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Thou Shalt Treat thy Neighbour's Debt as Thine

A cross sectional study on the impact of housing cooperatives' financial condition on transaction prices of apartments in the inner city of Stockholm[1]

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Abstract:
In this paper we aim to investigate whether buyers of apartments in Stockholm evaluate the financial condition of the housing cooperative. Housing cooperatives have different debt levels, implying different risk for the buyer. Little research has been done within this field due to lack of data availability. Debt per square meter is used as a proxy variable for the financial condition of cooperatives. We employ econometric methods in two steps, both steps including control variables of cooperative and apartment characteristics. Firstly, we examine the effect of debt on fee. Secondly, using a hedonic pricing model, we examine the effect of debt on transaction price. Results show that debt has a positive impact on fee, and a negative impact on transaction price. Evidence suggests that cooperatives are sensitive to increases in interest rate of debt, implying a risk of having to raise the member fee. As buyers believe that the financial condition of a housing cooperative is reflected through the fee, they are exposed to dual risk of potential interest rate increases, from the increased fee as well as increased interest on mortgage loans. The main contribution of this paper is showing that buyers do not evaluate the financial condition properly when buying an apartment.

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1 INTRODUCTION

"I don't like being in houses alone."—Martin Scorsese, 2012

Living in a housing cooperative may have a large impact on an individual's private economy, which can be illustrated by the following example from 2005.

In a large housing cooperative of small apartments outside of Stockholm, members were swiftly summoned to an unanticipated extraordinary general meeting in the middle of the summer. The board stated, to the few members who showed up, that the building was in desperate need of a pipe system change and bathroom renovations. The attendees voted whether this should be financed through increased fees or a one-off deposit of cash, the majority voted for the deposit. Accordingly, all members of the cooperative were asked to put in additional cash of about 95,000 SEK per apartment. The payment was due in two months, and those who were unable to pay were asked to consider selling their apartment. This decision came as a shock to many of the residents who had not been able to attend the summer meeting and vote on the emission. It is uncertain who is to be held responsible for this unfortunate series of events. It may be the current board being unable to negotiate appropriate financing solutions, or a previous boards who neither budgeted for nor catered to the renovation need in time. This example illustrates the complexity of living in a housing cooperative, making important decisions as a group, and being jointly responsible for the cooperative. (Hernbäck, 2005)

Purchasing an apartment in the inner city of Stockholm usually implies a tenant ownership form; the buyer purchases a share in a housing cooperative[2] which in turn owns the building. Investing in an apartment is a substantial investment for most buyers, the average price for an apartment in the inner city of Stockholm was 3,600,000 SEK[3] in the first quarter of 2011 compared to the

[2] A housing cooperative is an economic association. Members of a housing cooperative are given the right to utilize an apartment or premise for a payment without a time limit, under the condition that the obligations toward the cooperative are fulfilled (SFS (1991:614)). The occupant of an apartment in a housing cooperative does not own the real estate, but merely acquires a share in the housing cooperative, which in turn owns the real estate. Only the housing cooperative is allowed to deed a cooperative apartment, but the holder of a cooperative may sign away the apartment to another holder, retrieving the invested capital (the level of capital retrieved may be higher or lower, depending on the current trade conditions in the housing market). This is usually referred to as "selling" the apartment. A sign over of an apartment requires a written contract signed by the previous owner and the buyer of the apartment for the deal to be legitimate. Furthermore, the new holder must be approved by the cooperative to become a member of the cooperative, with the exception of executive sales and forced sales (Bolagsverket, 2013).

[3] The average per capita dispensable income in Stockholm was 202,000 SEK in 2011 (SCB, 2013).

countrywide average of 1,400,000 SEK (Mäklarstatistik, 2011). Since the mid-80s, the Swedish real estate prices have increased by about 150 percent[4]. The increase has been more apparent in Stockholm and other urban areas, where the population growth rate has been higher than the housing construction rate. (SCB, 2012)

Generous credit grants from banks have over the years facilitated the substantial real estate price increase. In 2010 the Swedish households' mortgage loans amounted to about sixty-one percent of GDP[5] (BKN, 2011). In the same year, the growth of mortgage loans declined due to banks' increased requirements on mortgage loans customers (SCB, 2012). In addition to this, Finansinspektionen[6] introduced a loan ceiling in October 2010 that further mitigated the increase in mortgage loans (FI, 2012). The loan ceiling of eighty-five percent prevented home buyers from taking mortgage loans of the full purchase price with the property bought as collateral.

When browsing for a new apartment in newspapers, appealing pictures are displayed in the advertisements along with vivid descriptions on features of the apartments. The financial condition of the housing cooperatives, apart from the monthly fee, is rarely described in the advertisements (Dagens Nyheter, 2013)[7]. This is vexing since purchasing an apartment de facto implies purchasing a share of a cooperative, why careful consideration of the financial condition should be undertaken. The debt level varies greatly between different housing cooperatives, and should be considered when valuating apartments.

Tenant ownership is common in Sweden, twenty-two percent of all real estate properties in the Swedish housing market are apartments in housing cooperatives (BKN, 2011). This paper aims to investigate if buyers evaluate the financial condition correctly of housing cooperatives' when purchasing apartments in the inner city of Stockholm. This is done by investigating how cooperatives' debt affect transaction prices of apartments while attempting to control for other factors that may affect prices. If buyers are completely rational, the debt should be taken into account and have an impact on the buyers willingness to pay and thereby be reflected in the transaction prices.

[4] Adjusted for inflation.
[5] Based on 2010 GDP. In 2010, Swedish households' mortgage loans amounted to 2,684 billion SEK.
[6] The Swedish Financial Supervisory Authority (public authority)
[7] In newspaper supplement DN Bostad (with real estate advertisements) none of the advertisements included information on financial condition of cooperatives.

2 CURRENT STATE OF KNOWLEDGE

"The devil is in the details" — Attributed to Ludwig Mies van der Rohe, 1886-1969

A depletive register of apartment sales has not been available until a few years ago since buyers and sellers of tenant owned apartments are not legally obliged to report their sales, in contrast to other housing sales that are registered by law (SFS (2002:94)). Due to this reason, little research has been carried out within the field of investigating the effect of housing cooperatives' financial condition on transaction prices of apartments.

Dynamics of Housing Cooperatives

Tenant ownership through a housing cooperative is common in the Nordic countries, but not so frequent worldwide (BKN, 2011). The members of a housing cooperative are charged an annual fee, commonly divided into monthly or quarterly payments. The board of the cooperative is responsible to set and adjust the fee at an appropriate level and ensure that it is divided fairly between the members. The fee is calculated through prime cost principle and is supposed to cover the cooperatives' common expenditures, including but not restricted to; ongoing maintenance, taxes, and cost of capital. Fee levels vary across different cooperatives due to many factors, including the size of debt, the interest rate, operating costs, and possible sources of income apart from the fee. (Borättupplysning, 2013)

The revenues of a typical cooperative mostly consist of the fees from the tenant owners. Other potential sources of income is rental apartments or rents from firms utilizing the premises of the cooperative (Skatteverket). A comparison of revenues and expenditures of housing cooperatives and municipal rental housing in 2010 are shown in Table 1.

Table 1 Yearly revenues and expenditures of housing cooperatives and municipal housing in 2010 (SEK per m^2)

Ownership type	Revenues	Costs								
		Total costs	Cost of capital (excluding interest subsidies)	Operating costs						
				Total (including real estate tax)	Thereof					
					Service and administration	Heating	Taxation tied costs	Maintenance	Other operating costs	Real estate taxation
Housing cooperatives	633	600	182	419	91	117	75	80	36	20
Municipal housing	924	895	219	670	176	120	92	234	27	20

Note. m^2 predefined as m^2 of both living area and premises.
Source: SCB, 2012

As can be concluded from Table 1, the interest rates of an average cooperative amounts to about thirty percent of the total costs.

The Transaction Process

In the Swedish market of residential apartments sold through realtors, an asking price is set by the realtor after an appraisal process. A prospectus is made with information about the apartment. In addition to this, financial statements of the cooperative is offered to potential buyers. Generally, the prospectus and financial statements are posted on the realtor's website as well as housing platforms along with information on open houses. Interested buyers may bid before or after the open houses. The auction lasts until a legally binding transaction contract is signed by the seller and the buyer. The final bidding price is in most cases equal to the transaction price (Boupplysningen, 2009). If the apartment is successfully sold, the transaction price is the current market value of the apartment.

Impact of Monthly Fee on Transaction Price

Research on the effect of the monthly fee on transaction prices in Stockholm city including suburban areas has been conducted in 2006. Evidence is found that housing investors in the market of small apartments, one or two room apartments, undercapitalize the negative cash flows of the monthly fee into the transaction price and thereby do not act completely rational. For buyers of larger apartments, the hypothesis of rationality cannot be rejected. A possible explanation behind the irrationality may be credit rationing by the banks toward first time buyers implicating that first time buyers buy cheaper apartments with higher monthly fees to match their lower credit limitations. (Samuelson & Zettervall, 2006)

Dynamics of Housing Pricing

Housing Market Efficiency

Most research in the area of housing pricing has been focusing on macroefficiency, investigating whether the market is correctly valued in relation to an assumed fair price. Macroeconomic variables such as demographic features and income per capita have been used as explanatory variables. In some parts of the United States, per capita income is a good predictor of housing price; in one state it explained ninety-nine percent of the variation in house prices whilst in other states it explained less than half of the price variation. (Case, Quigley & Shiller, 2003)

If hypothesizing that the housing market is efficient, housing investors are assumed to be completely rational and value properties correctly, with all information available and all alternative costs as well as transaction costs included. However, home buyers in the United States do not seem to have rational expectations as they are very optimistic about future housing prices and base their expectations on assumptions based on historical prices. Buyers expect a ten percent price increase yearly over the next ten years. Hence, the housing market in the United States is possibly not to be considered efficient due to the common short term overly optimism of value increases in housing prices. (Case, et al., 2003)

Overly optimistic public expectations of future real estate prices cause prices to increase. The term housing bubble is widely used when discussing booming housing prices and the concern of a potential crash. During a housing bubble, home buyers purchase homes that they would normally consider being out of their price range, since they believe that they will be compensated in the future by further price increases (Case & Shiller, 2004). Buyers expect the increased value of the newly purchased home to do the savings for them. Consequently, they save less than they normally would (The Economist, 2003). In this scenario, there is small perceived risk associated with investments in real estate. This, in addition to overly optimistic growth expectations make housing prices inherently unstable. If the expectations of price increases are high enough to generate sufficient anxiety, buyers react and the housing bubble may burst. (Case & Shiller, 2004).

