# Co-op Debt and the Pricing of Apartments

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# Abstract

We test for market efficiency in the Swedish market for co-op shares by examining how buyers take the debt held by a co-op into account when buying a co-op share. We argue that - in an efficient market - debt on co-op level should be reflected in the price of the co-op share. We use the tax reform of 2006 as a natural experiment and as means to test whether buyers of co-op shares take co-op leverage into account. The tax reform meant that a beneficial tax treatment of co-op debt disappeared; this should translate into a different valuation of co-op debt after the reform. More specifically we would expect that apartments in co-ops with little or no debt on the co-op level to increase in price relatively to those in highly levered co-ops. However, our results show that such a change in price did not occur, which means that buyers of co-op shares that the Swedish market for co-op shares is efficient. Our results show that apartments in highly levered co-ops are overvalued.

Keywords: housing market, market efficiency, co-op market, co-op debt, tax shield valuation

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# **I** Introduction

The decision to buy the dwelling in which you reside is probably one of the biggest - if not the biggest – investment decision a household undertakes. This is reflected in that almost 20 percent of the total financial assets held by all Swedish households are shares in housing co-operatives (henceforth co-ops). Given the size of housing wealth it is likely that changes therein have impacts on consumer spending, making the issue of a functioning market important. For instance Case et al (2003) shows that there exists a significant effect of housing wealth on consumption, Muellbauer et al (2006) show similar results.<sup>1</sup> During the last decade housing prices in Sweden have grown rapidly, even during the last more turbulent year prices have been stable or even increasing whereas they have declined in many other parts of the world (Englund 2011). In light of this there has been a debate whether housing is overvalued in Sweden or even if we are in the midst of a bubble.<sup>2</sup> The discussion has merit from a customer protection point of view. The Swedish Financial Supervisory Authority (Finansinspektionen, FI) states that even a moderate decrease in housing prices can drive households into negative home equity, if this coincides with job loss a household may be forced to sell their house or apartment thus incurring losses that may be hard to recuperate from (Den svenska bolånemarknaden och bankernas kreditgivning, FI 2010). But if the market is efficient we need not worry since prices only reflect the fundamental value of the asset, that is to say there are no inflated house prices - but what if the market is not efficient? According to the National Housing Credit Guarantee Board (Statens bostadskreditnämnd) housing prices in Sweden as of February 2010 deviated from fundamentals as much as they did during the last two peaks in housing prices in 1979 and 1990, they even go on to state that we are in fact in the midst of a bubble (Marknadsrapport 2010-02).

In light of the potentially large impact of falling housing prices and the sheer size of the market for co-op shares in Sweden it is important to determine if this market is functioning properly, that is to say: is the Swedish market for co-op shares efficient? In a semi-strong efficient market all public information is calculated into the price of an asset (Bodie et al 2009). This means that apart from apartment and apartment building characteristics the debt held by the co-op itself should be reflected in the price since it is clearly stated in the balance sheet of a co-op. This is also what we will use to test for efficiency in the market for co-op apartments; i.e. is co-op debt reflected in the

<sup>&</sup>lt;sup>1</sup> It should be noted that these results have not gone unchallenged see for instance Calomiris 2009.

<sup>&</sup>lt;sup>2</sup> Selection of the debate in print and online; *Riksbankens utredare: bopriserna är för höga*, Dagens Industri 2010-11-24; *Floor to Ceiling*, The Economist 2010-10-21; *En bostadsbubbla kostar*, Marknadsrapport 2010-02 Statens bostadskreditnämnd; *Boräntan kan ge ny bubbla*, svd.se 2009-10-07; *Professor: Ingen boprisbubbla*, svd.se 2011-02-23

price of an apartment? To test whether the co-op debt is in fact calculated into the price we develop a model based on Miller-Modiglianis proposition one. Our model states that the value of an apartment in a levered co-op is equal to the value of an identical apartment in an unlevered co-op minus the debt held by the co-op. We then test this with data on co-op share sales in Gothenburg and Uppsala during the period 2006-2008. We fit a hedonic price model and run a difference-indifference estimation using the 2006 tax reform as a natural experiment. Prior to the tax reform there was a tax levied on an imputed rent on co-ops. Against this tax interest rate payments were deductible. This meant that highly levered co-ops did not pay this tax whereas unlevered or lowly levered co-ops did. With the tax reform this tax was abolished, this meant that lowly levered co-ops would experience a reduction in tax costs but highly levered co-ops would be pretty much unaffected. In an efficient market with informed agents this should translate into a relative price change between lowly levered and highly levered co-ops, more specifically that highly levered coops ought to decrease in value compared to lowly levered co-ops. Our results however show that this was not the case; there was no economically significant relative price change between apartments in highly- and lowly levered co-ops. On this basis we reject the hypothesis that the Swedish market for co-ops is efficient.

