashi investment equation 14
Equation 7: Murray & Tao investment equation 15
Equation 8: Chaney et al. investment equation 15
Equation 9: Long term debt explained by real estate value 27

Figure 1: WACC with and without taxes 5
Figure 2: Trade off theory firm value maximization 7
Figure 7: Average investment for companies in the dataset per country and year 19
Figure 3: HPI development, base year 2000 20
Figure 4: Mean investment per year & country, and the HPI with base year 2000 21
Figure 6: European dataset company location 22
Figure 6: Real estate market value in proportion to fixed assets per country and year 23
Figure 8: HPI development 24
Figure 9: Overview of Swedish sample firms 29
Figure 10: Evolution of coefficients over the sample period using 4 year windows 33

Table 1: Regressions on European data 31
Table 2: Evolution of regression coefficients over the sample period using 4 year windows 33
Table 3: Regression on Swedish accounting data 35
Table 4: Regression 2 on Swedish accounting data 36
Table 5(A): European data summary statistics A1
Table 6(A): Swedish SME accounting data A2
Table 7(A): European firms by country and year A3
Table 8(A): Swedish firms by country and year A4
Table 9(A): HPI sources A5

1. Introduction

In a world with no financing frictions firms invest in positive net present value projects. The firms' investment only depends on the presence of profitable investment opportunities. Other factors such as the availability of liquidity reserves, capital structure, cost of capital and tangibility of a firm's assets have no effect on the investment decisions of the firm. Merton Miller and Franco Modigliani (1958) provided the theoretical basis for this argument in their seminal indifference theorem. Whether financing frictions influence real investment decision or not is an important matter in contemporary finance as the world is most likely not without financing frictions. By introducing asymmetric information and Akerlof's famous lemon-problem (Akerlof, 1970), investors cannot distinguish between the quality of firms, Myers & Majluf (1984) arrive at a 'pecking order' theory which states that firms prefer internally generated funds to external debt and external equity. Many research attempts have since been made to identify the magnitude of the financing frictions in the economy. Identifying the financing–investment interactions is however not an easy task. This study aims at identifying the presence of financing frictions among large European corporations as well as Swedish small- and medium-sized enterprises (SMEs). We build on the work of Chaney et al. (2012) by applying a similar specification for identifying financing frictions, namely the variation in collateral value and its effect on corporate investments, the so called 'collateral channel'.

A common notion is that a main driver of a growing and well-functioning economy is the investments made by corporations, and that an important goal of any corporation is to maximize the shareholder value by identifying and exploring profitable business ideas. Exploring business ideas often requires capital that is either provided by the firm itself, its owners, or externally. In a world with financing frictions a lack of collateral might be detrimental to a firm seeking to explore investment opportunities using debt financing, as it might be denied a loan due to the bank having insufficient security regarding the reimbursement of their capital. Providing outside investors with collateral acts as a strong disciplining device on borrowers, and an assumption would therefore be that the financing of investment opportunities eases with the existence of pledgeable assets that can be posted as collateral. The more collateral the firm can post, the easier it will obtain financing. Thus, an increase in the value of the underlying collateral should increase the firm's debt-capacity and enable the firm to take on more investment opportunities. The collateral channel will be examined in this study, using exogenous increases in real estate values as explanatory variable

for corporate investment. We explore the idea that variables that increase a firm's ability to obtain external financing may also increase investment when firms have imperfect access to credit.

The theoretical starting-point in this study is to identify to which extent firms are financing constrained. Our hypothesis is that firms indeed are financing constrained and that the extra financial slack created from value increases in their real estate assets will co-vary positively with increased investment. Following the proof of contradiction such a positive relationship between increases in the real estate value and increases in investment would indicate that firms are credit constrained. If firms were not financing constrained and acted as postulated by Miller & Modigliani's indifference theorem, variation in the firm's collateral value would not affect the firm's investment decision.

The hypothesis was tested on European large firm data as well as Swedish SME data, thus extending the applicability of previous findings on American large firm data (Chaney, Sraer, & Thesmar, 2012). In order to make a complete argument for the collateral effect on firm investment it is essential to test the hypothesis not only on large corporations, with dispersed ownership and potential problems of monitoring and free-riding behavior, but also on small private firms where agency costs are of a somewhat different kind and magnitude. Small firms face a different reality with regards to firm investments than do large companies, and it can be questioned whether SMEs display the same investment behavior as large firms as real estate value increases. On the one hand, one might presume that SME investments would be more affected by variation in collateral value as they are more constrained by the availability of internal finance and face more financing frictions than larger enterprises (Carpenter & Petersen, 2002). On the other hand, the SMEs might not display the same desire to grow beyond what economists call the 'minimum efficient scale' – the level of sales required for survival in the industry. All small firms are not managed by strategic, growth oriented, dynamic entrepreneurs, but the SME management population also consists of 'lifestyle'-oriented managers with no desire to grow beyond the level required to achieve the lifestyle the manager was previously accustomed to (Cressy, 1996). On the basis of this 'Target income' – hypothesis, it could be expected that SME investments diminish with high returns in the real estate market as it takes 'lifestyle'-managers closer to their target income.

In order to estimate the effect of collateral value on firm investment, we use variation in country house price indices for the European data and variation in county house price indices for the Swedish data as shocks to the real estate assets held by firms.

Our findings support the argument of existing financing frictions. For the European data we estimate that for a value increase of $1 in a firm's real estate assets the firm will allocate $0.05 to new investment. In the Swedish SME data we find a slightly lower effect. For a value increase of $1 in a firm's real estate assets the firm will allocate $0.02 to new investment. In this setting we define investment as investment in tangible fixed assets. Although this is not the only way for a firm to find new investment opportunities the present study has out of comparability reasons been restricted to this simple investment definition. Furthermore, the Swedish data shows a positive relationship between the variation in collateral value and firm long term debt, indicating that it is by posting the collateral and taking on a higher level of debt that firms exploit the increased financial capacity and take on new investment opportunities.

Our estimates might be biased and experience two different types of endogeneity issues. First, we treat the house price index (HPI) development as exogenously given. If the house price index development is considered as an endogenous variable, co-varying positively with investment opportunities for real estate asset holding firms, we might overstate the effect using our estimation method. In order to avoid some of this potential bias, we exclude firms in the industries of insurance, real estate, mining, construction, and financial trading. Second, in our methodology we assume that the firm's real estate assets are located in the same location (country or county) as the firm's head quarter. Although this assumption is partly motivated it might, through Europe's relatively short history as an integrated economy and the small size of the Swedish firms, lead to a downward bias if incorrect. If the firm's real estate assets are distributed across geographical locations and are not primarily located in the same location as the firm's head quarter, our results would incorporate a downward bias and we would underestimate the effect of variation in collateral value on firm investment. These two potential biases motivate us treating our results with some caution.

The remainder of this thesis is organized as follows: Section 2 presents the framework of the corporate financing theory in which we operate and Section 3 describes recent literature on financing frictions in the economy. In Section 4, the data and methodology are outlined. Section 5 reports the main findings of our study and finally Section 6 concludes.

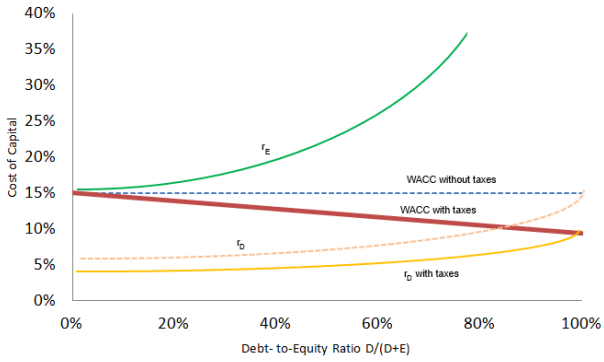
2. Theoretical framework

Investments will be made if there are growth opportunities and a firm can access capital. A measure of growth opportunities is Tobin's Q ratio that, together with the Gordon growth formula, states that a firm will invest more if its growth rate is higher. The pecking order theory gives the rationale behind using cash or debt as capital to fund investments and finally signaling theory can give additional rationale to use debt financing that will be cheaper if a company can post collateral.

2.1. The trade off theory

The indifference theorem postulated by Miller & Modigliani (1958) states that in a tax free setting and in perfect capital markets, the choice of funding a firm or project using debt or equity is unnecessary as investors themselves can replicate the debt level they find appropriate and will require higher return on their investment if the company has a heavier debt burden. With taxes included in the Miller Modigliani theorems, the result propagates that a firm should maximize their debt in order to reap full benefit of the tax shield created by equity and debt returns being differently taxed. The resulting weighted average costs of capital (WACC), with and without the tax effect, are displayed in Figure 1. With applied taxes the theory explains that the value of a projects levered cash flow is the market value of the cash flow, plus the tax effect derived from the firm taking on debt to finance the project, and is further explained by Miles & Ezzell (1980). This effect stems from the fact that interest rate paid to banks and equity returns are differently taxed, giving bank interest repayment a tax deduction, whereas equity repayment is taxed. The theory examined by Miles & Ezzell (1980) extend the theory to suggest that, in order to maximize the value of a project, a firm should try to finance it to as high degree as possible using debt. This conclusion has interesting implications if it is adhered by firms; fully financing projects using debt increases the risk of the company as the leverage is increased and ultimately an unsuccessful project might prove detrimental to the firm if there is no equity reserve to levy. Modigliani & Miller (1963) explains that even though their arguments for the tax shield effect imply use of as much debt as possible, high debt carries other cost than captured by the WACC. As discussed further later in this section, the required rate of return to equity and debt are not the only costs that affect the financing cost of a firm, which means that excessive debt is unattractive.

Figure 1: WACC with and without taxes



Further expanding this theory by including the cost of financial distress results in the trade off theory:

Consider a firm with a debt at date t=0 with face value K that expires in the next period. At $t = 1$, the firm generates random earnings X in the interval $\left[\overline{X}, \underline{X}\right]$ with the cumulative density function $H(X)$. The firm will also pay taxes τ_C if $X < K$. If the firm cannot repay the fully tax deductible face value of the debt K, the firm will face bankruptcy costs of C. Assuming that investors do not require return higher than the risk free return r_f, the market value of the firm is:

$$V(K > \underline{X}) = V(0) + \frac{1}{1 + r_f}\left[\tau_C\left(\int_{\underline{X}}^{\overline{X}} X dH(X) + K\left(1 - H(K)\right)\right) - CH(K)\right]$$

Equation 1: Value maximization problem faced by firms with bankruptcy costs

This equation, explained in more detail by Frank & Goyal (2005), states that the value of a firm with risky debt will experience an upward pressure in debt due to the tax shield effect but at the same time a downward pressure due to the bankruptcy costs.

Managing a large firm has its perks. Hope & Thomas (2008) list some of the benefits of managing large corporations. Not only does managing a large company imply high status for the manager but there are also other incentives for managers to invest internally rather than to pay dividends to investors. The theory says that a manager will enjoy a private benefit from increased corporate investments, and that this comes at the expense of the owners of the firm who will get a smaller dividend payout. Corporations invest to capture business opportunities such as launching a new product line or performing research and development. Companies

should ideally invest in projects when they observe positive net present value projects. There are however other incentives at play when corporate investments are made. Instead of paying back money to the owners, some managers may invest in the company despite a lack of positive NPV project simply due to the prestige in managing a large company, or due to other benefits related to managing a large company, as discussed by Jensen & Meckling (1976) and others. Relying on debt financing incentivizes managers to perform well enough to be able to repay the debt with interest; the alternative of bankruptcy being unattractive as it implies having unsuccessfully managed the firm.