Impact of Buyer Behavior on Housing Prices

Investors in housing generally perceive low risk with their investments, a common notion is that housing prices cannot go down in the long run (Case & Shiller, 1989; Case, et al., 2003; Case & Shiller, 2004). Evidence from the United States suggests pricing inertia. If housing prices increase, the conditional expected value of the following price level is higher than the former level. An expected ten percent annual increase over ten years would equal a value increase of 160 percent if realized (Case, et al., 2003). In an efficient market, it should not be possible to predict future prices based on historical prices (Malkiel & Fama, 1970), implying that the U.S. housing buyers are not completely rational in their predicting behavior (Case, et al., 2003). Swedish housing buyers have similar, irrationally optimistic predicting behavior. In the first quarter of 2011, fifty-four percent of the Swedish households expect the prices to increase in the next year. Twenty-one percent expect

the prices to remain at its current level, and eighteen percent expect them to decrease (Skandinaviska Enskilda Banken AB, 2011)[8].

The irrational expectations about future price growth affected by recent trends may be due to behavioral biases of the homeowners and buyers. The expectations can be explained by a phenomenon in behavioral economics called anchoring. Anchoring is a cognitive bias that causes markets to act irrationally due to the human tendency to rely profoundly on a priori information, an anchor, when making succeeding decisions and judgments (Shiller, 2000). Anchoring is not a result of ignorance from the investors; they strive to act rationally. Limitations in abilities along with natural behavior decide buyers' actions and create a bias toward relying on the anchor information when making decisions (Shiller, 2000).

Quantitative anchoring occurs when individuals correlate numerical anchors, a priori information, to subsequent scenarios that are completely randomized (Shiller, 2000). People may anchor their willingness to pay per square meter for a new apartment to what they were paid themselves for their previous apartment, even though the two apartments may differ completely in other parameters, implying different actual market values. Another possible anchor is the average per square meter transaction price for a specific city area. If focusing on the average price, buyers may be unwilling to deviate from this. This implicates that they act irrationally and do not adjust their willingness to pay in accordance to specific features of the apartment that ought to have an impact on the price.

Moral anchoring occurs when investors weigh a story (without quantitative dimensions), against the observed quantity of financial wealth that they have available for consumption (Shiller, 2000). This is exemplified in advertisements for apartments where realtors address potential buyers by telling stories of what it is like to live in the apartments, not providing investment information concerning financial condition of the cooperative (Dagens Nyheter, 2013)[9].

Buyers' Consideration of Financial Statements

Buyers are in general poorly informed about the financial condition of the housing cooperative when attending an open house. The financial statements typically contain much information, and

[8] The Swedish bank SEB, issues the report "Housing price indicator" every ten months, based on Swedish households' expectations on real estate prices

[9] In newspaper supplement DN Bostad (with real estate advertisements) none of the advertisements included information on financial condition of cooperatives.

demand economic knowledge to evaluate and interpret. A common notion of buyers is that the financial condition of a cooperative is reflected in the monthly fee. (Uhlén, 2013)[10]

Housing Valuation Methods

Valuing real estate is complex, the demand for modeling and forecasting work is substantial and is expanding rapidly. The growing number and larger size of forecasting teams, and the existence of forecasting related research sponsored by industry organizations and of professional courses in this area, demonstrate the importance given by the industry to quantitative modeling and forecasting. (Brooks & Tsolacos, 2010)

There is often ambiguity concerning the value of a housing property until a transaction takes place. Housing properties differ in terms of location and characteristics, and a specific property is seldom sold several times within a reasonable time period. Consequently, the market value of real estate properties is rarely exact. Asking prices and bidding prices are not the true value of a real estate, it is the transaction price that reflects where supply and demand meet (Haight & Singer, 2005). Hence, the market value of the property is what the buyer pays for it. Real estate investments require skill, knowledge and dedication to find appropriate properties and evaluate them correctly. Investments, in any form, deals with uncertainty about the future and handling risk. (Haight & Singer, 2005)

A nonmarket approach to approximating market value is through a specialist real estate appraisal process, often resulting in a close approximation to the market value realized at transaction. In the Swedish housing market, valuation certificates of real estate properties are issued by professional realtors. The valuation certificates are used by buyers, sellers, and banks as a basis for settling transaction prices, mortgage loans, tax matters, and other issues. Realtors need a license to operate, which is issued by the state through Fastighetsmäklarinspektionen and regulated by the real estate broker statute. (SFS (2011:666))[11]

The comparable pricing method[12] is based on the principle of substitution and can be applied on both commercial and residential real estate. Locating data of recent, similar sales is the first step in this valuation approach. The second stage implies comparing the key characteristics of each

[10] Mats Uhlén, Sales manager at Bjurfors (a major Swedish real estate agency), estimates that about fifty percent of the attendees of open houses ask questions about the financials of the cooperative. Some ask more detailed questions regarding the debt, common questions include whether the debt level or interest rate on the debts is expected to change.

[11] In 2011, the time period studied in this thesis, the former version of the real estate broker statue, (SFS (1995:1028)), was still in use. In 2012, it was updated to (2011:666). At the same time, Fastighetsmäklarnämnden changed name to the current name Fastighetsmäklarinspektionen, with the same function as previously.

[12] The name Sales Comparison Approach is commonly used interchangeably.

comparable property with that of the subject property and stating the differences. (Haight & Singer, 2005) The differences identified may be positive or negative; a better location is a positive one whilst inferior planning is a negative difference. The transaction price of the subject property is finally approximated with respect to the differences from the comparable properties.

A general market valuation method values the real estate to the price at which it would trade in a competitive Walrasian auction setting[13]. The market value is interchangeable with open market value or fair value. International Valuation Standards (IVS) states that the market value is the estimated amount for which an asset or liability exchanges on the day of valuation between a buyer and a seller. The exchange should take place in an arm's length transaction, where both parties act knowledgeably, prudently and without compulsion (International Valuation Standards Council, 2011).

When Swedish banks evaluate mortgage loan applicants they use a number of different valuation methods. First and foremost they evaluate the private economy of the applicant. If the state of the private economy passes the banks' requirements the bank evaluates the financial condition of the corresponding cooperative. Financial statements and cash flows are examined to evaluate the financial condition. The bank also conducts a forecast of potential changes and their incremental effect on the fee. The condition of the cooperatives' loans are evaluated as well as the reasons underlying them. It is common that banks use services from other companies who provide an analysis of the financial condition. If the financial condition is poor or if matters are unclear, the banks continue evaluation on their own. If the cooperative faces a risk of increasing the member fee, an urgent need for renovation or similar, the bank notifies the interested buyer and include the risk costs in the housing expenditure calculation[14]. If the financial condition does not satisfy the risk preferences of the bank, they generally dissuade the purchase and are hesitant to provide a mortgage loan to finance the purchase. When considering providing loans, the resaleability (i.e. asset liquidity) of the apartment is the most important concern of the bank. The asset liquidity is increased with the demand. If the potential buyer group is broad, the bank is more willing to issue a mortgage loan. (Österman, 2013)

[13] A Walrasian auction is a simultaneous auction where each agent calculates its demand for a good at every possible price, and then submits it to the auctioneer. The price is set so total demand across agents equals the total amount of the good. Thus, a Walrasian auction perfectly matches supply and demand.

[14] A model of calculating and estimating living expenditure costs, depending on different scenarios, that the purchase of a real estate will imply.

Summary of Current State of Knowledge

Prior research shows that people expect real estate prices to increase over time, a common notion is that real estate prices cannot go down (Case, et al., 2003). Furthermore, house buyers tend to anchor previous housing prices to subsequent ones, implying irrational investment behavior (Shiller, 2000). Moral anchoring occurs as house buyers often purchase apartments by evaluating how it would be to live their lives in a particular home rather than evaluating the investment it implies.

One study shows that buyers of small apartments in Stockholm undercapitalize future payments of monthly fees when investing in housing cooperatives (Samuelson & Zettervall, 2006). Other than that, there is little research concerning the dynamics of investments in housing cooperatives. A common notion of Swedish housing buyers is that the financial condition of a housing cooperative is reflected in the monthly fee (Uhlén, 2013).

There are many different methods of valuing real estate properties. The exact market value is difficult to approximate correctly, it is not until the sales process is finished and the transaction price is set that the true market value is realized (Haight & Singer, 2005). Expert appraisal to approximate sales prices is used by buyers, sellers, and loan givers but since all real estate differ in its characteristics, it is the subjective valuations of buyers that determine the price. In this thesis, we will consider the market value as being equal to the transaction price, as that price is the final price in a market auction and the buyer's subjective valuation.

3 Method

"I like cosy, intimate houses."—Tori Amos, 2005

Due to the empirical nature of this study, an econometric approach will be applied. The aim is to investigate if the financial condition of cooperatives is considered and evaluated properly by buyers. This is done by investigating how cooperatives' debt affect transaction prices of apartments when other factors that may affect prices are controlled. We will investigate this relationship in two steps by using several econometric techniques. In the first step, we will conduct an ordinary least squares estimation to identify the linear effect of the net debt on the monthly fee. In the second step, an ordinary least squares hedonic regression will estimate the net debt effect on transaction prices. We will then interpret the results separately as well as simultaneously in order to try understanding the true effect.

The first step in the analysis will control for factors specific for the cooperatives using dummy variables for the age of the building as well as the parish[15] in which the building is located. In the second step, we will investigate the effect of both cooperative specific variables as well as apartment specific variables on the transaction price. Control variables for building age, location, area, number of rooms and floor level will be included. The relationship between cooperative specific as well as apartment specific characteristics and transaction prices will be investigated through a hedonic pricing model. The variables of both models will be further explained along with the data in Section 4.