These results are in accordance with several other studies, both in Sweden and abroad. For instance Case and Schiller (1989) use repeat sales data from four large US cities during 1970-1986 to create a price index, they then regress the changes in prices on lagged changes – in an efficient market there should not be any correlation between present and past prices. They find that such correlation do exist meaning that housing prices have some inertia. Larsen and Weum (2008) use the same methodology as Case and Schiller but for a sample from Norway during 1991-2002, they as well reject the hypothesis of an efficient housing market. Hill et al (1997) manage to test if house prices in Baton Rouge LA during 1985-1990 follow a random walk by testing for a certain pattern of heteroskedasticity on repeat sales data, they find that prices do not follow a random walk.<sup>3</sup> Englund et al (1999) also test if house prices follow a random walk but for Swedish properties during 1981-1993, they reject that house prices follow a random walk instead they are found to be first order serially correlated. Our research differs from that of Englund et al in that we use a hedonic price model and a natural experiment rather than a repeat sales model; moreover our study focuses on the market for co-op apartments rather than single family homes. Given the growth of this market we believe that further research in this respect is valuable.

<sup>&</sup>lt;sup>3</sup> For more research concerning housing market efficiency see Gatzlaff and Tirtiroglu (1995) who reviews previous studies on the efficiency of the housing markets and finds that short-run returns to housing are positively auto-correlated.

Hjalmarsson and Hjalmarsson (2009) test for efficiency in the Swedish market for co-ops. Their approach is that the present value of future payments of co-op fees should be reflected in the sales price. Their result is that an increase of 100 SEK in present value of future fees only reduces the price with 75 SEK. Furthermore, this gap is wider in areas with a less educated population. Similar to our thesis Hjalmarsson and Hjalmarsson's model of the relationship between prices and co-op fees is based on a discounted future cash flow approach. However, given that they run a crosssectional model and that the functional form specification is not known with certainty (Englund et al 1999) there is likely an issue of omitted variable bias. The most likely omitted variable is the standard of the apartment and the building itself. Hjalmarsson and Hjalmarsson deal with this potential problem by first stating that the apartments are fairly homogenous due to the strict Swedish building codes, and they also control for fixed effects on zip codes which they state should account for the state of the building. Our approach differs from that of Hjalmarsson and Hjalmarsson in that we use a natural experiment, this means that we get exogenous variation in our explanatory variables which reduces the problem of endogeneity. Moreover we believe that running fixed effects on zip codes is not enough to account for the condition of the building; due to the size of zip codes it is likely that there is a rather large variation of building condition within zip codes. Therefore, we run fixed effects on co-op level. This will with great likelihood account for the condition of the building since it is very rare that co-ops own several buildings and if they do it is unlikely that the condition between these vary.

Other studies have highlighted certain irregularities in the housing market. Case et al (2003) conducted a survey to determine the behavior and expectation of home buyers in the US in 2002. They find that buyers – even after a long boom – expect that prices will show double digit growth and that the growth comes with a relatively low level of risk. In a paper from 2008 based on US data Benitez et al show that people in general over-estimate the value of their dwelling, they also find that people that bought their dwelling in a booming market have less accurate estimates of their housing value whereas people who bought their dwelling during down markets have more accurate estimations. These results are indeed interesting with respect to the period prior to and during the time of our sample. During the period 2000-2006 the median price of co-ops in Gothenburg and Uppsala increased with 325 percent and 210 percent respectively (Statistics Sweden, SCB), i.e. there has been a great boom in co-op share prices up until our sample period. If we assume that buyers in the US housing market do not differ much from those in Sweden this suggests that the market participants in Sweden might hold irrational expectations on price development.