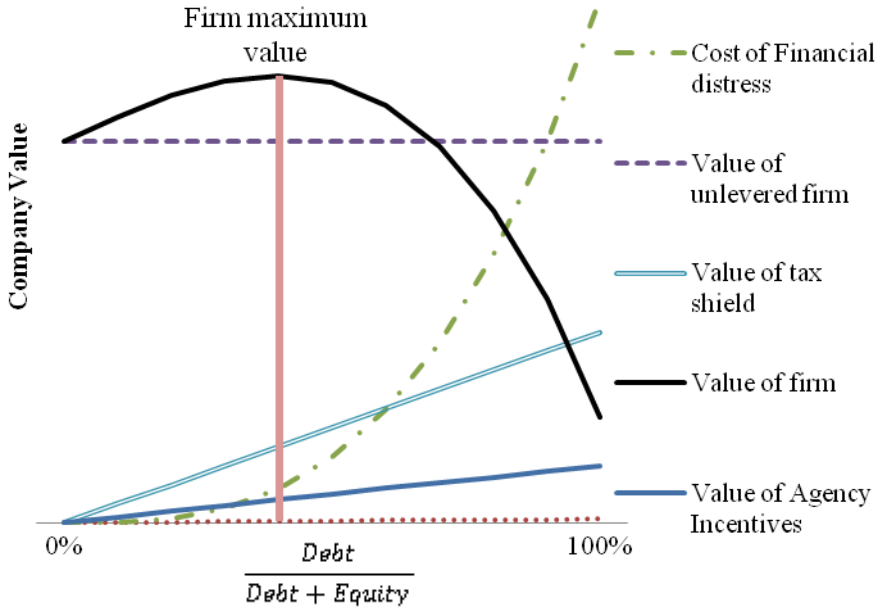
These findings can be further extended to postulate the naïve model of firm value that also includes the incentive effect of debt on managers:

$$Value_{firm} = V_{Equity} + V_{Debt} + V_{Tax\ shield} - Probability_{bankruptcy} \cdot Cost_{Bancruptcy} + V_{Agency\ incentive\ effect\ of\ debt}$$

Equation 2: Firm value according to the trade off theory

The results of equation 2 are also visualized in Figure 2. The trade off theory helps to explain that firms will not take on excessive debt as they would have done, should the maximization of the tax shield and thus lowering the WACC, be the goal for "cheap" financing. As the simplified explanatory Figure 2 displays, firms face a value maximization problem when deciding on the optimal level of debt to aim for. This optimum could change due to additional costs, such as the alternative cost of not being able to engage in an investment project due to excessive debt, or lack of pledgeable collateral.

Figure 2: Trade off theory firm value maximization



The conclusion from the trade off theory is that there are many factors to consider when deciding which form of finance to choose for a firm or project. It is up to each firm to gauge their costs and benefits to maximize the firm value and find their optimal debt level. The cost of financial distress and the value of agency incentives are prime examples of financing frictions, but to quantify them has proven to be difficult.

2.2. The pecking order theory

An alternative theory that explains capital source preferences among firms is the pecking order theory developed by Myers & Majluf (1984). There exist several channels of funding available to firms carrying different transaction and agency costs. A firm can use internally generated funds if available, or external funding in the form of bank loans or new equity issue. If external funds are to be used, the firm will need to convince the entities providing the funds that it can meet their required risk adjusted return. Due to the information asymmetry and financing frictions, a firm will pay a premium for external funds as external lenders will have a difficult task to gain full insight in what level of return the firm can achieve with the funds. This premium of external funding will incentivize the firm to use internal funds to as large extent as possible since it would be cheaper. Internal funds being inaccessible, the second hand choice is external funding from banks or new equity issue. Issuing new equity implies selling part of the company to fund the project. This would lead to more owners sharing the

profits of the company, implying both higher transaction costs and costs of information asymmetry, and result in lower returns for existing owners. Obtaining bank financing will not imply selling part of the firm but rather promises repayment with interest and if need be posting securities to exacerbate the information asymmetry. The pecking order theory as explained by Myers & Majluf (1984) states that firms have the following order of funding preference:

1) Internal funds
2) Bank loan
3) New equity issue

Internal funds should be easily accessible to use in investment projects whereas going to the bank to get financing would require the firm to incur transaction costs to overcome information asymmetry. It is suggested that getting a bank loan to finance net positive projects before selling parts of the company to the market would be an alternative strategy when a firm lacks enough additional internal funds. The pecking order theory has been tested and was found helpful in explaining investment behavior by Shyam-Sunder & Myers (1999) and others. There are many reasons for a company not being willing to sell shares, one of which will be further discussed in detail in section 2.6.

2.3. Credit rationing and collateral

In order to secure a bank loan, a firm will often be asked to provide securities to ensure repayment. As discussed in section 2.6, there are also incentives for a firm to provide the bank with as much information as possible in order to improve the negotiating terms with the bank. Posting collateral will provide the bank with some value in case of the firm going bankrupt. The bank can offer better interest rates and improved loan agreement terms if a company can post collateral. Collateral is an asset that the bank can repossess and sell in the case of a firm not being able to repay a loan on time.

According to the theories of Miller-Modigliani, a firm's investment only depends on the profitability of its investment opportunities. Neither capital structure, nor cash or liquidity security reserves matter. By contrast, research shows that firms with more cash and firms with lower debt burden invest more. The positive correlation between investment and measures of financial slack has been interpreted as indication of credit-rationing (see for instance Fazzari et al., (1998)). One determinant of credit rationing is the collateral the firm can post to the

bank. Two common issues in corporate finance, namely the moral hazard problem and the problem of asymmetric information, can be overcome by collateral posting. As an illustration of the moral hazard problem, consider a simple framework where a firm faces an investment opportunity with initial investment I, and payoff X which will pay off with the probability θ_i. The firm has assets A, which it can use to finance parts of the investment I through converting the assets or posting them as collateral. Outside investors need to contribute at least I-A in order to finance the project, and they will be repaid the pledgeable income R in case of success and zero in case of failure. The management of the firm can affect the success probability with $\Delta_\theta = \theta_H - \theta_L$ by either contributing with high effort e_H, or extract private benefits B and contributing with low effort e_L. The payoff of the project if the management contributes high effort is

$$\theta_H X - I = [\theta_H(X - R) - A] \quad + \quad [\theta_H R - (I - A)] > 0$$

where $[\theta_H(X - R) - A]$ is awarded the firm and $[\theta_H R - (I - A)]$ is awarded the outside investor. The project has a negative NPV if management extracts private benefits:

$$\theta_L X + B - I = [\theta_L(X - R) + B - A] \quad + \quad [\theta_L R - (I - A)] < 0$$

The implication is that the firm management will not extract private benefits if

$$\theta_H(X - R) \geq \theta_L(X - R) + B \quad \Leftrightarrow \quad \Delta_\theta(X - R) \geq B$$

Rearranging yields the maximum pledgeable income that can be offered to the investor:

$$R < R^{\max} = X - B/\Delta_\theta$$

Hence, the outside investor will only contribute to financing of the project if the expected pledgeable income R will exceed the investment outlay:

$$\theta_H R = \theta_H \left(X - \frac{B}{\Delta_\theta}\right) \geq I - A$$

This translates into a minimum requirement on the assets A in order to meet the firms and the outside investors' constraints:

$$A \geq A^{\min} = \theta_H B/\Delta_\theta \; - [\theta_H X - I]$$

The implication of this is that the higher the A the more likely it is for firms to overcome the moral hazard issue of extracting private benefits and being able to invest in positive NPV

projects. Thus we would expect firms with higher collateral value to be able to undertake more investments.

In a setting where the success probability of an investment opportunity is unobservable by outside investors, posting of collateral can help the company to overcome the problem of asymmetric information and thus obtain financing more easily.

2.4. Tobin's Q as measure of investment opportunities

One of the most prominent factors driving firm investment is naturally the investment opportunities facing the firm. A firm in a growth phase will invest more than the mature firm. The anticipated growth of the firm will be incorporated into the market valuation of the company. A model for corporate valuation is the Gordon growth model (Gordon, 1962):

$$Price = \frac{dividend}{required\ return - growth}$$

Equation 3: Gordon growth model

From Equation 3, it is easily seen that, in the cross-section of firms, firms with high growth rates will command a higher price than their low growth counterparts. As the growth increases, the price of the firm will also increase, leading to investors being willing to pay a premium for growth opportunities. This premium can be measured by looking at Tobin's Q which measures the quota of market to book value of a firm.

Using Tobin's Q to explain the investment behavior has been fairly standard in the empirical studies performed by many econometricians. Von Furstenberg et al. (1977) and Engle & Foley (1975) were early advocators of using Tobin's Q to explain corporate investment. Von Furstenberg et al. (1977) gives the rationale for using Tobin's Q as follows; "[…] investment is stimulated when capital is valued more highly in the market than it costs to produce it, and discouraged when its valuation is less than its replacement cost." (von Furstenberg, Lovell, & Tobin, 1977, p. 348). The Q ratio is thus a measure of the growth opportunity of a firm, and a firm with high Q is expected to have higher growth than a firm with low Q.

Tobin's Q, as defined by Brainard & Tobin (1968), is a measure of the discrepancy of the market value of a firm and the book value of the same firm. The variable is defined according to Equation 4:

$$Q = \frac{MV_e + MV_d}{BV_e + BV_d}$$

Equation 4: Tobins Q

The measure is said to be in equilibrium when $Q = 1$, i.e. when the market value of the company coincides with the book value of the company. In a situation where the ratio is higher than its equilibrium, the recorded value of a company's assets are higher than their market value, and it would make sense to invest as the book value of the purchased assets would be lower than their valuation in the market. Conversely, if the ratio is lower than one, the company is showing signs of being undervalued.

According to the above theory, the Q ratio would thus explain the behavior of firms with respect to investments. Several tests of this theory have been performed; including that of Murray & Tao (2012), Bond & Van Reenen (2007) and Gomes (2001). While Bond & Van Reenen (2007) and Gomes (2001) find that Q indeed does explain investments, Murray & Tao (2012) find that cash flow and WACC are also important factors when it comes to investments in line with the pecking order theory.

2.5. Weighted average cost of capital

The weighted average cost of capital with taxes will yield the required return on equity (Modigliani & Miller, 1963). The theory by Modigliani & Miller (1963) evaluates the cost of capital to the tax corrected WACC. The WACC will yield the required rate of return for various sources of funding and ultimately it can be used to identify whether an investment project has a positive net present value or not. Using the WACC to discount projects is taught at business schools, and as many managers have some kind of business education, it is assumed that the use of WACC affects the way they do business. As Tobin's Q described in the previous section cannot fully explain investment behavior, the managers indeed tend to use the WACC when evaluating projects and deciding whether to invest or not (Murray & Tao, 2012). The idea behind the WACC is that a project should be discounted using the weighted average of the financing cost. If equity holders require a high rate of return and the equity proportion of funding is high, the project could be considered too costly if the company is pursuing a constant debt level. If the company is willing to adjust the debt level, more debt can be used to finance the project. The well known delusion of considering debt to be cheaper than equity could result in real implications on investment behavior, by not considering the

negative externalities of using debt as discussed in section 2.1. The required rate of return on debt is decided by the bank and should, at least, cover their funding cost plus a risk premium. The risk premium is contingent on the borrowing firm's ability to repay the loan. In order to lower the risk of not getting repaid, the firm can post collateral that will be transferred to the lending bank in case of the firm being unable to repay the loan.

The WACC is calculated according to Equation 5:

$$WACC = \frac{MV_e}{MV_d + MV_e} \cdot R_e + \frac{MV_d}{MV_d + MV_e} \cdot R_d \cdot (1 - \tau)$$

Equation 5: Weighted average cost of capital

Murray & Tao (2012) have explored the effects of WACC in an investment setting, and their findings will be presented in section 3.

2.6. Debt financing and signaling theory

Building further on Akerlof's theories on information asymmetries (1970), Ross illustrates the application as it applies to capital structure (Ross, 1977). In the Ross model, managers with an informational advantage compared to outside investors have incentives to signal their private information through their choices of debt levels. The relative cost of debt for firms with high expected cash flow versus firms with low expected cash flow, will separate the level of debt the firms are able to carry. Firms with high expected cash flow thus have the ability to reveal their status by taking on a level of debt which firms with low expected cash flow cannot bear.

One of the services provided by banks is to help in transforming future expected cash flows into hard cash today that can be used to invest or engage in other business activity as discussed by Scholtens & van Wensveen (2000). Being granted a bank loan is a signal that a bank indeed expects a company to be able to repay the loan with interest in the future as explained by, amongst others, Narayanan (1988).

Several papers, including that of Narayanan (1988), point to the fact that the market value of equity, i.e. the stock price, actually appreciates if a company obtains additional debt finance. A company that uses debt will thus increase in value due to the signaling effect of getting the seal of approval from the bank. As credit is difficult to obtain in the wake of a financial crisis due to banks experiencing problems themselves, the above argument extends to implying that

the granting of a loan becomes an even more prominent indicator of quality as discussed by many, including Lummer & McConnell (1989). Thus obtaining a bank loan would be even more attractive during periods of financial crisis. If a firm has projects that it wants to invest in, it is therefore attractive to obtain a bank loan to finance this if it is more in line with the company's target financial structure. Conveying information of having additional positive NPV investment projects available could be difficult for a firm without divulging trade secrets that would open up opportunities to competitors. Relaying information to banks of a new innovation might thus be easier for a firm that is not yet ready to divulge the information to the market due to protection issues.