We will use the net debt per square meter as a proxy variable for the financial condition of housing cooperatives. The rationale for choosing net debt as proxy variable is intuitive considering the properties of the underlying asset. Long term debt is the most constant liability on the balance sheet of a housing cooperative. Cash and cash equivalents are liquid assets. As they could be used for amortization, they are subtracted from the long term debt. The remainder of the debt is what we refer to as the net debt. The rationale of not including short term debt is that long term debt fluctuates less. Long term debt is defined as liabilities due in one year or more. In general,

[15] Parish is a civil register term representing the smallest geographical administrative classification of Sweden in which census is performed yearly by SCB. As the civil register has historically been the concern of Church of Sweden, the parishes of civil registration (through Skatteverket) are identical to those of the Church of Sweden (Skatteverket, 2013).

cooperatives have a far larger share of long term than short term debt. When purchasing a share of a cooperative, a share of the cooperative's net debt corresponding to the ownership share can be considered as a liability of the buyer. In order to accurately measure the net debt and to improve comparability we use the absolute measure per square meter, rather than a leverage ratio. Differences in parameters such as age, deprecation, and taxation value are reasons behind incomparable valuation in balance sheets. As buildings often vary in valuation, using a regular debt to equity ratio as a proxy variable could potentially be ambiguous. We will therefore treat the absolute net debt per square meter as the proxy variable for financial condition of housing cooperative in our study[16].

Impact of Cooperatives' Financial Condition on Monthly Fee

The effect of housing cooperatives' financial condition on monthly fees will be estimated through an regular ordinary least squares regression. The monthly fee will be treated as the dependent variable and variables related to the cooperative will be treated as independent variables.

Consider the model:

$$FEE_M2_i = \theta_0 + \theta_1 NET_DEBT_M2_i + \vartheta X_i + \epsilon_i \quad (1)$$

where, for every cooperative i, FEE_M2_i denotes the monthly members' fee in SEK per square meter, $NET_DEBT_M2_i$ denotes the net debt in SEK per square meter, X_i is a vector of control variables, and ϵ_i is the error term. θ_0 denotes the constant, θ_1 denotes the coefficient of net debt, and ϑ denotes the coefficient of the control variables. Control variables included in the vector X_i are dummy variables for building age and location of building. For definitions of the variables, see Table 2 in Section 4.

Impact of Cooperatives' Financial Condition on Transaction Prices

To appraise the value of real estate, it is common to use the hedonic pricing model (Cebula, 2009). Appraisal methodology treats hedonic regression as essentially a statistically robust form of the sales comparison approach (Kilpatrick, 2004). The hedonic pricing model used in this thesis is developed in line with the microfoundation work of Rosen, defining real estate as combinations of characteristics. The model relies on the assumption of a perfectly competitive market. According to

[16] For the sake of comparison we have included the long term debt as an alternative proxy variable in the first step OLS regression and the hedonic regression. The results of these regressions can be viewed in Table 11 and Table 12 in the appendix.

the hedonic pricing model, the real estate market is constituted by endless combinations of real estate characteristics. Furthermore, all characteristics may be valued separately. (Rosen, 1974)

We will restrict the theoretical framework to include only the preferences of the apartment buyers and their decision making process, and exclude the sellers' preferences. This is due to the nature of the real estate market in Stockholm where apartments in general are already existing and not produced to meet demand.

The hedonic pricing model is a description of competitive equilibrium in a plane of several dimensions on which buyers locate. The apartments are described by n objectively measured characteristics. Location on the plane for each observation is represented by a vector of coordinates $z = (z_1, z_2, \dots, z_n)$ Where z_i measures the ith characteristic of each apartment. Examples of measured characteristics may be area in square meters, net debt per square meter in SEK, age of building in years and so forth. In the model, apartments are exhaustively described by numerical values of z. It is assumed that a sufficiently large number of differentiated apartments is available so that choice among various combinations of z is continuous for all practical purposes; there is a continuum of apartments to choose from. The components of z are objectively measured in the sense that all buyers' perceptions of the characteristics embodied in each apartment are identical, although buyers differ in their subjective valuation of alternative combinations.

The price of an apartment is given by $p(z) = p(z_1, z_2, \dots, z_n)$ and is defined at each point in the plane. As concluded from prior research, the transaction price is considered equal to the market value. Competition prevails as we are under the assumption that a single agent adds zero weight to the overall market and consider prices $p(z)$ as parametric to their decision. The assumption implies that individual agents act as price takers, unable to affect prices on their own.

Both buyers and sellers base their decisions on utility maximizing behavior. Hence, equilibrium prices are determined so that buyers and sellers are perfectly matched. Furthermore, the bundles of apartment characteristics cannot be untied or combined. An example in a real estate context is that the utility of two small apartments and one apartment of twice the size does not necessarily imply equal total utility. The utility function of buyers consumption of z_i is expressed as $U(x, z_1, z_2, \dots, z_n)$ where x is all other goods consumed. Individuals' income is denoted as y and is measured in terms of x, expressed as $y = x + p(z)$. Buyers' utility maximization requires choosing x and $(z_1, \dots, z_n)$ to satisfy budget constraint and first order condition.

Allowing for parameterization of tastes among buyers implies the utility function $U(x_1, z_1, \dots, z_n; \alpha)$ where α is a parameter differing between buyers, representing different preferences of combinations. Equilibrium value functions now depend on both y and α. A joint distribution function $F(y, \alpha)$ is given in the population. The equilibrium of all buyers is characterized by a family of value functions that contain the market hedonic or implicit price function. (Rosen, 1974)

Consider the following hedonic pricing model:

$$PRICE_M2_i = \beta_0 + \beta_1 NET_DEBT_M2_i + \beta_2 FEE_M2_i + \gamma X_i + \varepsilon_i \quad (2)$$

where, for every apartment i, $PRICE_M2_i$ denotes the price per square meter, $NET_DEBT_M2_i$ denotes the net debt per square meter, FEE_M2_i denotes the members' fee per square meter, X_i is a vector of control variables, and ε_i is the error term. β_0 denotes the constant, $\beta_1$denotes the coefficient of net debt, γ denotes the coefficient of the control variables. Control variables included in the vector X_i are control variables for the characteristics of the cooperatives and apartments. For definitions of the variables, see Table 2 in Section 4.

Hypothesis Formulation

We expect buyers to be rational and care about the debt of the cooperatives when purchasing apartments in the inner city of Stockholm. If buyers are rational we expect a negative relationship between debt and transaction price, *ceteris paribus*.

4 DATA

In contradiction to most real estate sales, sales of cooperative apartments are not registered by law in Sweden. The lack of sales registration for cooperative apartments has historically made data on apartment sales rather difficult to obtain until recent years. Värderingsdata is an organization working with analysis of the real estate market that uses data from Mäklarstatistik[17] along with complementary data to reach a market coverage of about eighty to ninety percent of all transactions, the highest among real estate analysts in Sweden. For this thesis, Värderingsdata has provided us with data. Our sample consists of 1,427 transactions from the first quarter of 2011 (Värderingsdata, 2013). This particular period was chosen to study as it had little fluctuations in prices and demand according to our data provider. The observations are anonymous regarding the exact address and real estate agent of each observation. Since the transactions are all within the same period, and no observation appears twice, we will consider the data set as cross sectional. Definitions of the variables included in the dataset are presented in Table 2.

[17] In 2004, several large actors (Mäklarsamfundet, Svensk Fastighetsförmedling, Föreningssparbankens Fastighetsbyrå among others) in the Swedish realtor industry collaborated and founded Mäklarstatistik AB. The organization gathers data on real estate transactions, with a coverage of about seventy percent of the entire real estate market in Sweden. (Mäklarstatistik, 2013)

Table 2 Variable definitions

Variable	Variable name	Definition
AGE	Age	Age of building measured in years[a]
CASH_M2	Cash and cash equivalents	Cash, bank, account recievables, and clearence account of cooperative measured in SEK per m²
DATE	Transaction date	The date the purchase contract was signed
DEBT_M2	Long term debt	Long term debt of cooperative measured in SEK per m²
ELEV	Elevator	If the building has an elevator [true or false]
FEE_INCHW_M2	Monthly fee including heating	Monthly fee paid to the cooperative including heating cost, measured in SEK
FEE_M2	Monthly fee	Monthly fee paid to the cooperative, measured in SEK
FLOOR	Floor	Floor level of apartment
M2	Area	Size of the apartment measured in m²
M2_TOT	Total area of cooperative	Size of the cooperative's living area measured in m²
NET_DEBT_M2	Net debt	Total long term debt excluding cash and cash equivalents of cooperative measured in SEK per m²
PARISH	Parish	Parish in which the apartment is located (total of 14)
POSTAL_CODE	Postal code	Postal code of the area in which the apartment is located (total of 245)
PRICE_M2	Price	Transaction price of the apartment, measured in SEK per m²
ROOM	Rooms	Number of rooms, excluding kitchen, bathroom, and hall
SHARE	Ownership share of cooperative	Ownership share of the cooperative, expressed as percent
TOT_FLOOR	Total floors	Total number of floors in the building

[a]Denotes the age with respect to the valuation year, in most cases the construction year. However, valuation year may be updated after a large scale restoration.

Most variables in Table 2 were included in the original data set. The cooperative related variables measured in per square meters (cash, debt, and net debt) are computed by being divided by the total area of the cooperative to obtain the per square meter measure. Net debt per square meter is computed by subtracting cash and cash equivalents per square meter from long term debt per square meter. Apartment related variables measured in per square meter (fee and price) are calculated through dividing the monthly fee and price respectively by the area of the apartment. Ownership share is a given variable of the tenant's percentage share of the cooperative[18].

[18] Ownership share defines the share of the housing cooperative that the buyer has acquired from the transaction that each observation represents. For some observations, the buyers own a share that equals the area share of the respective apartment, meaning that ownership share equals to size share. This holds for 11.4% of the observations. In total, 25.5% of the buyers own a cooperative share that differs with 0.1 percentage points or less from the area share. For the remaining observations, the ownership share differs from the area share between -4.6 and +5.52percentage points. Many

The variable postal code we find being too narrow as a location variable, 1,427 observations are unevenly distributed across 244 unique postal codes. Geographical distribution of postal codes in Stockholm do not follow a logical pattern. For the sake of conservatism, to avoid subjective reasoning around compartmentalization, postal codes is excluded from further testing. Parish[19] is therefore chosen as geographic determinant. Furthermore, the variable date is excluded from testing as the sample observations are all from the first quarter of 2011. In the data set, the values of monthly fee with costs of heating included are equal to the fee values. Hence, the variable fee with heating cost included is dropped. The dummy variable elevator was, due to missing values and lack of significance[20] in initial models, not included in this study.