Another area of research that is of interest for this thesis is how people choose credit. This due to the fact that buyers of co-op shares take on two separate debts: personal debt (mortgage) where the share of the co-op acts as collateral and the debt held by the co-op itself that is attributable to the individual co-op shareholder. In general, research has shown that many individuals fail to choose optimal credit contracts. Agarwal et al (2007) use a market experiment where a bank offered their clients two different credit card contracts to determine how costly potential mistakes in choosing credit contracts are. Among their findings is that only 60 percent chose the credit card contract that actually minimized their cost. Reasons for these sub-optimal choices may lie in salience of certain types of debts and fees. Furthermore, it has been shown that salience of taxes do effect consumer choices, Chetty et al (2009) conduct an experiment in a supermarket where they for a three week period display tax included prices for a number of goods (otherwise tax is added at the register), this reduced the demand for the goods with 8 percent, i.e. the salience of the tax affects consumers. Given this evidence it is not unlikely that salience of debt might affect buyers of co-op shares in that the less salient co-op debt is not properly accounted for in the price. Almenberg and Karapetyan (2010) test whether buyers of co-op shares in Sweden have a bias towards the less salient personal debt. They construct a model where "naïve" and "sophisticated" agents face the same optimization problem when choosing debt-structure and they interact on the same marketplace but where the naïve agents attaches a psychological cost to personal debt. The model predicts that sophisticated agents chose a higher level of personal debt. Almenberg and Karapetyan run an empirical test of their model where they – like us - use the 2006 tax reform as a natural experiment. Their approach is that in presence of naïve agents prices will deviate from economic fundamentals. To test whether the prices do in fact deviate from fundamentals they see how the market reacts to the change incurred by the 2006 tax reform. Moreover, they study whether home buyers take into account the more costly loans held by the co-op after the reform. They find that buyers do not take into account the debt held by the co-op, i.e. that there is no relative price difference between highly- and lowly levered co-ops after the reform. This supports their model and the view that there is a bias in the market towards more costly co-op loans. Almenberg and Karapetyan's empirical model specification is very similar to ours, which means our results can also be used to test their model. Our results do support their findings of a bias towards less salient but more costly loans due to the fact that people do not account for the more costly debt held by the co-op after the reform. However, it is important to note that our model differs from that of Almenberg and Karapetyan in two important aspects. Firstly, in our specification we use the 2006 general election date as the reform date rather than the 2006 budget proposal date (when the tax reform was presented) which Almenberg and Karapetyan use. The decision to use this date is due to the fact that the center right wing coalition - which won the election - had during the campaign leading up to the election clearly stated that the tax on imputed rents for co-ops were to be abolished if they won<sup>4</sup>, in this aspect it is also important to state that they won by a slim margin. The event window used by Almenberg and Karapetyan only covers 30 days prior to and 30 days after the budget proposal date when the tax reform was presented. Seeing that the election date was 19th of September and the budget proposal date was the 16<sup>th</sup> of October pretty much all of the sample used by Almenberg and Karapetyan occurred after what we hold as the true event date. Secondly, we use actual co-op debt rather than using the co-op monthly fee as a proxy for debt; this means we overcome potential problems in that the fee might not always be a rational reflection of the future cash flows due to the debt on the co-ops balance sheet. Given these differences our study adds to the research of Almenberg and Karapetyan in that we provide further empirical evidence on whether salience towards debt affects home-owners choice of financing. Furthermore, our thesis ads to the research on efficiency of the Swedish housing market in general and the market for co-op shares in particular. And by using a natural experiment we overcome some endogeneity issues otherwise associated with hedonic pricing models. One important implication of our results is that we cannot reject any claim of a housing bubble on the Swedish housing market due to the market being efficient.

The rest of the thesis is structured as follows; in section II we present an overview of the Swedish market for co-op shares, in section III the theoretical model for apartment valuation is presented, in section IV the data used for the empirical analysis is explored, in section V the econometric model used to test for market efficiency is outlined and the accompanying results are presented and discussed, and section VI concludes.

# II The Swedish Co-op market

## **Market overview**

The Swedish housing market consist of approximately 4.5 million households. In 2009 55 percent of Swedish homes were located in multi-unit dwellings and 45 percent were single family houses (Statistics Sweden, SCB).

According to Statistics Sweden there were 762 000 co-op apartments and 1 678 600 rental units in Sweden 2009. During the last 20 years fewer and fewer rented apartments have been built, instead the production of co-op housing has been steadily growing, as of 2008 50 percent of newly

<sup>&</sup>lt;sup>4</sup> Fler i arbete – mer att dela på Valmanifest 2006, p11

built dwellings were co-ops compared to 28 percent in 1990. In major suburban areas the percentage of newly built apartments that are co-ops is 59 percent (Statistics Sweden, SCB). Between 1990 and 2009 the number of co-op apartments have grown with 256 400, of which over half, 146 600 apartments, are due to conversion of primarily rental units. 102 600 new co-op apartments have been constructed during the period. Figure 1 illustrates the growth in co-op apartments as well as the relative decline of rental units.