3. Empirical tests of drivers of corporate investments

Several researchers have tried to understand and identify financing frictions. Chaney et al. (2012), Duchin et al. (2010), and Gan (2007) found that firms that are credit constrained show a more substantial effect on investment by the collateral channel. The decision to invest or not is likely to depend on several factors including the accessibility to positive NPV projects, different financing options available, and other factors. Studies by Hayashi (1982), Murray & Tao (2012), and Chaney et al. (2012) have sought to explain the investment behavior by the use of Tobin's Q, cash flow, the variation of real estate value, and the weighted average cost of capital. The studies all find that cash is positively correlated with investment, that Q is also positively correlated, and that WACC is an uncertain way of explaining investment behavior. To deepen the knowledge of the mechanisms of debt financing, we look at the investment effect of variation in house prices for firms in line with Chaney et al. (2012), as this variation directly affects the amount of collateral the firms can pledge to the banks.

Hayashi (1982) early suggested that Tobin's Q is relevant to explain corporate investment and suggested Equation 6 to explain this;

$$Log\left(INV_{i,t} \,/\, K_{i,t}\right) = \alpha + \beta_Q Log\left(Q_{i,t-1}\right) + \beta_{CF} Log\left(CF_{i,t} \Big/ K_{i,t}\right) + \sum_i firm_i + \sum_t year_t + \varepsilon_{i,t}$$

Equation 6: Hayashi investment equation

where the explaining variables for the investment quota are Tobin's Q, calculated as described in section 2.4, i.e. the quota of market value to book value of equity and liabilities, and cash flow quota. As described in section 2.4, the rationale for using Q in an investment setting is that it measures the growth opportunities of a firm as measured by market value versus book value. Having collateral to post will increase the investment of a firm which in turn stimulates growth and thus Q is also likely to measure the availability of funds to pursue investments.

The theory behind Equation 6 is examined by Murray & Tao (2012) who argues that practitioners seldom use Tobin's Q when deciding whether to invest or not but rather looks at the weighted average cost of capital calculated according to Equation 5. Murray & Tao (2012) suggest Equation 7 to better capture what decision makers are facing when looking at an investment opportunity.

$$Log\left(\frac{INV_{t,i}}{K_{i,t}}\right) = \alpha + \alpha_1 Log(Q_{i,t-1}) + \alpha_2 Log\left(\frac{CF_{i,t}}{K_{i,t}}\right) + \alpha_3 Log(WACC) + \alpha_4\left(\frac{g}{WACC}\right) + \sum_i firm_i + \sum_t year_t + \varepsilon_{i,t}$$

Equation 7: Murray & Tao investment equation

The idea behind Equation 7 is that the WACC is an important addition to the investment decision making process that firms face. The study by Murray & Tao (2012) suggests that the cash flow coefficient is positive, that $\alpha_1$is positive and is significant, that α_3 is negative, and that α_4 is positive given a good measure of the growth. The sign of the coefficients imply that a higher market than book value will lead to higher investment, that high cash flow will lead to higher investment, and that a higher WACC will lead to less investment. We will refrain from replicating the study made by Murray & Tao (2012), as they themselves mention the difficulty of calculating a reliable measure of WACC due to lack of internal information such as cost of debt & equity, and the somewhat arbitrary choice of method of WACC creation from the 440 methods identified by Murray & Tao (2012). The study by Murray & Tao (2012) found that the WACC coefficient is significant but varies in sign depending on the method of calculation. We thus seek a different approach to explain investment. Another interesting factor that Murray & Tao (2012) found is that leverage is negatively correlated with investment, i.e. that companies with a high proportion of debt to equity will invest less. This is in line with the theory presented by Chaney et al. (2012) of collateral explaining investment by allowing a firm to borrow more. If a company has already used this channel, it is natural to expect a company's investment to decrease due to it being credit constrained.

$$INV_{it}^{l} = \alpha_i + \delta_t + \beta.\mathrm{RE}\, Value_{it} + \gamma P_t^l + controls_{it} + \epsilon_{it}$$

Equation 8: Chaney et al. investment equation

In a study by Gan (2007), the Japanese real estate market was subject to a price shock with a sharp decrease in land value which led to firms having less collateral to offer the banks. This price shock made liquidity dry up in Japan as banks were faced with posted collateral that had decreased in value, making the banks worried that they would not get their loans repaid. This collateral channel of debt capacity break down also affected the Japanese firms as they suddenly faced a decreased supply of credit which led to a decrease in investment. Gan (2007) found that many firms lost their bank relations and that the firms that managed to keep their relations were faced with worse negotiation positions. When it was time for their loans to be

rolled over, the firms were offered less credit due to the inability to post as high collateral as before.

3.1. SME investments

It is well known that small firms are not scale-down versions of larger corporations. The process by which a company grows large is not a linear process but rather a process of evolution which will involve major changes in management structure and functioning and financial policy and capital structure (Penrose, 1959). Although firms are not necessarily public companies, rather the publicly listed corporations numerically represent the exception, the vast majority of studies on firm financing and investments usually examines the publicly listed companies with dispersed ownership. Empirically, this bias toward large traded companies has led to an excessive concentration of studies on large publicly traded companies. Although they represent the most important ones from a value-weighted perspective, the dispersed ownership and following free riding behavior motivates a larger dependence on internally generated financing the rest of the firm universe (Zingales, 2000). One possible reason for the disproportionate amount of research dedicated to large U.S. listed companies might be the availability of data and dataset such as COMPUSTAT to facilitate this kind of research (Zingales, 2000).

López-Gracia & Sogorb-Mira (2008) investigate the capital structure of 3,569 Spanish SMEs and explore the two most important theories on capital structure, namely the trade-off and the pecking order theory. They do not find clear evidence that Spanish SMEs follow a pecking-order theory, but rather their results reveal that greater trust should be put in the trade-off model for explaining SME capital structure. Moreover, the empirical evidence provided by Lopéz-Gracia & Sogorb-Mira (2008) confirms that SMEs clearly behave differently to large firms where financing is concerned.

3.2. Real estate as collateral in USA

Collateral is a common way to deal with the information asymmetry in financial contracts where the expected payoff is differently estimated by the lender and the borrower as examined by, amongst others, Chan & Kanatas (1985). Chaney et al. (2012) investigated how US firms collateral level in the form of market value of real estate assets divided by lagged PPE affect the ratio of investment to lagged PPE. The authors find that one dollar more collateral will, on average, yield 0.06 dollar worth of additional investment. The source of

funding will also affect the level of investment conditional on collateral. It is easy to think of a scenario where a conservative bank will charge a high premium for granting a loan with high risk due to low collateral, whereas an equity investor might be willing to invest given the investment opportunities of the firm. If investment is contingent on the collateral posted as suggested by Chan and Kanatas (1985), a firm owning its buildings rather than renting them might be better off during a credit crunch as its supply of capital will not be affected as easily as that of a firm that can post little collateral.

4. Data and method

Two different datasets are used to perform this study: Orbis is a dataset collected from Bureau Van Dijk which encompasses global data, and the second dataset encompass the balance sheets of all Swedish companies between 1997 and 2008. In this study the two datasets are studied to expand the findings of Chaney et al. (2012).

4.1. Revisiting Chaney et al. (2012) using European data

The simple regression used by Chaney et al. (2012) is of the form displayed in Equation 8.

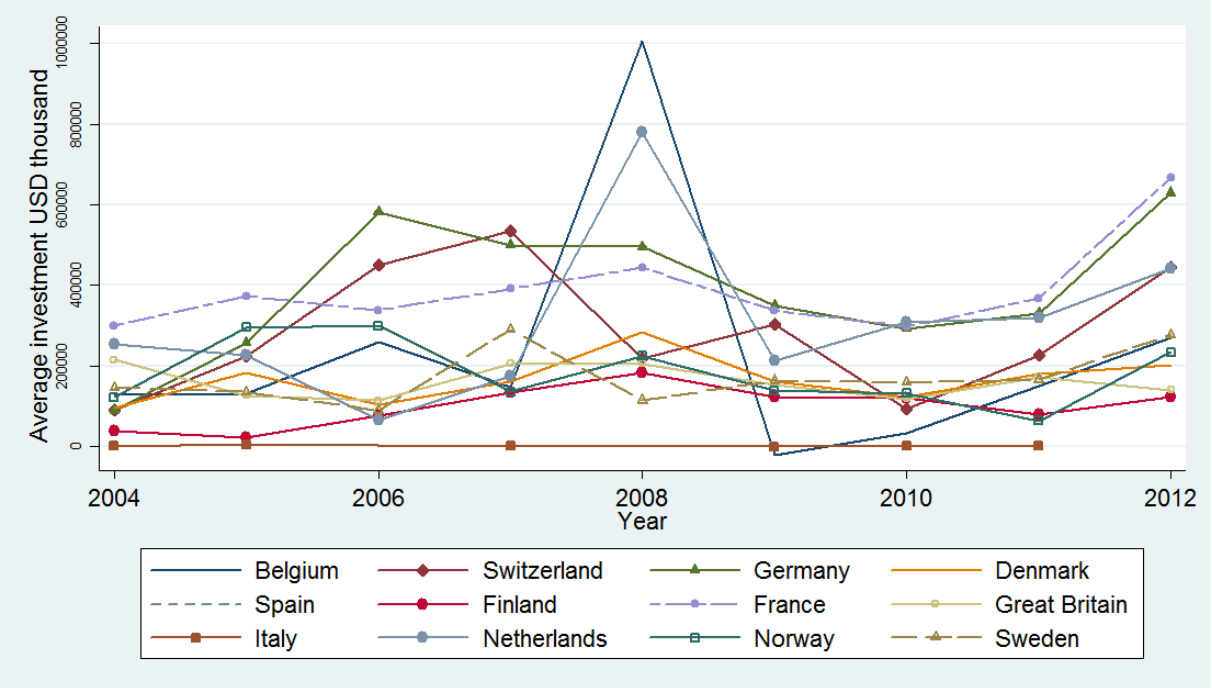
$$INV_{it}^{l} = \alpha_i + \delta_t + \beta.\mathrm{RE}\, Value_{it} + \gamma P_t^l + controls_{it} + \epsilon_{it}$$

Equation 8: Chaney et al. investment equation

Where INV_{it}^{l} is the ratio of investment (CAPEX) in year t, to lagged PPE (We use lagged tangible fixed assets instead of PPE to normalize as the tangible fixed assets capture PPE but is reported more consistently in the European dataset), $RE\ Value_{it}$ is the ratio of real estate market value to lagged PPE (again, we use tangible fixed assets), and P_t^l controls for the real estate price levels in the area where the company is located. The Orbis data can fairly easily be used to run this regression. The real estate value is calculated by using the cumulative depreciation of companies' real estate and dividing it with the book value of real estate to get the average age of the real estate owned by the firms. The average age is then used to approximate a market value of the real estate using house price indices for each respective country where the firm is located. The indices for house prices are not always easily available and it is especially difficult to find commercial property price indices. The approach in this study was to follow the methodology employed by Chaney et al. (2012) in calculating the variables and approximating the real estate value to make their study comparable to this study. The difference is that this study explores the cross sectional approach on country level whereas Chaney et al. (2012) uses the different states in USA. Using the HPI for countries should alleviate the endogeneity concerns regarding the actual location of the real estate that prompted Chaney et al. (2012) to control for the location of real estate compared to headquarter location for the American firms. As this study uses a cross-sectional set up on country level, we conclude that the assumption of a company's real estate being mainly located in the same country as the firm's headquarters is a weaker one than an assumption of non cross-state border ownership of real estate by American firms. Furthermore, as argued by

Chaney et al. (2012), endogeneity stemming from assuming same location of real estate and headquarters will only contribute by a downward bias. The findings of using European data in a similar set up to that of Chaney et al. (2012) is discussed in section 5.1. The study by Chaney et al. (2012) showed that American firms indeed do invest more given that they can post real estate as collateral. The methodology employed by Chaney et al. (2012) uses different approaches in order to validate the findings including an I.V. approach using local land constraint interacted with interest rate to instrument house prices. The study furthermore splits the data into two subsets and look at the internal consistency of the data. The data used in this study encompass the years 2003-2012 which had some interesting developments in the financial markets on a global scale which hit banks and probably affected lending policies. Splitting the dataset in a pre-crisis and post-crisis is therefore likely to yield different results. This is something that this study finds to be true with the caveat that the anomaly seems to predate the crisis by some years as discussed in the results in section 5.1.