The data set is mostly balanced although some observations lack important information, the data provider argues that the missing values are to be considered missing at random. Observations deleted are due to missing values of the important variables; age of building, floor, ownership share, rooms. Extreme outliers are also excluded from further testing. The numbers of missing values and extreme outliers of each variable are stated in Table 3. The final data set consists of 1,252 observations, this data set will be used in the analysis. Descriptive statistics for the variables included in the study are shown in Table 4.

reasons underlie these differences. Parameters like the location of apartment within the building and original rent level if the house was previously a tenement house affect the value of the apartment, which in turn is reflected in the ownership share. Factors that may increase the value and hence the ownership share is southern balconies and previous renovations. Changing the ownership share is a complicated process – a majority from two separate cooperative meetings is needed. The ownership share is usually the calculation basis of the monthly fee. (Gullbrandsson, 2013)

[19] Parish is a civil register term representing the smallest geographical administrative classification of Sweden in which census is performed yearly by SCB. As civil register has historically been the concern of Church of Sweden, the parishes of civil registration (through Skatteverket) are identical to those of the Church of Sweden. (Skatteverket, 2013)

[20] We included the elevator dummy in all our models originally, including interaction terms with respect to relative floor of building, but could not prove it to be significant in explaining transaction prices. Therefore we excluded the variable from further testing.

Table 3 Preparation of data set

	Observations	Action
Start	**1427**	
Age missing	117	*Delete observations*
Area missing	0	*None*
Cash missing	0	*None*
Date missing	0	*Drop variable*
Elevator missing	38	*Drop variable*
Fee inluding heating missing	0	*Drop variable*
Fee missing	0	*None*
Floor missing	4	*Delete observations*
Long term debt missing	0	*None*
Net debt missing	0	*None*
Ownership share missing	64	*Delete observations*
Parish missing	0	*None*
Postal code missing	86	*Drop variable*
Price missing	0	*None*
Rooms missing	2	*Delete observations*
Total area of cooperative missing	0	*None*
Total floors missing	407	*Drop variable*
Price outliers	3	*Delete observations*
Age outliers	1	*Delete observations*
End	**1252**[a]	

Note. Price outliers defined as those observations with a transaction price above 100,000 SEK per square meter. Age outlier defined as older than 200 years.

[a]Please note that some observations lack several values, therefore the number of dropped observations in total is smaller than the sum of the indivudial numbers of missing values per variable.

Table 4 Descriptive statistics

Variable	Definition	Unit of measurement	Obs.	Mean	Std. Dev.	Min	Max
AGE	Age of building[a]	Years	1252	73.5	33.29	0	151.0
CASH_M2	Cash, bank, account recievables, and clearence account of cooperative	SEK per m²	1252	673.1	866.97	-246.5	8990.6
DEBT_M2	Long term debt of cooperative	SEK per m²	1252	6086.2	4848.48	0.3	37346.8
FEE_M2	Monthly fee paid to the cooperative	SEK per m²	1252	47.8	13.11	0.0	117.8
FLOOR	Floor level of apartment	No. of floors	1252	2.7	1.97	0.0	13.0
M2	Size of apartment	m²	1252	60.4	29.62	17.0	242.0
M2_TOT	Size of cooperatives living area	m²	1252	6027.9	7461.87	547.0	39701.0
NET_DEBT_M2	Total long term debt excluding cash and cash equivalents of cooperative	SEK per m²	1252	5413.2	4547.06	-1752.2	35831.0
PARISH	Parish in which the apartment is located (total of 14)	-	1252	-	-	-	-
PRICE_M2	Transaction price of apartment	SEK per m²	1252	58258.0	9628.80	28901.7	96000.0
ROOM	Number of rooms, excluding kitchen, bathroom, and hall	No. of rooms	1252	2.2	1.02	1.0	8.0
SHARE	Ownership share of cooperative	%	1252	2	1.94	0.0001	14

[a]Denotes the age with respect to the valuation year, in most cases the construction year. However, valuation year may be updated after a large scale restoration.

We have chosen only to study transactions from within the inner city of Stockholm. This delimitation is exercised due to the fact that although inner city areas differ somewhat in location and in variation of buildings, they are all attractive housing areas with high and even demand. These transactions will have less variation in price per square meter compared to non-urban areas. The inner city is divided into fourteen different parishes. Table 5 displays the distribution of the observations across the parishes. For an overview of descriptive statistics divided by parishes, see Table 10 in the appendix. A map of the inner city parishes is displayed in Figure 1 in the appendix.

Table 5 Observations by parish

Parish	No. of obs.	%
Stockholms Domkyrkoförsamling	2	0.2
S:t Johannes	27	2.2
Adolf Fredrik	27	2.2
Gustav Vasa	51	4.1
S:t Matteus	121	9.7
Engelbrekt	50	4.0
Hedvig Eleonora	27	2.2
Oscar	147	11.7
Maria Magdalena	72	5.8
Högalid	135	10.8
Katarina	136	10.9
Sofia	125	10.0
Kungsholm	142	11.3
S:t Göran	190	15.2
Total	1252	100

We generate dummy variables to represent each parish, where Stockholms Domkyrkoförsamling is the omitted parish dummy. Age as a continuous number is not likely to affect the value of a building per se. Different age periods may reflect different building styles or conditions which are likely to have varying perceived values among home buyers. We generate dummy variables of age intervals of twenty years (0-19 years, 20-39 years, …,100+years). The first dummy variable representing the most recently constructed buildings is the omitted age variable.

Furthermore, we generate dummy variables from the number of rooms. The room dummy variables are generated using one room, two rooms, three rooms, and four rooms or more. The dummy for one-room apartments is the omitted room dummy.

To further refine the data set, we generate squared and cubed variables of the square meter variable included in the data set. This is to control for nonlinear effects of area on transaction prices. It is reasonable to assume a diminishing effect of increased area on transaction price. Finally, floor

dummy variables are generated with unique dummies for floor one through floor six, and one dummy variable for apartments located on the seventh floor or higher[21].

[21] Living on the ground floor or top floor is likely to have a larger price effect than the other floors. In the original data set a variable of total floors was included. We tried constructing a relative floor variable as well as controlling for the apartments being located on the top floor. Due to many missing values in the variable total floor (in total amounting to 407 missing values). In the tradeoff between dropping the observations (with missing values of total floors) and not being able to control for top floor and relative floor, we chose to keep the observations. However, ground floor is controlled for in the constant.

5 RESULTS

The Effect of Net Debt on Monthly Fee

Results from the relationship between the cooperatives' debt and the monthly fee paid by its members, both variables measured in SEK per square meter, are presented in Table 6. The results are obtained by robust ordinary least squares estimation for the 1,252 observations.

Table 6 Ordinary least squares regression: *Estimation of fee determinants*

	Model 1	Model 2
Dependent variable	Monthly fee	Monthly fee
Net debt	0.000884***	0.000736***
	(0.000110)	(0.000108)
Building age dummies included	no	yes
Parish dummies included	no	yes
Constant	43.04***	48.00***
	(0.606)	(6.111)
Observations	1,252	1,252
R^2	0.094	0.265
Adjusted R^2	0.093	0.254

Note. Ordinary least square estimation. Monthly fee and net debt measured in SEK per m^2. Robust standard errors in parentheses. Significance level of ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.

Model 1 shows the effect of net debt per square meter on monthly fee per square meter, with no control variables included in the estimation. From Model 1 it can be inferred that the net debt of cooperatives have a positive, and statistically significant effect on the monthly fee. The effect of net debt on the monthly fee is statistically significant at the 1% level. The explanatory power of net debt effect on transaction prices is slightly higher than 9%.

Model 2 shows the effect of net debt with the control variables of building age and parish included. The effect of net debt on the monthly fee is positive, statistically significant, and slightly smaller when compared to Model 1. The effect of net debt on the monthly fee when including control variables is statistically significant at the 1% level. Including the control variables increases the

explanatory power to above 25%. A summary of the coefficient, standard error, and confidence interval of the net debt estimate in Model 2 is presented in Table 8.

Model 1 does not account for fixed effects of omitted variables of cooperatives such as building age, and location. Hence, there is a likelihood of an omitted variable bias in this estimate, underlying the decision of including the control variables in Model 2 in an attempt to correct for this bias. The control variables included are therefore those who are describing the cooperatives' characteristics and are isolated from the apartment characteristics.

The smaller effect of net debt on monthly fee in Model 2 is due to one or more control variables being correlated with the net debt. When the control variables are included in the regression, they absorb some of the effect of the net debt variable due to collinearity between the control variables and the net debt variable. This implicates that the most conservative approach to analyze the net debt effect on monthly fee is to include these control variables, as in Model 2.

Contextualizing the findings in Model 2 implies that, ceteris paribus, a one standard deviation increase in net debt, 4,547 SEK per square meter, translates into a monthly fee increase of 3.35 SEK per square meter. The average monthly fee is 47.8 SEK per square meter, a one standard deviation increase in net debt implies an incremental increase in monthly fee of 7.04%.

The Effect of Net Debt on Transaction Price

Results from the impact of the cooperatives' net debt on transaction prices, both variables measured in SEK per square meter, are presented in Table 7. The results are obtained by a hedonic regression for the 1,252 observations. Model 3 shows the relationship between net debt and transaction price, when the only control variable is monthly fee.

Table 7 Hedonic regression: *Estimation of price determinants*

	Model 3	Model 4
Dependent variable	Price	Price
Net debt	-0.271***	-0.118**
	(0.0650)	(0.0497)
Monthly fee	-84.03***	-131.8***
	(23.98)	(19.99)
Building age dummies included	no	yes
Area controls included	no	yes
Room dummies included	no	yes
Floor dummies included	no	yes
Parish dummies included	no	yes
Constant	63,745***	81,746***
	(1,087)	(4,202)
Observations	1,252	1,252
R^2	0.038	0.466
Adjusted R^2	0.037	0.452

Note. Ordinary least squares estimation of hedonic pricing model. Price, net debt, and monthly fee measured in SEK per m^2. Robust standard errors in parentheses. Significance level of ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.

It can be inferred from Model 3 that the net debt of housing cooperatives has a negative, and statistically significant impact on the transaction prices of apartments. The effect of net debt on the transaction price is statistically significant with a p-value below 1%. The explanatory power of net debt on transaction prices when only controlling for monthly fee is slightly above 3.5%.

Model 4 shows the effect of net debt with the control variables of fee, building age, area, rooms, floor, and parish included. The effect of net debt on the transaction price is negative, statistically significant, and slightly smaller compared to Model 3. The effect of net debt when including control variables is statistically significant with a p-value below 5%. Including the control variables increases the explanatory power to slightly higher than 45%.

A summary of coefficients, standard errors, and confidence intervals of the net debt and monthly fee estimates in Model 4 is presented in Table 8 and compared with the results of Model 2.

Table 8 Summary of coefficients of Model 2 and Model 4

Model	Dependent variable	Independent variable	Coefficient	Standard error of coefficient	95% confidence interval of coefficient
Model 2	Monthly fee	Net debt	0.000736	0.000108	(0.0005241:0.0009487)
Model 4	Price	Net debt	-0.118	0.0497	(-0.215:-0.020)
Model 4	Price	Monthly fee	-131.82	19.99	(-171.044:-92.598)

Model 3 does not account for fixed effect of omitted variables such as building age, area, rooms, floor, and location. Hence, there is a likelihood of a bias in this estimate of the net debt effect, underlying the decision of including the control variables in an attempt to correct for this bias. The control variables included in Model 4 are therefore those who are describing the apartments' as well as the cooperatives' characteristics.

The smaller effect in Model 4 is due to some control variables being correlated with the net debt. When the control variables are included in the regression, they absorb some of the effect of the net debt variable due to collinearity between the control variables and the net debt variable. This implicates that the most conservative approach to analyze the net debt effect on monthly fee is to include these control variables, as in Model 4.

Contextualizing the findings in Model 4 implies that, ceteris paribus, a one standard deviation increase in net debt, 4,547 SEK per square meter, translates into a price decrease of 537 SEK per square meter. As concluded in the first step regression a one standard deviation increase in net debt equals an incremental monthly fee increase of 3.35 SEK per square meter[22]. According to Model 4, the fee increase of 3.35 SEK per square meter implies an incremental price decrease equal to 442 SEK per square meter. The altogether incremental effect of a one standard deviation increase in net debt is a decreased price of 979 SEK per square meter[23]. Hence, a one standard deviation increase in net debt has an incremental price effect of -1.68%.

[22] Concluded from Model 2 in Table 7.
[23] Incremental price effect due to standard deviation increase in net debt: (-537)+(-442)=(-979 SEK) per square meter.

6 ROBUSTNESS DISCUSSION

In this section we aim to identify potential sources of endogeneity. This includes identifying variables that may be included in the error term. Due to the many unique characteristics of real estate properties, there is reason to expect that many variables are included in the error term. If they are in turn correlated with the dependent variables, there is a risk of them leading to an omitted variable bias. There is also reason to expect that some of the variables included in the error term may be correlated with some of the independent variables, leading to our model overestimating or underestimating the impact of our independent variables.

Estimations from our data provider states that the coverage of the data set is about eighty to ninety percent of the entire real estate market in Stockholm. This implies a risk of selection bias, as those transactions not included may differ systematically from those in the data set.

Justification of the Hedonic Pricing Model

The framework of Rosen estimates value of real estate properties by evaluating its constituent characteristics through a hedonic regression. This relies on the assumption of perfectly competitive markets where no agent is influential enough to act as price setter. It is not unreasonable to assume that this assumption holds for the housing market in Stockholm as well. However, we find that home buyers act irrationally when valuating and purchasing apartments. This is also a common notion among real estate researchers. We argue that even though the market may not be perfectly efficient, it is efficient enough for all practical purposes, justifying the use of the hedonic pricing model.

Furthermore, Rosen assumes that there is a continuum of combination of characteristics considering apartments. This holds to some extent, but not completely. There are combinations that are nonexistent in the Swedish housing market. This restraint contradicts the assumption underlying the hedonic model. No real estate market in the world de facto provides a full continuum of combinations, therefore we once again argue in favor of applying the hedonic pricing. To conclude, we are confident in that the benefits of the hedonic pricing model outweigh the limitations.

Justification of Control Variables

Geographical determinants could ideally be more specific for our observations, narrowed down to neighborhoods for instance. Compartmentalizing the observations in a proper way with preferred

precision from the current variable postal code requires vast insight in real estate geography and the postal code system, and we are incapable to attain such knowledge or data. Omitted geographic variables that are more specific than parish are however not likely to be highly correlated with the net debt and hence are not endogenous. We conclude that the net debt does not seem to systematically correlate with the parishes[24]. This implicates that the lack of a precise geographic determinant is not likely to create a bias but merely lowers the overall explaining power of the model.

The overall standard of apartments is very likely to have an impact on the transaction price; newly renovated apartments are sold at higher prices than those with a large need for renovations. Despite having identified this potential bias, we are unable to control for this factor with available data. This may create an omitted variable bias. The overall standard is likely to explain overpricing or underpricing. However, if assuming that buyers are evaluating the apartment standard objectively and paying for it accordingly, sellers would be indifferent whether to renovate or not before selling. Adding to the assumption, sellers know that they will compensated by the same amount put into renovations. These assumptions implicates that the supply of apartments on the market is normally distributed in terms of renovation, not leading to a bias.

Justification of Net Debt as Proxy Variable for Financial Condition

In order to investigate the effect of debt on transaction price we have run regressions where we only control for the net debt effect and monthly fee effect on the transaction price, in addition to the full model with all control variables included. The reasoning behind this is that if both regressions show a statistically significant coefficient of net debt this implicates a strengthening of the hypothesis that the debt has an impact on the transaction price. We found both regressions to show statistically significant coefficients of net debt.

The question of whether net debt is a good proxy for the financial condition of cooperatives arises when evaluating the robustness of our results. However, we argue that debt is the most pure determinant of financial risk in any enterprise, and equally so in housing cooperatives. Several ways of improving this proxy variable can be discussed, refining it to better reflect the condition of the actual cooperative it represents. A cooperative with debt due to value adding investments is, ceteris paribus, better off financially than a cooperative with the same debt but without the value adding

[24] See Table 14 in the appendix for correlation matrix of net debt and parishes.

investments. We are not able to accomplish this possible refinement of the proxy variable with the data available to us. Nevertheless, using the net debt of the cooperative instead of the long term debt helps achieving a more fair estimation of the financial risk as cash and cash equivalents are deducted from the long term debt.

The results of using long term debt as an alternative proxy variable for financial condition of cooperatives are shown in Table 11 and Table 12 in the appendix. The coefficients of long term debt are similar to the coefficients of net debt, and results in slightly lower explanatory power of the model. The net debt is exclusively used as the main proxy variable due to its higher explanatory power.

Results from the linear as well as logarithmic relationship between the cooperatives' net debt and transaction prices, both variables measured in SEK per square meter, are presented in Table 9. The results are obtained by hedonic regressions for the 1,252 observations. All control variables available are included to avoid omitted variable bias. Model 4 shows the linear relationship between the net debt and the transaction price, with control variables included. The results of Model 4 are discussed in the analysis of Table 7.

Table 9 Hedonic regression: *Linear and logarithmic models of price determinants*

	Model 4	Model 5	Model 6
Dependent variable	Price	ln(price)	ln(price)
Net debt	-0.118**	-0.00000207**	
	(0.0497)	(0.000000849)	
ln(net debt)			-0.00499
			(0.00326)
Monthly fee	-131.8***	-0.00238***	-0.00225***
	(19.99)	(0.000341)	(0.000351)
Building age dummies included	yes	yes	yes
Area controls included	yes	yes	yes
Room dummies included	yes	yes	yes
Floor dummies included	yes	yes	yes
Parish dummies included	yes	yes	yes
Constant	81,746***	11.34***	11.34***
	(4.202)	(0.0782)	(0.0854)
Observations	1,252	1,252	1,220[a]
R^2	0.466	0.472	0.473
Adjusted R^2	0.452	0.457	0.459

Note. Ordinary least squares estimation of hedonic pricing model. Price, net debt, and monthly fee measured in SEK per m^2. Robust standard errors in parentheses. Significance level of ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.
[a]32 of the net debt observations are less than zero, therefore not compatible with the logarithmic function.

Model 5 shows the relationship between net debt and logarithms of transaction prices. Model 5 infers that cooperatives' net debt has a negative, statistically significant impact in percentage changes of apartments' transaction prices. The effect is statistically significant at the 5% level, similar to the significance level of the linear Model 4. The implication of this model is that a standard deviation increase of net debt, 4,547 SEK per square meter, causes a decrease of 0.009% in transaction price

per square meter. This results in a price per square meter of 57,734 SEK compared to the average 58,258 SEK per square meter. The decrease of 524 SEK per square meter is close to the decrease of 537 SEK per square meter that Model 4 implies when increasing net debt by the same amount.
The explanatory power of Model 5 is slightly above 45%, and slightly higher than the explanatory power of the linear model.

Model 6 shows the relationship between the logarithm of net debt and the logarithm of transaction prices, the elasticity of transaction prices with respect to net debt. The coefficient of net debt logarithm is not significant in this model, the results will therefore not be discussed. This is possibly due to thirty-two observations of net debt being less than zero, therefore not compatible with the logarithmic function.

The explanatory powers of Model 5 and Model 6 are similar to that of Model 4. Thus, we can conclude that nonlinear forms do not improve the model substantially. Hence, Model 4 is used when analyzing the effect of net debt on transaction prices. The interpretation of the net debt coefficient in Model 4 and Model 5 are very similar, it only changes negligibly when using the logarithmic Model 5. This validates our choice of the linear Model 4 when studying impacts of net debt.

Although we can measure the effect of different net debt levels on the fee, we cannot observe actual events where net debt is changed. Actual debt increases may imply nonlinear increases in fee due to interest rate changes, contradicting our linear model. Before facing severe financial distress in a cooperative, the fee is likely to be substantially increased in order to avoid a scenario where the cooperative is resolved. Members have strong incentives to accept necessary increased fees as they are otherwise obliged to leave their share in the cooperative and are left with mortgage loans. Besides, cooperatives with a strained financial condition may be hesitant to take on additional debt. This distinction of those cooperatives being able to handle additional debt and those cooperatives unable to, cannot be considered in our model.