Figure 3: Average investment for companies in the dataset per country and year



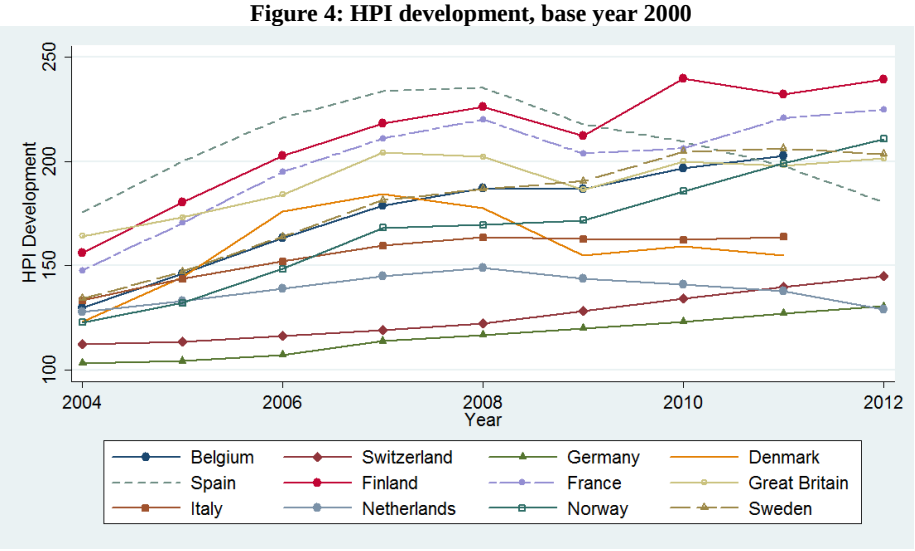
An interesting feature to look at is how the effect on investment by owning real estate develops over time as the world experienced a financial crisis not uncorrelated with the prices of real estate during this period. In the paper by Chaney et al. (2012), a consistency test was made by dividing the data into a pre and post 2003 period. We propose a model of rolling regressions where the data is divide into overlapping four year windows. Having useable data

between 2004 and 2012, this yields a total of six points of measure where the regression presented in Equation 5 is run as if there were only data for four years. The first period tested will thus be 2004-2008, the second 2005-2009, and so on until the four year period of 2009-2012. Using this approach, the time consistency of the results is displayed. Using the method presented in this study, the development of the effect can be followed on a year by year basis, adding to the understanding of the importance of real estate as collateral over time. In addition, this method of testing will yield a better understanding of result robustness rather than the method employed by Chaney et al. (2012), who performed a robustness test by testing two periods. The results of the overlapping window method are presented in section 5.1.

4.1. European house price index data

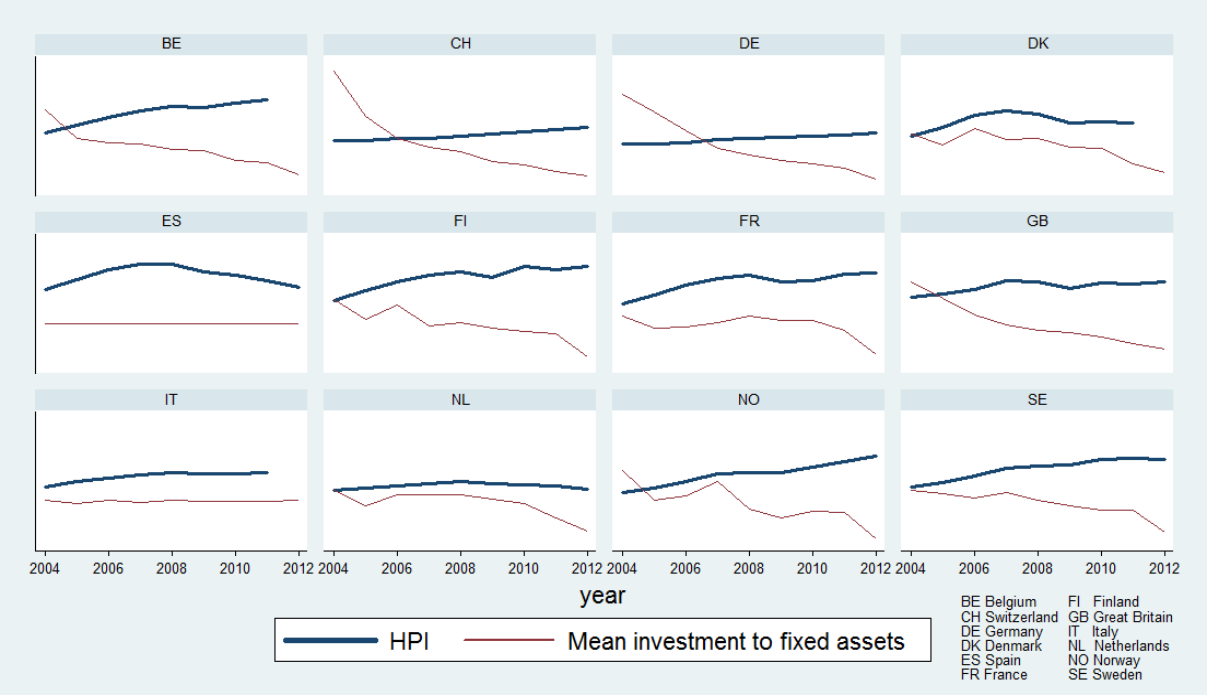
The European House Price Index Data was collected from national statistics bureaus as well as the European Central Bank. See Table 9 for an overview of the national HPI data sources. Finding detailed uniform HPI data by metropolitan statistical area as Chaney et al. (2012) used in their study on U.S. firms, poses a challenge in the diverse European market. The HPI data is produced by national statistic bureaus and national banks, and are not produced using a uniform methodology. Instead, several slightly different methodologies are used to capture the true national HPI development. In addition, the HPIs are not the same in every country. Some countries provide HPI for commercial properties, whereas some provide HPI for multi-dwelling houses and others provide HPI for newly built properties. However, one index that exists for most European countries is the HPI for existing residential single-family houses. We have therefore chosen the HPI for existing residential single-family houses or a very similar HPI as proxy for the general HPI development in the country. The HPI's are visualized in Figure 4 & Figure 5.

Figure 4: HPI development, base year 2000



There exists no uniform HPI methodology for the European countries. One might however assume that each national statistics office is best suited to construct a true and comparable HPI for their respective country using the best possible methodology which considers country specific changing institutional details and good comparability over time. Moreover, the difference in methodology across countries poses a minor issue as long as each HPI is consistent over time. One potential issue is however if the correlation between the commercial HPI and the chosen residential HPI changes considerable over time across countries.

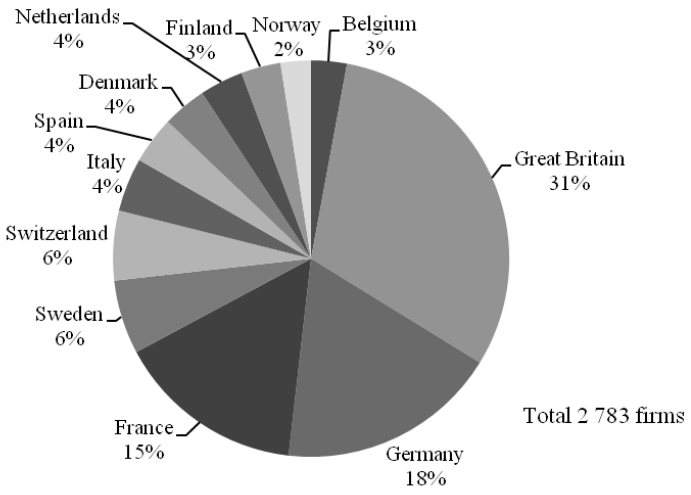
Figure 5: Mean investment per year & country, and the HPI with base year 2000



4.2. European accounting data

The data comprises of balance sheet data collected from European companies by Bureau van Dijk. The selection strategy for the Orbis database was to select all active companies in Western Europe with a known value (zero or greater than zero) for 'Buildings' and 'Total Buildings Depreciation' in the last available year. This resulted in 2783 companies in the countries where HPI was available. Figure 6 provides an overview on the companies and their location, it is clear that the main body of companies is located in the big European countries UK, Germany, and France.

Figure 6: European dataset company location



In line with Chaney et al. (2012), companies in the industries of insurance, real estate, mining, construction, and financial trading, are removed to avoid bias. Naturally the companies selected using this search strategy are mainly large listed companies due to the restriction on 'Buildings' and the fact that this detailed accounting information is not available for smaller firms. Data was recorded from 2003 to 2011 (and even 2012 when available). In order to normalize the FX rates and take out any FX rate implications of historical FX fluctuations all values have been normalized to the last reported US FX rate.

The variables selected for the study of European firms were 'Country ISO Code' 'NACE-code', 'Number of employees', 'Operating P/L' (EBIT), 'Net Property Plant & Equipment' (PPE), 'Buildings', 'Total Buildings Depreciation', 'Net Cash used by Investing Activities' (Investments), 'Total Assets', 'Long term debt', 'Cash & cash equivalent' (Cash), 'Tangible fixed assets' (TFA), 'Depreciation', 'Market price per share- year end', 'Book value per

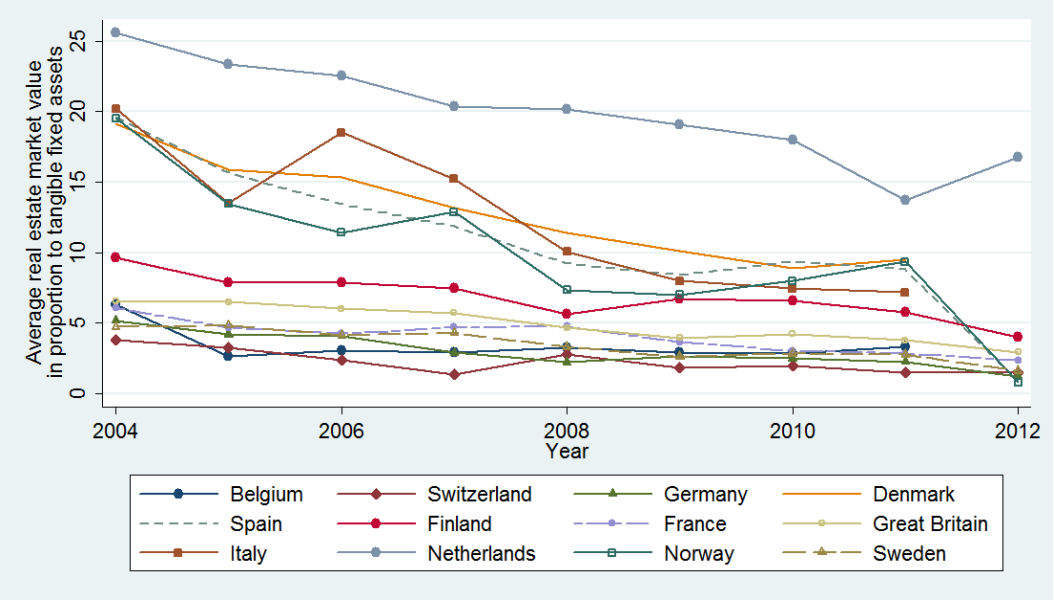
share- year end', and 'Shares outstanding – year end'. We compute the variable 'Operating cash flow' as EBIT plus depreciation.

In order to calculate the market value of real estate property the variables 'Buildings' and 'Total Buildings Depreciation' were used. The 'Buildings' variable corresponds to the acquisition price of the companies' buildings. By dividing 'Total Buildings Depreciation' by 'Buildings' we get the fraction of the depreciated part of the property. Assuming a straight line depreciation of 40 years we arrive at an average acquisition age of the buildings. [1] Using house price indices for each individual country, a "market value" of the company real estate is calculated. For illustration purposes: If a company had \$100 reported in 'Buildings' and \$20 reported in 'Total Buildings Depreciation' in year 2010 (yielding an average acquisition year of 2002) and the HPI development was 50% from 2002 to 2010 the market value of the companies buildings would be calculated as $\$100 \cdot 1.5 = \$150$. The real estate value development is depicted in Figure 7.

Using the national HPI development to construct the market value of the companies' real estate assets assumes that the companies' real estate assets are located in the same country as the companies head office.

See table Table 5 & Table 7 for summary statistics of the final European dataset.

Figure 7: Real estate market value in proportion to fixed assets per country and year

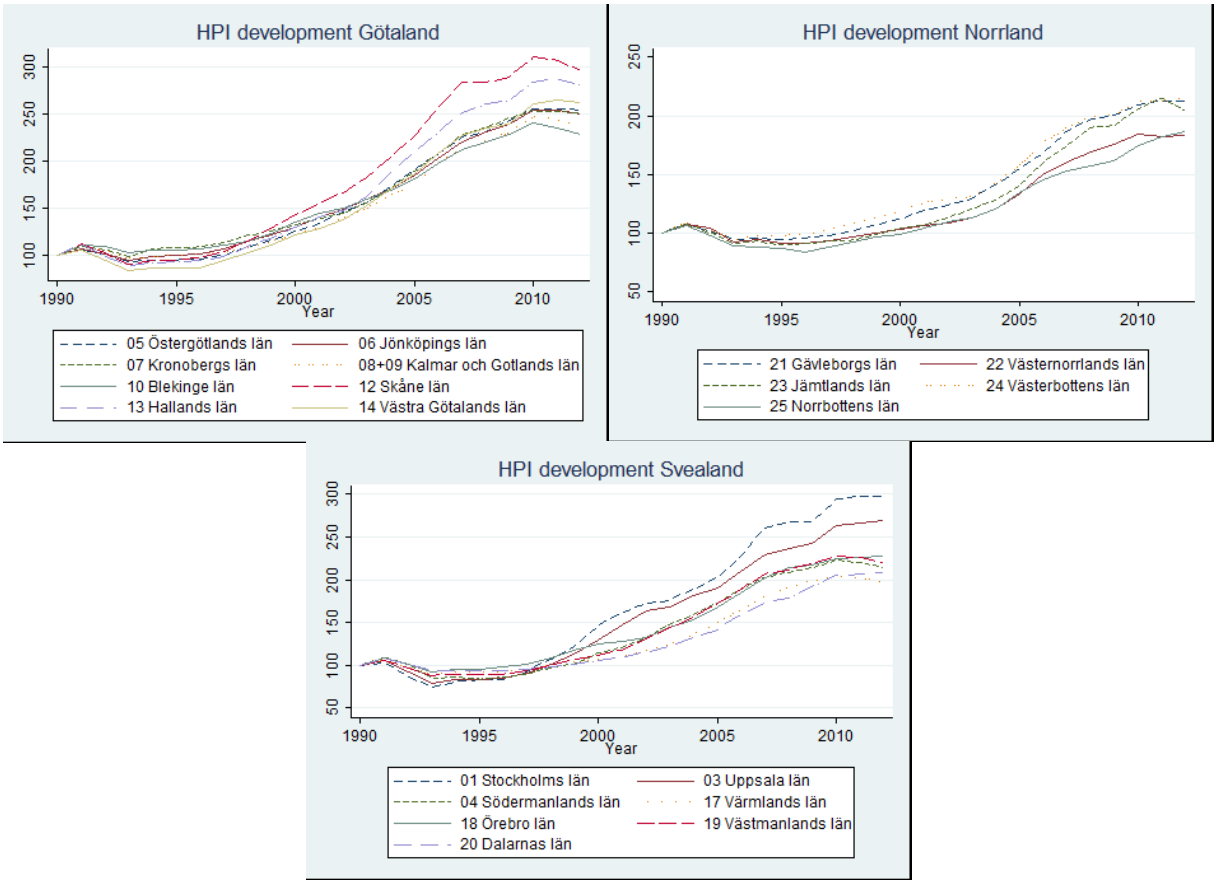


[1] Europe is not as homogenous as U.S. when considering depreciation of buildings, but the most frequent depreciation rate range for European Union member states was 2-5% before 2004 (European Commission: Common Consolidated Corporate Tax Base Working Group, 2004). The assumed depreciation rate of 2.5% is reasonable.

4.3. Swedish house price index data

The Swedish HPI data is provided by Statistics Sweden (SCB) and comprises of HPI development on county level for permanent residential buildings. The HPI is based on property registration of acquired property by Lantmäteriet, the Swedish Authority for property registration. The property registration information is combined with taxation values for the acquired properties and Lantmäteriet creates a price register that SCB uses to produce the official HPI (Statistiska Centralbyrån, 2013). See Figure 8 for an overview of the HPI development in Sweden by county from 1990.

Figure 8: HPI development



4.4. Swedish SME accounting data

The Swedish accounting data encompass a total of 446 535 firms in the years 1997 to 2008 in an unbalanced panel dataset, representing the whole population of companies in Sweden during the period. After cleaning for mining, finance, insurance, real estate, municipalities, and construction companies, as well as cleaning for companies with no revenues or no

employees the data covers 153 313 firms totaling approximately 1.5 million observations. The data contains information on the items in the firms' annual reports filed at Bolagsverket, the Swedish Companies Registration Office. The data contains variables from the profit and loss statement, the balance sheet as well as general information on location, industry sector and number of employees. The balance sheet items are reported net of depreciation. This poses a problem for assessing a good estimate for the market value for the assets. As we are interested in the firms' exposure to fluctuations in the real estate market, it is important to be able to estimate the market value of a firm's real estate assets. With no information on whether acquisition price or acquisition year, it is impossible to construct a good estimate for the real estate market value as we are able to do with the European data. A potential solution of using the net real estate book value as proxy for the market value is not advisable as one might expect the net book value to co-vary with the age of the firm and the firms' investment cycle. Instead we limit the sample to a subset of firms where we are able to assess a good proxy for the market value of the real estate property. These firms include the ones who acquired their first real estate property, i.e. went from zero to above zero reported net book value of real estate assets, as well as firms in their first year of operation with reported book value of real estate assets. We use the years 1998-2000 in the beginning of the sample to construct a real estate market value by assuming that the firms who went from zero reported real estate assets (or did not report at all) to above zero real estate assets had acquired their real estate property during the year at an, on average, fair market price. This gives us the acquisition price of the real estate properties for 7 150 firms in the years 1998-2000. Using the information on acquisition price of the real estate properties in the years 1998-2000, we construct the real estate market value in the years 2001-2008 by combining the acquisition price with the HPI development in the county, analogously to the Chaney et al. (2012). This gives us a proxy of the market value of the companies' real estate assets in the years 2001-2008 yielding 46 887 firm year observations when excluding observations with less than 5 employees or revenues below 1 million SEK. Approximately 1000 firms fall out of the sample at some point during the period 2000-2008. Note that the method for computing the real estate value does not take into account any real estate transactions after the initial acquisition of real estate in the period 1998-2000. The proxy real estate value of the company is hence a function of the acquisition price in 1998-2000 and the HPI development in the county where the company is located.

Using the data we compute the following variables:

Investment as the change in fixed assets from the previous year plus depreciation in the year.

Operational Cash flow (*Cashflow)* as the operational profit plus the sum of depreciation in the year.

In addition we normalize all variables by dividing with lagged fixed assets. The big variation in fixed assets in the cross-section of SMEs motivates to also normalize all variables by lagged revenue.

See Table 6 and Table 8 for summary statistics of the Swedish sample firms in the years 2001-2008.

4.5. Method employed when examining the Swedish data

In order to facilitate comparability between our results on the European data as well as the results in the Chaney et al. (2012) study we employ an identical model specification to test the effect of real estate price increases on investments for the Swedish firms.

$$INV_{it}^{l} = \alpha_i + \delta_t + \beta.\mathrm{RE}\,Value_{it} + \gamma P_t^l + controls_{it} + \epsilon_{it}$$

Equation 8: Chaney et al. investment equation

The model specification is identical to the specification used to examine the European data which will enable comparability between our results. The model is run in two different settings, one where the ratios *INV, REValue* and *Controls* are normalized by lagged fixed assets and one where the variables are normalized by lagged revenue. The *P* controls for the relative HPI price level in the county. Observations outside the 5^{th} and 95^{th} percentile as well as observations where revenue is below 1 million SEK are excluded from the regression. Moreover, following a standard SME definition, firms with less than 5 employees and firms with more than 2000 employees are excluded from the regression. As the Swedish data consists of private firms, the market to book ratio is excluded from the control variables, i.e. the only control variable is the operational cash flow. The specification is run without firm fixed effects with robust standard errors. The specification is also run controlling for firm fixed effects and clustering the standard errors on firm id.

The ex-ante hypothesis of the signs of the coefficient is that β is positive, i.e. that firms which are exposed to an increase in their real estate value will invest more. The findings of Chaney et al. (2012) suggest that the level of the β should be around 0.06 meaning that for an increase

in real estate value by 100 SEK the firm would invest 6 SEK. The difference in sample firms, both geographical locations, firm size and to some extent time period should require us to treat the suggested level by Chaney et al. (2012) with caution. Although we expect to find a positive sign on the β-coefficient, we cannot make a qualified guess on the magnitude of the coefficient. One could argue both that the coefficient should be larger than 0.06 due to the fact that SMEs often are more credit constrained due to higher costs of overcoming agency issues than large publicly listed companies (Carpenter & Petersen, 2002). On the other hand one could question the SMEs growth ambitions in the presence of 'lifestyle'-oriented managers (Cressy, 1996) or the ability of SMEs to take advantage of the fact that their assets have grown in value and are able to convert the value increase into new investment opportunities. We further expect the cash flow control variable to show a strong and positive sign (Jensen & Meckling (1976), Fazzari et al. (1998), Chaney et al. (2012), & López-Gracia & Sogorb-Mira (2008)).

As we have access to information on the Swedish firm's long term debt, we can test if real estate value increases have any effect on firm debt. This would allow us to partly answer the question on through which mechanism real estate value increases affects firm investments. We employ the same specification for the effect on long term debt:

$$Debt^{\mathrm{l}}_{it} = \alpha_i + \delta_t + \beta.\mathrm{RE}\, Value_{it} + \gamma P^l_t + controls_{it} + \epsilon_{it}$$

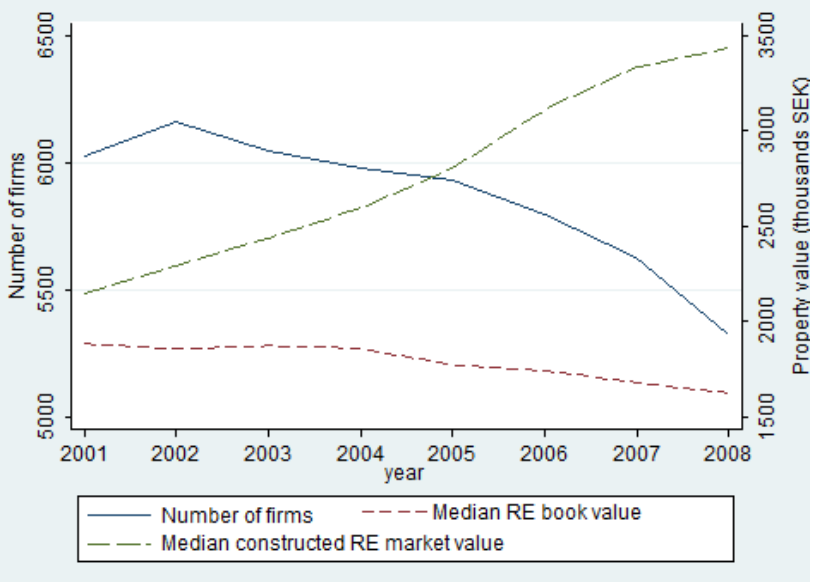
Equation 9: Long term debt explained by real estate value

Where $Debt^l_{it}$ is the long term debt level of firm i in time t. Identical to the previous specification we normalize the debt variable by lagged fixed assets as well as lagged revenue. In this setting the employed methodology of fixing the real estate value exposure in the 1998-2000 period and interacting it with the HPI development is beneficial as the effect on long term debt of acquiring additional real estate property is ignored. We hypothesize that the employed specification will yield similar results as the specification on firm investment. A positive β coefficient would mean that firms with increases in real estate values are borrowing against the value increase. We believe, however, that the magnitude of the effect on firm long term debt is greater than the effect on firm investment. We believe that credit constrained firms will use the additional financial slack created by the real estate value increase not only in order to take on new investment opportunities defined as investments in tangible assets, but

also for other purposes, and that the mechanism through which firms utilize the increased financial slack for all these purposes is by taking on more debt.