As the model used is static, we have not studied actual events where the net debt has been increased in our cross sectional study. Transactions from within the same cooperative, both before and after a change in net debt must be compared in order to observe the true effect on transaction prices. This type of panel data is difficult to obtain. Constructing a data set of overlapping observations of these two criteria, in addition to a control group, is out of the scope of this paper. Changes estimated by

analyzing scenarios using our static model are not likely to be completely identical to true changes, but are merely estimations. A substantially increased fee is likely to lower prices disproportionally, and signal to buyers that the financial condition of the cooperative is in a bad state. However as we are not able to control for this, we can only discuss patterns identified in the static model.

7 CONCLUSION

"While civilization has been improving our houses, it has not equally improved the men who are to inhabit them. It has created palaces, but it was not so easy to create noblemen and kings."—Henry David Thoreau, 1817-1862

The main finding of this paper is that the effect of net debt of housing cooperatives, a proxy for the financial condition, on transaction prices of apartments is negative and significant, with small standard errors. However, we argue that due to irrationality among buyers in the valuation process the negative effect of the net debt is not sufficiently large.

Interpretation of Results

Apart from being statistically significant, there is a more extensive economic implication of our findings in Model 2 and Model 4, with regards to small standard errors of the coefficients. The coefficients, along with 95 percent confidence intervals are presented in Table 8, Section 5.

The narrow confidence interval of Model 2 indicates that the coefficient of net debt on the monthly fee in the inner city of Stockholm is a precise estimate of the true effect. The effect of net debt on transaction prices in Model 4 is low. The estimated coefficient has low standard errors, indicating that it is a precise estimate of the true debt effect on prices. When evaluating Model 4, we can conclude from the narrow confidence intervals that both the net debt and monthly fee coefficients are fair and precise estimates of the true effects.

Implications of Results

Assuming an average interest rate of three percent on the net debt of a housing cooperative[25], a one standard deviation increase in net debt per square meter leads to an incremental increase in monthly interest rate expense of 11.37 SEK[26] per square meter. The estimated incremental increase in monthly fee per square meter equals 3.35 SEK[27]. Hence, the increase in fee is not sufficient to cover the increased interest rate expenses faced by the cooperative due to the added debt. This is under

[25] In the time period of our data set the prime rate was raised from 1.25 to 1.5 percent. (Riksbanken, 2013) The five year mortgage interest rates was set to about 4 percent by the major banks. (Nordea, 2013) (Skandinaviska Enskilda Banken AB, 2013) It is reasonable to assume some interest rate discount for cooperatives due to pooling of risk. Hence, we have subtracted 100 percentage points from the five year mortgage interest rate. An approximation of 3 percent is conservative for the average cooperative, not taking into account potential negotiations with the bank.

[26] Incremental monthly interest rate per square meter computed as: (increased net debt per square meter)*(interest rate)*(1/12)=(monthly interest rate per square meter)

[27] Concluded from Model 2 in Section 5.

the additional assumption that the cooperative's incremental interest expenses cannot be financed from incomes from other sources than the members' fee.

Considering that the incremental interest rate expense of a one standard deviation increase in net debt equals 11.37 SEK, we can compute the coefficient of net debt in Model 2 that would increase the monthly fee by this precise amount. This is still under the assumption that the cooperative cannot finance the additional net debt by other means, implying that the members have to pay the full amount of increased interest expenses through a raised fee. This estimation shows that the coefficient of net debt in Model 2 has to equal 0.0025[28] in order for the expense to be fully financed through a raised fee. This estimate is outside of the 95% confidence interval for the net debt coefficient in Model 2.

Even though it is reasonable to assume that cooperatives do have other sources of income in addition to the fee, these results indicate a sensitivity to increased interest rates. Other revenues are likely to remain unchanged even when interest rates fluctuate[29]. This implies that if interest rates increase, the incremental interest expenses must be financed by raising the members' fee.

Buyers in Stockholm are irrational as they try to predict future prices based on historical prices (Skandinaviska Enskilda Banken AB, 2011), this is not possible in efficient markets (Malkiel & Fama, 1970). These optimistic expectations on future price increases cause buyers to invest in apartments that may be out of their price range, and take on excessive mortgage loans. Moreover, buyers are overly confident in the belief that the fee reflects the financial condition of the cooperative and therefore do not evaluate the financial condition thoroughly.

As a consequence, buyers fail to acknowledge the risk of interest rate fluctuations and the potential impact on their private economy. This increased risk of interest rate changes is twofold. If the cooperative has to take on more debt and thereby increase the fee, buyers are exposed to interest rate changes through their share of the cooperatives' debt. Further on, they are also indebted themselves, and hence the exposure of interest changes is dual. Changes will affect them through both an increased fee, and increased interest rate expenses on their mortgage loans. This scenario is

[28] Sufficient net debt coefficient computed as: (net debt coefficient)=(increased monthly interest expense)/(increased net debt per square meter)

[29] We acknowledge the fact that rents from premises of the cooperative are likely to increase as interest rates go up, but we argue that this effect is negligible. There are reasons to expect a stickiness of contracts and rents. The fee from the members is the most substantial source of income for the majority of the cooperatives.

cumbersome as buyers do not properly evaluate the financial risk of their investments. This leads to buyers underestimating their sensitivity toward interest rate fluctuations. They thereby risk putting themselves in a financially strained situation. Steadily increasing housing prices due to irrational expectations of future prices may result in a housing bubble. This, in addition to buyers being highly indebted may lead to the housing bubble bursting, potentially resulting in a credit crisis.

Banks should strive to increase the knowledge level of apartment buyers. By being better at understanding and evaluating the financial condition of the cooperatives they are investing in, apartment buyers may avoid unfortunate scenarios due to excessive risk taking. In addition to this, realtors should attempt convincing buyers to further investigate the financial condition.

Validation of Results

Interviews with realtors echo the evidence from this study that apartment buyers do not take the financial condition of cooperatives into account to a large extent (Jansson, 2013). The common perception among buyers is that the financial risk of debt is reflected in the monthly fee (Uhlén, 2013), but evidence suggests that this is not the case.

Evidence suggests that investors in small apartments undercapitalize the negative cash flows of monthly fees into the transaction price (Samuelson & Zettervall, 2006). This irrationality of buyers is in line with the findings of this paper.

Suggestions for Further Research

This paper sets out with the purpose of providing additional knowledge of how cooperatives' debt affect transaction prices. Still, additional research remains to be done within this field. Studying how changes over time affect prices by analyzing panel data should pose an interesting study. Investing how sudden increases in debt affect interest rates of loans and transaction prices can also relax the ceteris paribus assumption and give a more thorough analysis.

Furthermore, we welcome future research where the proxy for financial condition of cooperatives does not solely rely on debt. A more exhaustive framework, beyond the scope of this paper, could provide additional insight. More detailed evaluations of cooperatives, taking into account additional financial information, may highlight other aspects than those of this study. Taking into account supplementary possible sources of income for cooperatives would be especially interesting as we have only been able to investigate the monthly fee as revenue source of the cooperatives. As boards

of cooperatives mostly consist of the members, it is reasonable to assume variation in quality across boards. Evaluating the quality of the boards in terms of financial and economic knowledge as well as the boards' decision making process and the effect of those on the financial condition would also be interesting when further studying the dynamics of housing cooperatives.

8 SUMMARY

The aim of this paper is to investigate if buyers take financial condition of cooperatives into account when purchasing an apartment in Stockholm. Until recently, little research has been done on the dynamics of housing cooperatives in Sweden due to limited data availability. Previous research shows that buyers undercapitalize the future payments of the monthly member fees paid to the cooperative (Samuelson & Zettervall, 2006). Furthermore, evidence is found that buyers have irrationally optimistic expectations of future price increases of real estate, basing their expectations on historical levels rather than valuating it according to the current state of the market (Case, et al., 2003) (Case & Shiller, 2004).

In this study we investigate the effect of housing cooperatives' debt on transaction prices of apartments in the central part of Stockholm. We conduct an empirical study and employ several econometric methods in order to investigate this effect. A sample of 1,252 apartment transactions from the first quarter of 2011 is used, representing eighty to ninety percent of all transactions in the area during the time period.

When purchasing an apartment, a buyer is de facto acquiring a share of an economic association (the housing cooperative). The housing cooperative can be financed through debt and equity; a share of the cooperative's debt is therefore corresponding to the apartment bought. The share of the debt is therefore to be considered the apartment buyer's liability.

Net debt per square meter is used as a proxy variable for the financial condition of the cooperatives. We define net debt as cash and cash equivalents subtracted from long term debt. The study is conducted in two steps; firstly we estimate the effect of net debt on the monthly fee set by the cooperative in order to see how sensible the fee is to changes in net debt. This is done through an ordinary least squares estimation. Secondly, we estimate the effect of net debt as well as monthly fee on transaction price through a hedonic pricing model in line with the work of Rosen (Rosen, 1974). The hedonic pricing model is estimated through ordinary least squares estimation to investigate buyers willingness to pay for certain characteristics of apartments. We control for numerous control variables in both steps in order to correct for potential biases. The explanatory power of our hedonic pricing model is slightly above 45%.

The results from the first step show a positive but small, statistically significant effect of net debt on monthly fee. In the second step, we see a negative impact of both monthly fee and net debt on transaction price. The effect of net debt on prices is statistically significant but small, suggesting that buyers are irrational and not evaluating the debt properly. The estimated coefficient has small standard errors and is therefore a precise estimate of the effect. A high level of net debt in a housing cooperative implies an increased risk level when purchasing an apartment, but buyer irrationality results in underestimation of the risk of debt. Evidence suggests high sensitivity of cooperatives toward changes in interest rates. The risk undertaken by apartment buyers is twofold. As Swedish house buyers typically are highly indebted, they are exposed to interest changes from both their mortgage loans as well as the cooperatives' debt. Hence, the main finding of this study is that apartment buyers in Sweden do not evaluate debt of cooperative properly and paying for it accordingly.