The employed methodology selects all firms who reported real estate property for the first time in the period 1998-2000 and interacts the acquisition price of the property with the general HPI development in the country to construct a proxy for the market value of the real estate property in the period 2001-2008. This results in a fairly homogenous sample of firms from an age and investment cycle perspective. There is however some obvious issues with the specification that needs to be discussed. First, in the model we assume that the exposure to real estate value fluctuations will stay fairly constant after the initial acquisition. The motivation for this is partly from a data perspective where it is impossible to construct an unbiased estimate for the development of holdings of real estate property except to identify the first acquisition, and partly due to simplicity and understandability. It is conceptually easy to understand the setup with approx. 7000 firms in different counties who acquired their first real estate property in 1998-2000 and to hold the initial exposure to the real estate market constant and investigate how the firms' investments are affected by increases in the local house price indices. The drawback is of course that the methodology relies on a relative homogeneity among the selected firms and that the modeled real estate value for the years 2001-2008 may differ considerable from the actually held real estate property for the individual company. On an aggregate level however, we note that the book value of real estate assets and the computed market value of real estate assets follow an expected path as is visible in Figure 9: The median of book value decreases slightly during the period whereas the computed market value naturally increases somewhat with the HPI increases. Second, the methodology relies on the fact that the firms' real estate assets are located in the same county as the company head quarter. Considering the size of the firms in the sample this assumption is justifiable. Third, the methodology treats the HPI development in the county as exogenously given. If one were to consider house price growth as an endogenous variable dependent on the general economic environment, including corporate investments, in the county there exists an endogeneity problem in the specification. Chaney et al. (2012) overcome this endogeneity issue by instrumenting the HPI variable with an interaction of interest rates and land supply. Our simple model does not take into account the potential endogeneity issues the HPI poses, but treats the HPI development as exogenously given.

Figure 9: Overview of Swedish sample firms



5. Results

The results in large support the findings by Chaney et al. (2012), firms that hold real estate will on average invest more as the real estate value increases.

5.1. Testing the specification on European firms

The full regression results are displayed in Table 1. In line with the results found by Chaney et al. (2012), the European data used in this study displays the same general trend with a slightly lower effect magnitude compared to that found by Chaney et al. (2012). An increase of real estate value by one dollar leads to, on average, an increase of five cents worth of investment. Table 1 provides the regression result to the regressions on European data in a similar test setting to that employed by Chaney et al. (2012). All regressions follow the specification

$$INV_{it}^{l} = \alpha_i + \delta_t + \beta.\mathrm{RE}\, Value_{it} + \gamma P_t^l + controls_{it} + \epsilon_{it}$$

Equation 8: Chaney et al. investment equation

And increase in complexity from left to right. Column 1 displays the result of simply regressing investment on real estate value and HPI. The real estate market value is positively correlated with investment stating that an increase in real estate value with one dollar will lead to an additional 28 cents increase in investment. The HPI coefficient is small, significant, and displays a negative correlation with investment. In column 2, we add year dummies to capture year fixed effects, ideally removing bias from macro factors affecting the investment of all firms in a certain year. The results are similar to the baseline regression of column 1 save the difference that the significance of the HPI disappears. For the remaining four regressions we added firm fix effects and clustered the standard errors on firm level. When adding year and firm fixed effects to the baseline regression as reported in column 4, the real estate effect is still very large and significant. Controlling for cash flow in column 5 and finally cash flow and market to book ratio in column 6, we arrive at the result that a firm, on average, invests an additional 4.8 cents per one dollar increase in real estate value. An increase in real estate value by one standard deviation ($3 610 million) would correspond to an increase of $173 million in investment ($\$3\,610 \times 0.048 = \$173$) representing 12% of investment's standard deviation. As expected with the pecking order theory in mind, the cash flow effect is by large the most significant variable to explain investment. That being said, all other explanatory

variables are significant at a 0.001% level of significance. Using firm and year fixed effects, the market to book ratio, and the cash flow, the model explains 77.3% of the variation in firm investments.

Table 1: Regressions on European data

	(1) OLS	(2) OLS	(3) OLS	(4) OLS	(5) OLS	(6) OLS
ReValue/TFA	0.279***	0.249***	0.304***	0.253***	0.048***	0.048***
	(37.63)	(33.87)	(26.44)	(21.67)	(7.27)	(7.26)
HPI	-0.015***	0.004*	-0.090***	0.089***	0.017***	0.017***
	(-7.73)	(2.09)	(-21.23)	(13.40)	(5.52)	(5.69)
Cash flow/TFA					0.995***	0.991***
					(53.84)	(53.19)
MarketValue/BookValue						0.039***
						(4.56)
Constant	8.302***	9.967***	20.870***	-0.912	0.293	-0.433
	(24.56)	(27.20)	(28.62)	(-1.05)	(0.75)	(-1.01)
Year Fixed Effects	No	Yes	No	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes	Yes	Yes	Yes
R-squared	0.072	0.287	0.195	0.287	0.773	0.773
Observations	19053	19053	19053	19053	19053	19053

* p<0.05, ** p<0.01, *** p<0.001, T-Statistic within parenthesis

Notes: The dependant variable "Investment" is CAPEX normalized by the one year lagged value of the tangible fixed assets. The explanatory variable "ReValue/TFA" is defined as market value of real estate. normalized by one year lagged total fixed assets. "HPI" is the housing price index as collected according to Table 9. "MarketValue/BookValue" is the share market value normalized by the share book value. "Cash flow/TFA" is the cash flow from operating activities normalized by one year lagged total fixed assets. The standard errors are clustered on firm level and year dummy indicators are used.

The robustness checks performed by Chaney et al. (2012) included testing subsamples from different time periods. For the data used in this study, performing similar checks results in rather different effects of real estate as collateral to stimulate investment as depicted in Table 2 & Figure 10.

As previously mentioned, the effect on investment by holding real estate in the European data is in line with Chaney et al. (2012). The effect of having an additional dollar of real estate will, on average, increase the investment of a company by around five cents. Chaney et al. (2012) estimated the effect to be around 6 cents. Our estimation on the European firms lies slightly below at 4.8 cents. The effect of cash flow is notably higher in this study (0.99) when compared to the effect found in the American market (0.16). The market to book coefficient found in the European data (0.039) is similar to that found in the study by Chaney et al. (2012) who estimated it to 0.065.

In Figure 10 we present how the regression results change over time using overlapping periods of four years-worth of Orbis data. It is noteworthy that the effect is not consistent over time but rather increases in the sample period. The effect starts out low with an insignificant value on the ReValue/TFA explanatory variable for the first two periods. It then increases for all consecutive periods save the last where the effect decreases again.[2] Drawing any conclusions from this behavior is difficult but what can be said is that the result of the regression seems to be partly conditional on the time period examined. Chaney et.al. (2012) tested two periods (pre 1999 & post 2000) and arrived at the result that the two periods does not provide significantly different results. The reason for our discrepancy regarding the time consistency of regression results to the findings by Chaney et al. (2012) might be due to the asset backed securities originated crisis that struck globally in 2008.

[2] Recall from Table 7 that the last year 2012 only contains information for 806 firms in the sample of around 2700.

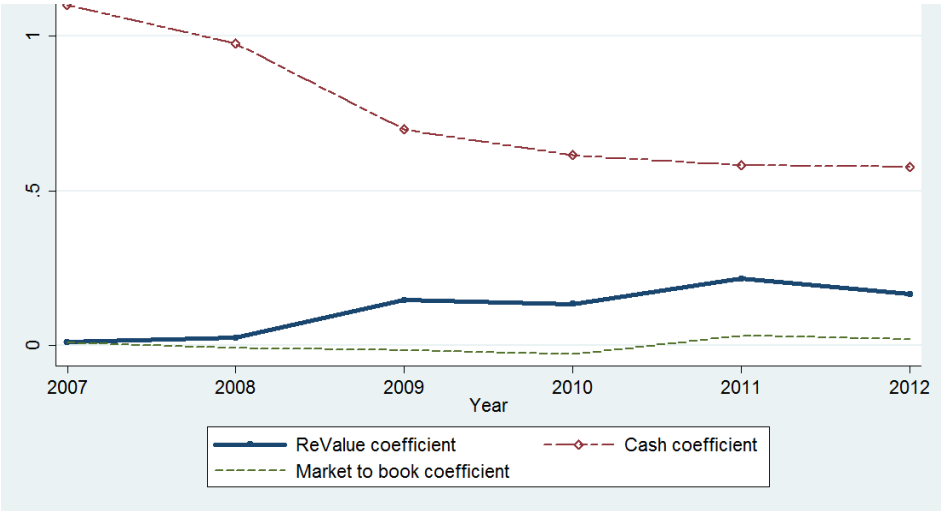
Table 2: Evolution of regression coefficients over the sample period using 4 year windows

	2004-2007	2005-2008	2006-2009	2007-2010	2008-2011	2009-2012
ReValue/TFA	0.010	0.024	0.147***	0.134***	0.216***	0.166***
	(0.73)	(1.50)	(6.29)	(5.25)	(7.00)	(5.69)
HPI	0.023*	0.021	0.014	-0.023*	-0.001	0.000
	(2.38)	(1.41)	(0.63)	(-2.49)	(-0.08)	(0.04)
Cash flow/TFA	1.101***	0.975***	0.698***	0.615***	0.583***	0.577***
	(35.75)	(30.09)	(11.97)	(8.86)	(8.26)	(8.32)
MarketValue/BookValue	0.009	-0.009	-0.015	-0.029	0.032	0.020
	(0.74)	(-0.36)	(-0.38)	(-0.63)	(1.16)	(0.46)
Constant	-2.617	-2.136	-0.206	6.489***	2.248	2.148
	(-1.70)	(-0.80)	(-0.05)	(3.87)	(1.45)	(1.22)
Year Fixed Effects	No	Yes	No	Yes	Yes	Yes
Firm Fixed Effects	No	No	Yes	Yes	Yes	Yes
R-squared	0.834	0.714	0.510	0.396	0.445	0.364
Observations	4195	4492	4766	4985	5055	4993

* p<0.05, ** p<0.01, *** p<0.001, T-Statistic within parenthesis

Notes: The dependant variable "Investment" is CAPEX normalized by the one year lagged value of tangible fixed assets. The explanatory variable "ReValue/TFA" is defined as market value of real estate. normalized by one year lagged total fixed assets. "HPI" is the housing price index as collected according to Table 9. "MarketValue/BookValue" is the share market value normalized by the share book value. "Cash flow/TFA" is the cash flow from operating activities normalized by one year lagged total fixed assets. The standard errors are clustered on firm level and year dummy indicators are used. The regressions are run on the same data as the ones in Table 1, but using data subsets of four overlapping years.

Figure 10: Evolution of coefficients over the sample period using 4 year windows



Note: The horizontal axis corresponds to the end year of the four year window examined

5.2. Testing the specification on Swedish SME firms

The results from the base line regression on the Swedish firms' accounting data are found in Table 3. From left to right the specification increases in complexity. Column 1-4 display results from running the specification without controlling for individual firm fixed effects and column 5-8 display results when controlling for individual firm fixed effects. The table displays the results for variables normalized both by lagged fixed assets and lagged revenue. The variable of interest, REValue is positive and statistically significant in seven of the eight regressions although the economic significance in OLS(1)-OLS(4) with no control on firm fixed effects can treated as negligible. The results in column 1-4 would indicate that for an increase in real estate value by 1 SEK would lead to increased firm investment by 0.006 a magnitude that, although statistically different from zero, has small impact on firm investment. An increase in RE value by one standard deviation (657 000 000 SEK) would lead to an increase of around 4 000 000 SEK ($657\,000\,000\,\text{SEK} \times 0.006$) in investment representing only 1.5% of investment's standard deviation of 286 000 SEK. The cash flow variable shows to be highly significant, in column 2 the cash flow variable coefficient is 0.311 and in column 4 the cash flow variable is 0.173. Including the cash flow variable increases the fit of the model with an R-square increase from around 1% to around 5%. Naturally, we do not expect the model to fit as well with regards to explanatory power on the Swedish SME data due to the relative non-consistent yearly investment behavior of smaller firms in comparison to larger corporations.

When running the specification in its most advance form, controlling for both firm individual effects and operational cash flow as usual in the literature on financing frictions, OLS(6) and OLS(8), the economic significance is considerable, although not as high as for the European firms with results around 5 cents increase of investment from a $1 increase in real estate value. The results for the Swedish data imply that for each 1 SEK value increase in the value of real estate property, the company will invest 0.02 SEK. The results displayed in column 6-8 indicate that for an increase of one standard deviation in real estate value would lead to an increase of 4.6% of investment's standard deviation. Notably, the cash flow variable coefficient remains at a high level of around 0.2 also when controlling for firm fixed effects. The constant in the regression is above zero and statistically significant in most cases.

Table 3: Regression on Swedish accounting data

	OLS(1)	OLS(2)	OLS(3)	OLS(4)	OLS(5)	OLS(6)	OLS(7)	OLS(8)
	INV/Revenue		INV/TFA		INV/Revenue		INV/TFA	
REvalue/Revenue	0.006***	0.007*			0.006***	0.025*		
	(3.81)	(2.37)			(3.41)	(2.32)		
REvalue/TFA			0.008*	0.004			0.010**	0.020***
			(2.55)	(1.55)			(2.63)	(3.93)
Cashflow/Revenue		0.311***				0.218***		
		(24.92)				(10.56)		
Cashflow/TFA				0.173***				0.216***
				(15.45)				(12.61)
HPI	0.000	0.000	0.000	0.000	0.000	0.000	0.000	-0.001
	(0.78)	(-1.46)	(1.67)	(0.22)	(-0.82)	(-1.00)	(-0.40)	(-1.70)
Constant	0.023***	0.01	0.129***	0.035	0.041	0.023*	0.199**	0.145
	(3.39)	(1.68)	(6.43)	(1.21)	(1.89)	(1.97)	(3.03)	(1.48)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
R-squared	0.007	0.041	0.017	0.062	0.003	0.013	0.018	0.071
Observations	46 539	45 463	46 767	46 318	46 539	45 463	46 767	46 318

* p<0.05, ** p<0.01, *** p<0.001, T-statistic within parenthesis

Notes: Regression on Swedish accounting data. $INV = \alpha + \delta + \beta.RE\,Value + \gamma P + controls + \epsilon.$ Approx 6000 unique Swedish firms in 2001-2008 who acquired their first real estate property in the period 1998-2000. The dependent variable Investements and the independent variables REValue and Cashflow are normalized by lagged total fixed assets and lagged revenue. The HPI variable is the HPI level for each county in a given year. Observations with less than 5 employees, more than 2000 employees and revenues less than 1 million SEK are excluded. Observations for the investment variable above the 95th percentile or below the 5th percentile are excluded. Standard errors are robust in OLS(1)-OLS(4). Standard errors are clustered on firm id in OLS(5)-OLS(8)

Results for the second model specification on the Swedish data are displayed in Table 4. The dependent variable in all regressions in Table 4 is the long term debt of the firm, normalized by lagged fixed assets and lagged revenue. Column 1-4 displays how long term debt is affected by an increase in real estate value without controlling for firm fixed effects. As expected, a real estate value increase and the subsequent possibility to post more collateral will increase the firm's long term debt. Column 1 and 3 where the operational cash flow variable is excluded report a lower impact than column 2 and 4 where the cash flow variable is included. The effect of cash flow on leverage is not economic or statistically significant as it is on firm investment.

Column 5-8 reports the results for the specification when controlling for individual firm fixed effects. The interpretation of the RE value variable coefficient when controlling for operational cash flow is that an increase in RE value by 1 SEK would lead to an increase in long term debt by 0.024 to 0.071 SEK. This implies that for an increase of one standard deviation in real estate value yields an increase of 6-16% of long term debt's standard deviation.

Table 4: Regression 2 on Swedish accounting data

	OLS (9)	OLS (10)	OLS (11)	OLS (12)	OLS (13)	OLS (14)	OLS (15)	OLS (16)
	LT Debt/Revenue		LT Debt/TFA		LT Debt/Revenue		LT Debt/TFA	
REvalue/Revenue	0.021***	0.099**			0.006*	0.071***		
	(3.89)	(3.02)			(2.01)	(4.15)		
REvalue/TFA			0.001	0.019***			0.002	0.024***
			(1.49)	(5.02)			(1.44)	(4.41)
Cashflow/Revenue		0.012				0.001		
		(0.77)				(0.09)		
Cashflow/TFA				-0.01				0.019
				(-1.31)				(1.73)
HPI	-0.000***	-0.000***	0.000	0.000	0.000	0.000	0.001	0.001
	(-4.66)	(-4.68)	(0.62)	(-0.1)	(1.81)	(1.28)	(1.84)	(1.21)
Constant	0.161***	0.203***	0.564***	0.555***	0.168***	0.163***	0.631***	0.390***
	(0.21)	(0.73)	(5.83)	(5.94)	(1.67)	(1.29)	(8.91)	(3.40)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	No	No	No	No	Yes	Yes	Yes	Yes
R-squared	0.02	0.06	0.01	0.09	0.05	0.06	0.02	0.03
Observations	44 919	44 076	46 430	46 031	44 919	44 076	46 430	46 031

* p<0.05, ** p<0.01, *** p<0.001

Notes: Base regression on Swedish accounting data. $Debt = \alpha + \delta + \beta.RE\ Value + \gamma P + controls + \epsilon.$ Approx 7 000 unique Swedish firms in 2001-2008 who acquired their first real estate property in the period 1998-2000. The dependent variable Debt and the independent variables REValue and Cashflow are normalized by lagged total fixed assets and lagged revenue. The HPI variable is the HPI level for each county in a given year. Observations with less than 5 employees, more than 2000 employees and revenues less than 1 million SEK are excluded. Observations for the Debt variable above the 95th percentile or below the 5th percentile are excluded. Standard errors are robust in OLS(1)-OLS(4). Standard errors are clustered on firm id in OLS(5)-OLS(8).

6. Conclusion

In this study we have investigated and made an attempt to quantify financing frictions for European firms by employing a specification that uses the 'collateral channel' in order to identify credit rationing in Europe. We have provided results for both larger European listed corporations and smaller Swedish firms that are in line with previous literature on the subject: the collateral value increase effect on investment indicates the presence of financing frictions in the market.

This study reaffirms that having collateral to post is important for firms in order to be able to exploit more investment opportunities. The European data suggests that the collateral channel enabling debt funding is of equal importance in Europe as in USA. A firm that can post collateral will invest more on average and thus ultimately grow faster. We believe that this study helps in exposing the additional benefits of being able to post collateral for a firm regarding the ability to exploit more positive net present value opportunities due to reduced financing frictions.

During the examined period in the European dataset; 2004-2012, the world experienced large shifts in the financial market. The selected time period is especially interesting due to the fact that the European economy has undergone substantial financial turmoil. First, the sub-prime market crisis in the US starting in 2007 ultimately created a worldwide financial contagion within the financial sector. Second, the financial stability of several EU member states has been destabilized during the later years in the sample period in what can be called a European debt crisis. Naturally, the house price index volatility during this period did not stay unaffected from the overall instability in the macro economy. The house price index in Europe has experienced high volatility over time and across countries in our sample period.

The results of our study suggest that the effect of the collateral channel of funding investment is not fixed over time. Using a rolling window methodology, we find that the collateral channel effect is not constant over time in our sample period. With these results we conclude that financing frictions measured in our sample are not constant over time. It is not difficult to imagine the effect increasing during financial crises, periods where information asymmetries might become more important. Banks will require more collateral to ensure getting repaid before granting loans; further exacerbate the information asymmetry between firms needing finance and banks offering liquidity selectively.

Examining the financing frictions using the 'collateral channel' specification on the Swedish SME data confirms previous findings on financing frictions and extends the applicability of those findings across geographies and firm sizes. Our results indicate that the effect of increased value of real estate assets on firm investment, although statistically and economically significant, is lower than for larger corporations. On the basis of our results we cannot conclude that smaller firms face higher financing frictions than larger firms as is suggested by Carpenter & Petersen (2002). We can however conclude that Swedish SMEs indeed are capital constrained and that variation in the value of their real estate property is positively correlated with firm investments. Employing the model to explain firm long term debt indicates that the initial hypothesis, of the debt channel as the primary mechanism through which firms utilize the increased financial slack created by the real estate value increase and take on more investment opportunities, is correct. The results on the Swedish SME data reaffirm the results on American publicly listed firms presented by Chaney et al. (2012) .

Detailed data on companies' investment and real estate value is not straight forward to obtain. The proxy used for market values in this study relies on assumptions on real estate being held in the same location as the firm headquarters, and assumptions on acquisition price and time that could potentially create a bias of the results. If a better measure of the real estate value could be used, a more fair representation of the collateral effect would be discernible. Targeting the taxation value of a firm's real estate might be closer to the market value and using this would probably give results closer to the real effect of the collateral channel.

Moreover, a future study would benefit from a longer time period than the one examined in this study to clarify whether the results are time consistent or not. Using the method of rolling windows employed in this study, it seems that the effect is stable in sign, but varies in magnitude. This makes future studies of the collateral channel interesting to follow the development of the effect in different macroeconomic settings. The dataset used in this study cover large macroeconomic shifts and indeed our results indicate a greater effect during times of macroeconomic crisis. Further exploring the effect during and outside times of financial disturbance should give deeper insight into the financing frictions experienced by firms during different macro regimes. It would be interesting to perform further studies on SME financing frictions and investment behavior. Employing the same strategy as the one used in this study would be interesting to apply to an Asian setting where bank relationships might be

different than the ones observed in Europe or USA. However, we leave this question for others to answer.

References

Akerlof, G. A. (1970). The Market for 'Lemons': Quality Uncertainty and the Market Mechanism. *Quarterly Journal of Economics, vol. 84(3)* , 488-500.

Bond, S., & Van Reenen, J. (2007). Microeconomic models of investment and employment. In J. J. Heckman, & E. Leamer, *Handbook of Econometrics, vol. 6* (pp. 4417-4498). Amsterdam: North Holland.

Brainard, W. C., & Tobin, J. (1968). Econometric Models: Their Problems and Usefullness - Pitfalls in Financial Model Building. *The American Economic Review, vol. 58(2)* , 99-122.

Carpenter, R. E., & Petersen, B. C. (2002). Is the Growth of Small Firms Constrained by Internal Finance? *The Review of Economics and Statistics, vol. 84(2)* , 298-309.

Chan, Y.-S., & Kanatas, G. (1985). Asymmetric Valuations and the Role of Collateral in Loan Agreements. *Journal of Money, Credit and Banking, vol. 17(1)* , 84-95.

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

Cressy, R. (1996). Pre-Entrepreneurial Income, Cash-Flow Growth and Survival of Startup Businesses: Model and Tests on U.K. Data. *Small Business Economics, vol. 8(1)* , 49-58.

Duchin, R., Ozbas, O., & Sensoy, B. A. (2010). Costly external finance, corporate investment, and the subprime mortgage credit crisis. *Journal of Financial Economics, vol. 97(3)* , 418-435.

Engle, R. F., & Foley, D. K. (1975). An Asset Price Model of Aggregate Investment. *International Economic Review, vol. 16* , 642-643.

European Commission: Common Consolidated Corporate Tax Base Working Group. (2004, October 28). Assets and Tax Depreciation. Brussels, Belgium.

Fazzari, S. R., Hubbard, G., Petersen, B., Blinder, A. S., & Poterba, J. M. (1998). Financing Constraints and Corporate Investments. *Brookings Papers on Economic Activity, vol. 1998(1)* , 141-206.

Frank, M. Z., & Goyal, V. K. (2005). Tradeoff and Pecking Order Theories of Debt. In E. Eckbo, *Handbook of Corporate Finance: Empirical Corporate Finance* (p. Chapter 7). Elsevier/North-Holland.

Gan, J. (2007). *Collateral, Debt Capacity, and Corporate Investment; Evidence from a Natural Experiment.* New York: Center of Japanese Economy and Business.

Gomes, J. F. (2001). Financing Investment. *American Economic Review, vol. 91(5)* , 1263-1285.

Gordon, M. J. (1962). *The investment, financing , and valuation of the corporation.* Homewood, IL: R. D. Irwin.

Hayashi, F. (1982). Tobin's marginal q and average q: A neoclassical interpretation. *Econometrica, vol. 50(1)* , 213-224.

Hope, O.-K., & Thomas, W. B. (2008). Managerial Empire Building and Firm Disclosure. *Journal of Accounting Research, vol. 46(3)* , 591-626.

Jensen, M. C., & Meckling, W. H. (1976). Theory of Firm : Managerial Behavior, Agency Cost and Ownershipship Structure. *Journal of Financial Economics, vol. 3* , 305-360.

López-Gracia, J., & Sogorb-Mira, F. (2008). Testing trade-off and pecking order theories financing SMEs. *Small Business Economics, vol.31(2)* , 117-136.

Lummer, S., & McConnell, J. (1989). Further evidence on the bank lending process and the capital-market response to bank loan agreements. *Journal of Financial Economics, vol. 21(1)* , 99-122.

Miles, J. A., & Ezzell, J. R. (1980). The weighted average cost of capital, perfect capital markets, and project life: A clarification. *Journal of financial and quantitative analysis, vol. 15(3)* , 719-730.

Modigliani, F., & Miller, M. H. (1963). Corporate Income Taxes and the Cost of Capital: A Correction. *The American Economic Review, vol. 53(3)* , 433-443.

Modigliani, F., & Miller, M. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *American Economic Review, vol. 48(3)* , 261-297.

Murray, F. Z., & Tao, S. (2012). Investment, Q, and the Weighted Average Cost of Capital. *Forthcoming* .

Myers, S. C., & Majluf, N. S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics, vol. 13(2)* , 187-221.