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10 APPENDIX

Table 10 Descriptive statistics by parish

Variable	Definition	Unit of measurement	Stockholms Domkyrkoförsamling	S:t Johannes	Adolf Fredrik	Gustav Vasa	S:t Matteus	Engelbrekt	Hedvig Eleonora	Oscar	Maria Magdalena	Högalid	Katarina	Sofia	Kungsholm	S:t Göran	Total
AGE	Age of building[a]	Years	45.0 (52.33)	93.0 (27.17)	104.0 (27.96)	95.3 (24.09)	89.5 (18.51)	82.1 (30.70)	103.1 (30.30)	73.2 (31.91)	62.8 (41.64)	73.8 (24.91)	77.6 (22.81)	35.5 (38.45)	81.6 (23.34)	63.9 (30.94)	73.5 (33.29)
CASH_M2	Cash, bank, account recievables, and clearence account of cooperative	SEK per m²	591.7 (837.02)	728.0 (703.07)	1008.6 (1219.89)	1099.4 (1936.75)	653.0 (701.20)	409.3 (537.53)	630.9 (761.56)	566.4 (764.46)	954.0 (1317.85)	790.5 (991.49)	680.0 (642.07)	640.3 (629.68)	680.6 (716.47)	495.7 (579.10)	673.1 (866.97)
DEBT_M2	Long term debt of cooperative	SEK per m²	14360.5 (9885.36)	6740.75 (5498.36)	10268.1 (8937.77)	5325.2 (3951.96)	3752.8 (2933.32)	4332.2 (3459.32)	7376.3 (8343.11)	5828.9 (5476.09)	6677.9 (4437.36)	6002.3 (4995.35)	6455.9 (4668.84)	8261.4 (4757.29)	5922.38 (3751.38)	5741.7 (4117.68)	6086.2 (4848.48)
FEE_M2	Monthly fee paid to the cooperative	SEK per m²	55.31 (8.92)	43.11 (11.92)	46.60 (14.11)	40.47 (9.07)	40.56 (10.76)	47.93 (13.88)	42.78 (10.45)	46.28 (12.57)	45.78 (15.46)	49.86 (12.93)	48.25 (15.88)	54.04 (10.46)	50.64 (12.03)	49.93 (11.93)	47.83 (13.11)
FLOOR	Floor level of apartment	no. of floors	4.5 (2.12)	1.89 (1.74)	2.3 (1.64)	2.7 (1.43)	2.3 (1.68)	2.3 (1.56)	2.3 (1.39)	3.0 (2.40)	2.8 (1.77)	2.6 (2.07)	2.7 (1.79)	3.0 (1.94)	2.5 (2.10)	2.9 (2.12)	2.7 (1.97)
M2	Size of apartment	m²	77.5 (31.82)	62.44 (40.47)	55.1 (29.88)	68.2 (34.64)	59.2 (28.19)	68.2 (38.95)	57.4 (24.21)	64.7 (35.68)	71.4 (29.30)	53.0 (22.72)	54.5 (24.10)	73.4 (28.21)	58.1 (31.45)	53.0 (21.73)	60.4 (29.62)
M2_TOT	Size of cooperative's living area	m²	6842.0 (7267.64)	3288.2 (2162.10)	2063.7 (1302.05)	3514.4 (4365.46)	2697.4 (1722.01)	5369.4 (4870.50)	3147.9 (2661.43)	5461.8 (7087.97)	5764.2 (5651.51)	6787.4 (7650.35)	4335.5 (5297.90)	6965.1 (5746.43)	8218.5 (11646.71)	9306.0 (9325.19)	6027.9 (7461.87)
NET_DEBT_M2	Total long term debt excluding cash and cash equivalents of cooperative	SEK per m²	13768.7 (9048.34)	6012.7 (5061.54)	9259.47 (8044.35)	4225.84 (3052.23)	3099.9 (2611.51)	3922.9 (3277.74)	6745.4 (8088.45)	5262.4 (5068.07)	5724.0 (4343.36)	5211.9 (4615.08)	5775.9 (4423.50)	7621.1 (4551.10)	5241.8 (3603.83)	5245.9 (3889.24)	5413.2 (4547.06)
PRICE_M2	Transaction price of apartment	SEK per m²	50045.5 (5721.14)	59546.8 (9842.86)	64311.6 (12944.45)	63421.5 (7747.74)	60189.2 (7260.98)	57470.2 (11374.96)	67294.1 (8662.03)	63445.2 (10729.14)	56296.8 (9682.40)	56427.2 (8205.56)	57837.8 (8268.98)	51063.8 (10279.25)	61122.6 (7266.27)	54531.8 (6899.62)	58258.0 (9628.80)
ROOM	Number of rooms, excluding kitchen, bathroom, and hall	No. of rooms	2.5 (0.71)	2.3 (1.02)	2.1 (1.09)	2.5 (1.29)	2.1 (1.01)	2.5 (1.27)	2.0 (0.81)	2.4 (1.12)	2.7 (1.12)	2.0 (0.87)	2.0 (0.88)	2.6 (1.04)	2.2 (1.02)	2.1 (0.81)	2.2 (1.02)
SHARE	Ownership share of cooperative	Percentage	0.032 (0.04)	0.024 (0.02)	0.034 (0.02)	0.033 (0.02)	0.029 (0.02)	0.027 (0.02)	0.028 (0.02)	0.025 (0.02)	0.027 (0.03)	0.019 (0.02)	0.022 (0.02)	0.018 (0.02)	0.024 (0.02)	0.014 (0.01)	0.023 (0.02)
Obs.	Number of observaions	No. of observations	2	27	27	51	121	50	27	147	72	135	136	125	142	190	1252

Note: Mean values. Standard deviations of the mean in parentheses.

[a]Denotes the age with respect to the valuation year, in most cases the construction year. However, valuation year may be updated after a large scale restoration.

Table 11 Ordinary least squares: *Estimation of fee determinants*

	Model 1	Model 2	Model 7	Model 8
Dependent variable	Monthly fee	Monthly fee	Monthly fee	Monthly fee
Net debt	0.000884***	0.000736***		
	(0.000110)	(0.000108)		
Long term debt			0.000775***	0.000639***
			(0.000101)	(0.0000974)
Building age (0-19 yrs)		(omitted)		(omitted)
Building age (20-39 yrs)		-11.86***		-12.14***
		(1.606)		(1.608)
Building age (40-59 yrs)		-13.49***		-13.73***
		(1.881)		(1.881)
Building age (60-79 yrs)		-0.204		-0.584
		(1.297)		(1.292)
Building age (80-99 yrs)		-5.646***		-6.130***
		(1.228)		(1.213)
Building age (100+ yrs)		-10.23***		-10.62***
		(1.387)		(1.378)
Stockholms Domkyrkoförsamling		(omitted)		(omitted)
S:t Johannes		-0.976		-1.660
		(6.542)		(6.222)
Adolf Fredrik		-1.640		-2.185
		(6.599)		(6.289)
Gustav Vasa		-2.470		-3.533
		(6.046)		(5.692)
S:t Matteus		-2.340		-3.218
		(6.027)		(5.679)
Engelbrekt		3.261		2.551
		(6.201)		(5.872)
Hedvig Eleonora		-2.971		-3.517
		(6.371)		(6.025)
Oscar		-0.921		-1.629
		(6.040)		(5.695)
Maria Magdalena		1.996		1.067
		(6.150)		(5.817)
Högalid		3.851		3.043
		(6.030)		(5.680)
Katarina		2.019		1.346
		(6.064)		(5.722)
Sofia		3.175		2.476
		(5.942)		(5.595)
Kungsholm		3.282		2.553
		(5.979)		(5.634)
S:t Göran		1.622		0.952
		(5.963)		(5.615)
Constant	43.04***	48.00***	43.11***	49.20***
	(0.606)	(6.111)	(0.628)	(5.747)
Observations	1,252	1,252	1,252	1,252
R^2	0.094	0.265	0.082	0.258
Adjusted R^2	0.093	0.254	0.081	0.247

Note. Ordinary least square estimation. Monthly fee, long term debt, and net debt measured in SEK per m^2. Robust standard errors in parentheses. Significance level of ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.

Table 12 Hedonic regression: *Estimation of price determinants*

	Model 3	Model 4	Model 9	Model 10
Dependent variable	Price	Price	Price	Price
Net debt	-0.271***	-0.118**		
	(0.0650)	(0.0497)		
Long term debt			-0.239***	-0.116**
			(0.0598)	(0.0461)
Monthly fee	-84.03***	-131.8***	-87.53***	-132.0***
	(23.98)	(19.99)	(23.88)	(20.00)
Building age (0-19 yrs)		(omitted)		(omitted)
Building age (20-39 yrs)		-1,909		-1,902
		(1,171)		(1,170)
Building age (40-59 yrs)		-2,085		-2,065
		(1,373)		(1,374)
Building age (60-79 yrs)		2,209**		2,227**
		(1,065)		(1,065)
Building age (80-99 yrs)		5,433***		5,444***
		(1,054)		(1,054)
Building age (100+ yrs)		8,808***		8,810***
		(1,159)		(1,160)
m^2		-1,005***		-1,005***
		(115.8)		(115.3)
$(m^2)^2$		8.096***		8.093***
		(1.412)		(1.405)
$(m^2)^3$		-0.0207***		-0.0207***
		(0.00486)		(0.00483)
One room		(omitted)		(omitted)
Two rooms		3,886***		3,879***
		(675.7)		(674.6)
Three rooms		9,553***		9,547***
		(1,118)		(1,117)
Four or more rooms		9,466***		9,453***
		(1,601)		(1,601)
Ground floor		(omitted)		(omitted)
First floor		1,082		1,078
		(752.3)		(752.1)
Second floor		1,855***		1,863***
		(708.1)		(708.3)
Third floor		1,972***		1,984***
		(703.0)		(702.9)
Fourth floor		4,558***		4,579***
		(753.3)		(753.2)
Fifth floor		4,960***		4,969***
		(852.4)		(852.2)
Sixth floor		8,034***		8,028***
		(1,384)		(1,381)
Seventh or higher floor		6,731***		6,739***
		(1,330)		(1,327)
Stockholms Domkyrkoförsamling		(omitted)		(omitted)
S:t Johannes		3,772		3,789
		(3,133)		(3,106)
Adolf Fredrik		8,056**		8,099**
		(3,236)		(3,204)
Gustav Vasa		6,534**		6,594**
		(2,878)		(2,844)
S:t Matteus		4,312		4,320
		(2,820)		(2,787)
Engelbrekt		4,607		4,586
		(3,096)		(3,068)
Hedvig Eleonora		12,524***		12,525***
		(3,022)		(2,994)
Oscar		10,553***		10,547***
		(2,893)		(2,862)
Maria Magdalena		5,022*		5,066*
		(2,931)		(2,898)
Högalid		3,266		3,287
		(2,803)		(2,769)
Katarina		4,581		4,587
		(2,826)		(2,795)
Sofia		2,182		2,192
		(2,800)		(2,768)
Kungsholm		7,165**		7,174**
		(2,833)		(2,801)
S:t Göran		1,722		1,708
		(2,807)		(2,776)
Constant	63,745***	81,746***	60,124***	81,813***
	(1,087)	(4,202)	(422.1)	(4,174)
Observations	1,252	1,252	1,252	1,252
R^2	0.038	0.466	0.037	0.467
Adjusted R^2	0.037	0.452	0.035	0.452

Note. Ordinary least squares estimation of hedonic pricing model. Price, net debt, long term debt, and monthly fee measured in SEK per m^2. Robust standard errors in parentheses. Significance level of ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.

Table 13 Hedonic regression: L*inear and logarithmic models of price determinants*

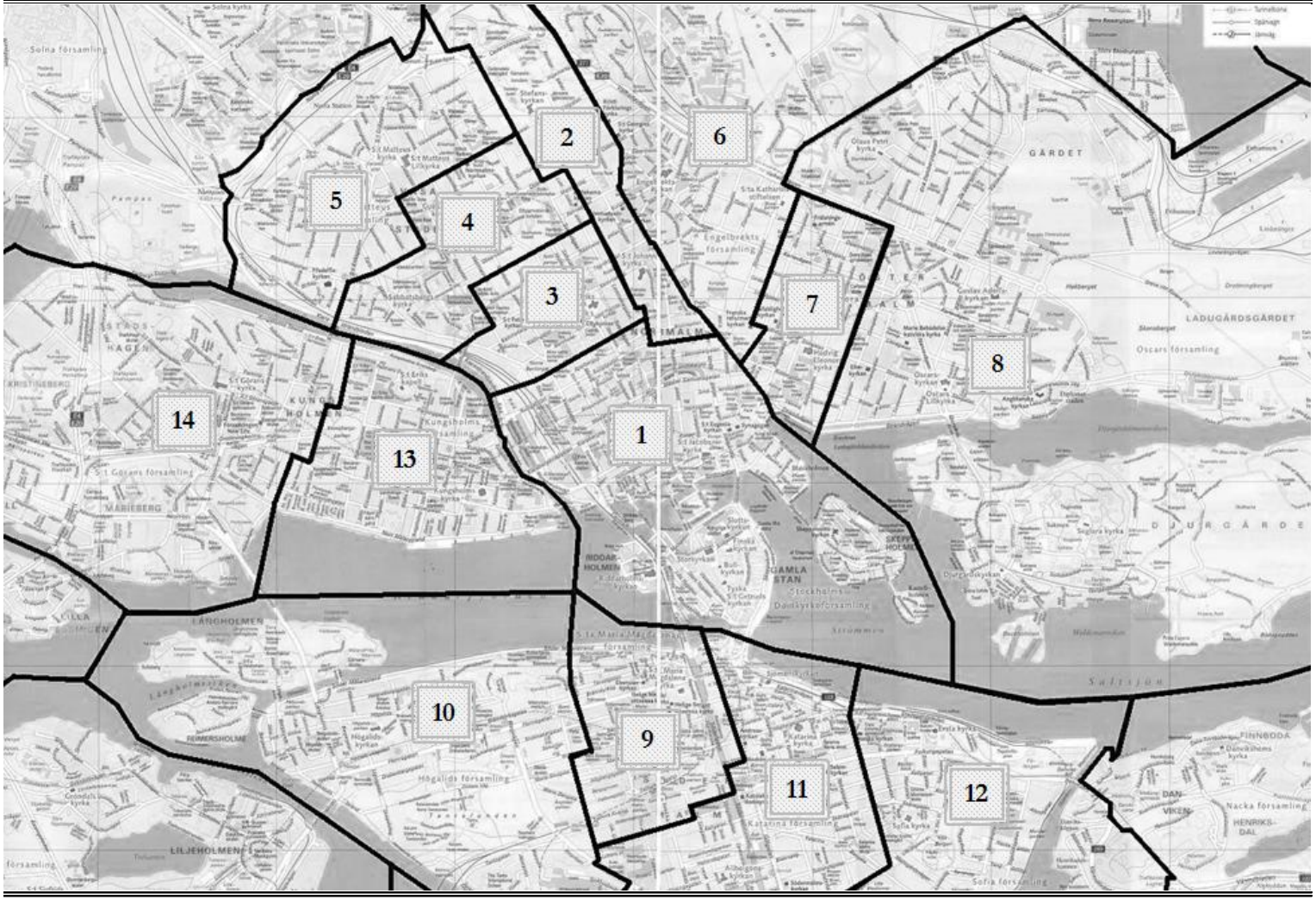
Dependent variable	Model 4 Price	Model 6 ln(price)	Model 7 ln(price)
Net debt	-0.118**	-0,00000207	
	(0.0497)	-0,000000849	
ln(net debt)			-0.00499
			(0.00326)
Monthly fee	-131.8***	-0.00238***	-0.00225***
	(19.99)	(0.000341)	(0.000351)
Building age (0-19 yrs)	(omitted)	(omitted)	(omitted)
Building age (20-39 yrs)	-1,909	-0.0314	-0.0261
	(1,171)	(0.0216)	(0.0223)
Building age (40-59 yrs)	-2,085	-0.0298	-0.0354
	(1,373)	(0.0255)	(0.0260)
Building age (60-79 yrs)	2,209**	0.0499***	0.0493**
	(1,065)	(0.0192)	(0.0195)
Building age (80-99 yrs)	5,433***	0.106***	0.108***
	(1,054)	(0.0187)	(0.0190)
Building age (100+ yrs)	8,808***	0.160***	0.162***
	(1,159)	(0.0202)	(0.0207)
m^2	-1,005***	-0.0163***	-0.0159***
	(115.8)	(0.00192)	(0.00192)
$(m^2)^2$	8.096***	0.000128***	0.000125***
	(1.412)	(0.0000235)	(0.0000234)
$(m^2)^3$	-0.0207***	-0.000000324***	-0.000000316***
	(0.00486)	(0.0000000806)	(0.0000000801)
One room	(omitted)	(omitted)	(omitted)
Two rooms	3,886***	0.0657***	0.0617***
	(675.7)	(0.0115)	(0.0116)
Three rooms	9,553***	0.163***	0.158***
	(1,118)	(0.0194)	(0.0197)
Four or more rooms	9,466***	0.170***	0.167***
	(1,601)	(0.0281)	(0.0284)
Ground floor	(omitted)	(omitted)	(omitted)
First floor	1,082	0.0173	0.0140
	(752.3)	(0.0133)	(0.0135)
Second floor	1,855***	0.0312**	0.0284**
	(708.1)	(0.0123)	(0.0124)
Third floor	1,972***	0.0351***	0.0317**
	(703.0)	(0.0123)	(0.0125)
Fourth floor	4,558***	0.0804***	0.0798***
	(753.3)	(0.0129)	(0.0131)
Fifth floor	4,960***	0.0846***	0.0815***
	(852.4)	(0.0149)	(0.0150)
Sixth floor	8,034***	0.138***	0.142***
	(1,384)	(0.0235)	(0.0239)
Seventh or higher floor	6,731***	0.123***	0.121***
	(1,330)	(0.0229)	(0.0229)
Stockholms Domkyrkoförsamling	(omitted)	(omitted)	(omitted)
S:t Johannes	3,772	0.0594	0.0741
	(3,133)	(0.0652)	(0.0700)
Adolf Fredrik	8,056**	0.125**	0.132*
	(3,236)	(0.0628)	(0.0680)
Gustav Vasa	6,534**	0.110*	0.123*
	(2,878)	(0.0598)	(0.0644)
S:t Matteus	4,312	0.0741	0.0897
	(2,820)	(0.0591)	(0.0637)
Engelbrekt	4,607	0.0678	0.0773
	(3,096)	(0.0634)	(0.0677)
Hedvig Eleonora	12,524***	0.204***	0.215***
	(3,022)	(0.0615)	(0.0662)
Oscar	10,553***	0.171***	0.186***
	(2,893)	(0.0601)	(0.0647)
Maria Magdalena	5,022*	0.0830	0.0907
	(2,931)	(0.0607)	(0.0654)
Högalid	3,266	0.0546	0.0679
	(2,803)	(0.0589)	(0.0636)
Katarina	4,581	0.0779	0.0927
	(2,826)	(0.0591)	(0.0638)
Sofia	2,182	0.0253	0.0319
	(2,800)	(0.0589)	(0.0636)
Kungsholm	7,165**	0.124**	0.134**
	(2,833)	(0.0593)	(0.0639)
S:t Göran	1,722	0.0288	0.0436
	(2,807)	(0.0589)	(0.0635)
Constant	81,746***	11.34***	11.34***
	(4,202)	(0.0782)	(0.0854)
Observations	1,252	1,252	1,220
R^2	0.466	0.472	0.473
Adjusted R^2	0.452	0.457	0.459

Note. Ordinary least squares estimation of hedonic pricing model. Price, net debt, and monthly fee measured in SEK per m^2. Robust standard errors in parentheses. Significance level of ***, **, and * denote significance at the 1, 5, and 10 percent level, respectively.

Table 14: Correlation between parish and net debt

Variable	Correlation net debt per m^2
Stockholms Domkyrkofö	0.0735
S:t Johannes	0.0196
Adolf Fredrik	0.1256
Gustav Vasa	-0.0538
S:t Matteus	-0.1665
Engelbrekt	-0.0669
Hedvig Eleonora	0.0435
Oscar	-0.0121
Maria Magdalena	0.0169
Högalid	-0.0154
Katarina	0.0279
Sofia	0.1618
Kungsholm	-0.0135
S:t Göran	-0.0156

Figure 1 Map of Stockholm inner city parishes



Note. 1. Stockholms Domkyrkoförsamling, 2. S:t Johannes, 3. Adolf Fredrik, 4. Gustav Vasa, 5. S:t Matteus, 6. Engelbrekt, 7. Hedvig Eleonora, 8. Oscar, 9. Maria Magdalena, 10. Högalid, 11. Katarina, 12. Sofia, 13. Kungsholm, 14. S:t Göran

Source: Original map; Liber AB 2007 (modified through highlighting parishes)