Narayanan, M. P. (1988). Debt Versus Equity Under Assymetric Information. *The Journal of Financial and Quantitative Analysis, vol. 23(1)* , 39-51.

Penrose, E. (1959). *The Theory of the Growth of the Firm.* Basil Blackwell.

Ross, S. A. (1977). The Determination of Financial Structure: The Incentive-Signalling Approach. *Bell Journal of Economics, vol. 8(1)* , 23-40.

Scholtens, B., & van Wensveen, D. (2000). A critique on the theory of financial intermediation. *Journal of Banking & Finance, vol. 24(8)* , 1243-1251.

Shyam-Sunder, L., & Myers, S. C. (1999). Testing static tradeoff against pecking order models of capital structure. *Journal of Financial Economics, vol. 51* , 219-244.

Statistiska Centralbyrån. (2013, 04 18). Fastighetspriser och lagfarter. Stockholm, Sweden. Retrieved from http://www.scb.se/Statistik/BO/BO0501/_dokument/BO0501_DO_2013.pdf

von Furstenberg, G. M., Lovell, M. C., & Tobin, J. (1977). Corporate Investment: Does Market Valuation Matter in the Aggregate? *Brookings Papers on Economic Activity, vol. 1977(2)* , 347-408.

Zingales, L. (2000). In search of new foundations. *The Journal of Finance, vol. 55(4)* , 1623-1653.

Table 5(A): European data summary statistics

Variable	N	Mean	SD	P25	Median	P75	Min	Max
Ebit (th)	19 083	281 000	1 370 000	1 021	14 381	94 943	-22 400 000	42 300 000
PPE (th)	19 115	1 140 000	5 890 000	8 319	48 848	308 000	0	166 000 000
ReV (th)	17 643	916 000	3 610 000	8 651	55 163	311 000	1	79 100 000
Cash (th)	18 975	370 000	1 640 000	5 300	24 067	115 000	0	34 200 000
Total Assets (th)	19 115	4 100 000	18 100 000	70 674	276 000	1 420 000	155	409 000 000
Tangible Fixed Assets (th)	19 115	1 140 000	5 890 000	8 319	48 848	308 000	0	166 000 000
Employees	18 364	11 046	41 291	248	1 055	5 102	1	640 000
Long Term Debt (th)	18 794	860 000	3 940 000	1 911	24 191	234 000	-415	87 100 000
Depreciation (th)	19 070	-128 000	613 000	-39 900	-7 139	-1 337	-15 100 000	8 811
Average Age of Buildings	19 115	14.74	8.86	8.06	14.20	20.14	-1.82	40.01
Net Investment (th)	14 132	256 000	1 420 000	1 645	12 402	76 521	-15 900 000	54 900 000
Cash Flow (th)	14 152	368 000	1 590 000	2 430	20 242	124 000	-1 450 000	38 100 000
Investment/TFA	19 115	7.30	10.31	0.14	0.50	22.85	-5.62	22.85
ReValue/TFA	19 115	5.65	9.80	0.78	1.41	2.96	0.02	29.46
HPI	19 053	170.04	37.35	132.86	181.37	202.19	103.13	239.53
Cash/TFA	19 115	5.69	8.33	0.20	0.69	17.99	-14.31	17.99
MarketValue/BookValue	19 115	7.08	7.24	1.11	2.54	16.82	-2.04	16.82

Notes: The dependant variable “Investment” is CAPEX normalized by the one year lagged value of the tangible fixed assets. The explanatory variable “ReValue/TFA” is defined as market value of real estate normalized by one year lagged total fixed assets. “HPI” is the housing price index as collected according to Table 9. “MarketValue/BookValue” is the share market value normalized by the share book value. The standard errors are clustered on firm level and year dummy indicators are used.

Table 6(A): Swedish SME accounting data

Variable	N	Mean	SD	P25	Median	P75	Min	Max
Employees	46 877	42	125	7	13	28	5	1 992
Revenue (th)	46 877	95 900	433 000	8 769	19 600	52 100	1 050	16 000 000
Operating Profit (th)	46 850	5 068	42 700	177	778	2 597	-896 000	4 350 000
PPE (th)	46 866	43 700	476 000	1 827	4 685	12 100	0	35 700 000
Depreciation (th)	46 876	3 114	51 500	0	0	75	-1 325	9 010 000
Cash (th)	46 868	5 602	36 900	74	624	2 441	-1 101	2 120 000
Long Term Debt (th)	46 876	23 300	285 000	174	1 851	5 878	-252	17 200 000
Real Estate Value (th)	46 877	24 800	657 000	852	2 721	7 317	1	61 100 000
Investment (th)	46 855	4 107	286 000	-276	1	995	-39 600 000	27 500 000
Operating Cashflow (th)	46 849	8 184	80 300	211	890	3 124	-867 000	11 100 000
Investment/Lagged Revenue	46 855	0.02	0.10	-0.02	0.00	0.04	-0.17	0.34
Investment/Lagged PPE	46 825	0.12	0.48	-0.08	0.00	0.18	-0.67	2.76
Op. Cashflow/Lagged Revenue	46 849	0.07	0.10	0.02	0.05	0.11	-0.21	0.42
Op. Cashflow/Lagged PPE	46 808	0.48	1.22	0.07	0.21	0.50	-2.29	11.40

Source: Swedish Accounting Data provided by Bolagsverket. The dataset contains firms which reported real estate assets for the first time between year 1998 and year 2000. The panel data covers 7150 firms from year 2001 to year 2008. Observations with number of employees greater than 2000 and smaller than 5 and with revenue below 1 million SEK are excluded. The investment and cash flow ratios are winsorized on the 5th and 95th percentile. Investments are defined as difference in PPE plus depreciation. Operating cash flow is defined as operating profit plus depreciation. RE value is computed as acquisition value of the real estate before 2000 times the yearly HPI development in the county.

Table 7(A): European firms by country and year

Year	2004	2005	2006	2007	2008	2009	2010	2011	2012	Observations	Unique Firms
Belgium	69	72	68	70	75	77	74	72	2	579	81
Switzerland	113	126	131	134	144	150	154	150	90	1 192	158
Germany	347	384	419	432	449	468	461	454	205	3 619	502
Denmark	76	82	87	90	93	93	94	91	57	763	100
Spain	72	78	86	90	94	96	98	98	2	714	107
Finland	234	234	234	234	234	234	234	234	234	735	90
France	258	298	321	351	374	392	396	378	93	2 861	428
Great Britain	557	634	687	746	780	796	770	730	236	5 936	859
Italy	9	14	21	34	59	72	86	117	3	415	122
Netherlands	74	70	78	82	88	93	93	90	20	688	99
Norway	49	52	55	60	63	64	64	65	5	477	69
Sweden	115	125	136	142	144	148	145	145	36	1 136	168
Total	1 820	2 019	2 176	2 316	2 450	2 535	2 520	2 473	806	19 115	2 783

Table 8(A): Swedish firms by country and year

Year	2001	2002	2003	2004	2005	2006	2007	2008	Observations	Unique firms
Stockholms län	745	752	737	718	702	674	645	605	5 578	895
Uppsala län	124	124	120	119	119	118	108	104	936	152
Södermanlands län	142	148	144	144	140	132	130	118	1 098	174
Östergötlands län	272	280	268	259	254	257	252	241	2 083	326
Jönköpings län	489	504	504	503	511	488	479	451	3 929	552
Kronobergs län	217	218	215	204	203	203	196	179	1 635	244
Kalmar och Gotlands län	235	234	226	226	237	224	223	219	1 824	276
Blekinge län	85	99	95	96	91	89	80	72	707	115
Skåne län	788	825	802	788	782	773	742	692	6 192	924
Hallands län	246	243	236	234	223	222	215	210	1 829	283
Västra Götalands län	1 020	1 044	1 015	999	1 003	981	962	914	7 938	1 202
Värmlands län	200	209	208	203	200	188	183	175	1 566	241
Örebro län	175	189	186	187	186	184	176	172	1 455	217
Västmanlands län	157	159	156	160	149	146	143	137	1 207	184
Dalarnas län	243	244	241	239	238	237	235	228	1 905	295
Gävleborgs län	186	191	192	189	185	182	184	170	1 479	233
Västernorrlands län	191	190	186	186	186	181	174	167	1 461	220
Jämtlands län	114	113	113	112	116	115	109	100	892	140
Västerbottens län	186	191	198	205	198	195	192	183	1 548	243
Norrbottens län	207	203	204	206	205	203	199	188	1 615	250
Total	6 022	6 160	6 046	5 977	5 928	5 792	5 627	5 325	46 877	7 166

Table 9(A): HPI sources

Country	Source	Access	Accessed	Comment
United Kingdom	*Office for National Statistics*	http://www.ons.gov.uk/ons/datasets-and-tables/index.html?pageSize=50&sortBy=none&sortDirection=none&newquery=hpi&content-type=Reference+table&content-type=Dataset	*2013-04-05 10:40:00*	Table 22 Housing market: house prices from 1930, annual house price inflation, United Kingdomfrom 1970 (DCLG table 502)
France	*institut national de la statistique et des études économiques*	http://www.insee.fr/fr/themes/info-rapide.asp?id=96	*2013-04-05 11:20:00*	French HPI data available from 1936. Also easily accessable via the General Council of the Environment and Sustainable Development: http://www.cgedd.developpement-durable.gouv.fr/rubrique.php3?id_rubrique=137
Germany	*Destatis Statistisches Bundesamt*	https://www-genesis.destatis.de/genesis/online	*2013-04-05 11:20:00*	German House Price index for One Family Homes without cellar. Data avalible from 1968.
Sweden	*Statistiska Centralbyrån*	http://www.scb.se/Pages/SSD/SSD_SelectVariables____340487.aspx?px_tableid=ssd_extern%3aFastpiPSRegAr&rxid=83fb68aa-ec63-4353-87a9-a8dc856ad3d8	*2013-04-02 11:20:00*	Swedish House Price Index for permanent residential houses. Data avalible from 1975.
Switzerland	*Schweizerische Nationalbank*	http://www.snb.ch/en/iabout/stat/statpub/statmon/stats/statmon/statmon_O4_3	*2013-04-06 09:20:00*	Swiss House Price Index for single-family homes. Data avalible from 1970.
Italy	*European Central Bank*	http://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=129.RPP.A.IT.N.TD.00.2.00&periodSortOrder=ASC	*2013-04-06 10:50:00*	ECB Calculation based on data from Banca d'Italia (based on data of Il Consulente Immobiliare). Data avalible from 1990
Spain	*European Central Bank*	http://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=129.RPP.A.ES.N.TD.00.0.00&periodSortOrder=ASC	*2013-04-06 10:55:00*	BANCO DE ESPANA, BOL.ESTADISTICO, T 25.7 COL 8 (QUARTERLY ONLY) AND BANCO DE ESPANA WEBSITE (WWW.BDE.ES), SUMMARY INDICATORS. ORIGINAL SOURCE: MINISTERIO DE LA VIVIENDA. Data avalible from 1995
Denmark	*Danmarks Statistik*	http://www.statistikbanken.dk/statbank5a/default.asp?w=1519	*2013-04-02 13:20:00*	Danish House Price Index for single-family homes: EJEN6. Data avalible from 1992.
Netherlands	*Centraal Bureau voor de Statistiek*	http://statline.cbs.nl/StatWeb/publication/?DM=SLEN&PA=81884ENG&D1=0-5&D2=16,33,50,67,84,101,118,135,152,169,186,203,220,237,254,271,288,305&LA=EN&HDR=T&STB=G1&VW=T	*2013-04-06 09:00:00*	Dutch House Price index for existing single family homes. Data avalible from 1995.
Finland	*Statistikcentralen*	http://www.tilastokeskus.fi/til/kihi/index_sv.html	*2013-04-16 16:00:00*	Property prices [e-publication]. ISSN=1799-4578. Data avalible from 1985.
Belgium	*European Central Bank*	http://sdw.ecb.europa.eu/quickview.do?SERIES_KEY=129.RPP.A.BE.N.ED.00.2.00&periodSortOrder=ASC	*2013-04-06 12:55:00*	Residential property prices. Existing dwellings. Residential property in good & poor condition.Data avalible from 1973.
Norway	*Statistisk Sentralbyrå*	https://www.ssb.no/statistikkbanken/selectvarval/Define.asp?subjectcode=&ProductId=&MainTable=NyBoligindeks3&nvl=&PLanguage=1&nyTmpVar=true&CMSSubjectArea=priser-og-prisindekser&KortNavnWeb=bpi&StatVariant=&checked=true	*2013-04-05 12:20:00*	Norwegian House Price Index for detached houses. Data availible from 1992