Figure 1. Change in volume of co-op apartments and rental units 1990-2008, nationwide. Source: Statistics Sweden, SCB.

The increase in the number of co-op apartments has a corresponding trend in apartment prices. Figure 2 illustrates the increase in co-op prices during the period 2000 to 2009. The prices have risen steadily during the period, especially in major metropolitan areas such as Stockholm, Gothenburg, and Malmö.



Figure 2. Median price of co-op apartments. Source: Statistics Sweden, SCB

As apartment prices and the number of co-op apartments have risen during the last 20 years, the co-op share of total household financial assets has increased. In the fourth quarter of 2010 the financial assets held by Swedish households amounted to 6 305 billion SEK out of which 1 190 billion SEK constituted of shares in co-op associations. This can be compared to 2 104 billion SEK in individually held stocks, bonds, fund shares, and private pension savings.



Co-op share •••••• Stocks, bonds, funds, and private pension savings

Figure 3. Share of total household financial asset (all Swedish households). Source: Statistics Sweden, SCB

## **Financing the Co-op**

The purchase of a co-op apartment is primarily financed through personal mortgages. According to a sample of originated mortgages, taken by Finansinspektionen in 2009, the average debt level of a purchase of an apartment is 67 percent. The sample consists of both new mortgages and refinancing of old mortgages. Figure 4 illustrates the average debt level in the sample split by age. The debt level for persons under 30 years of age is almost 85 percent, which indicates that first time buyers finance their purchase through debt to a higher extent than other groups. The mortgage rent payments are tax deductible at 30 percent for rent payments up to 100 000 SEK. Rent payments above 100 000 are tax deductible at 20 percent.



Figure 4. Average debt level split by age, new mortgage originations. Source Sverige Riksbank and FI<sup>5</sup>

Co-op ownership was during our sample period the only way to own an apartment in Sweden.<sup>6</sup> The purchase of a co-op apartment entails ownership of a share in the cooperative, as well as a membership in the cooperative association. The share and membership entails the right to use the corresponding apartment, as well as the freedom to renovate or modify the apartment in the same manner as a condominium owner. Co-ops are intended to be occupied by its owners, and are not intended to be treated as speculative investments. The member cannot sublet the apartment for more than 6 months without asking the co-op board for approval. Board approval is rarely given if no special circumstances apply, such as work or study abroad for shorter periods of time. Furthermore, when subletting an apartment there are legal limitations to what the owner can charge in rent, most likely making it unprofitable to sublet if the apartment is financed through personal debt.

The co-op is financed through debt and equity. In 2006 the debt at the co-op level in our sample was 58 percent calculated as a percentage of assessed property value. The assessed property value is set by the Swedish tax authority as a base for taxation and is significantly lower than the property market value. The equity comes from the stake price that initial members (similar to shareholders) of the co-op association put up when the co-op was founded. The purpose of the co-op is to administer the real estate property and to act in the interest of its members. The co-op's revenues come primarily from yearly fees paid by the co-op members. The yearly fee per square meter in a co-op is generally lower than the yearly fee per square meter in a rental unit. According to Statistics

<sup>&</sup>lt;sup>5</sup> The sample consists of 3478 observations. It includes all originated mortgages paid out 28-30 September 2009, including refinancing of old mortgages. Figure taken from Nordberg & Soultaneva 2010, Ekonomisk Kommentar nr 5, Sveriges Riksbank.

<sup>&</sup>lt;sup>6</sup> Condominiums did not exist in the Swedish market until May 2009 when the possibility of owning an apartment directly was introduced. Direct ownership is extremely rare in the Swedish market as per May 2011. Co-op ownership is still dominant.

Sweden in 2002 the average yearly fee per square meter in co-op apartments was 554 SEK. For rental units the average yearly fee per square meter was 755 SEK.

The co-op's costs can be divided into two major categories; administration costs and debt interest payments. In addition, co-ops face tax costs, which are calculated as a fraction of the property assessed value. The main taxes that were levied on co-ops were the real estate tax and the governmental income tax. The governmental income tax paid by co-ops in Sweden 2006 amounted to 1 107 MSEK. The real estate tax amounted to 2 053 MSEK (Statistics Sweden, SCB).

## The Swedish co-op tax reform

17<sup>th</sup> of September 2006 general elections were held in Sweden. The center-right wing coalition *Alliance for Sweden* won a close election obtaining 178 seats in the Swedish parliament, 7 more than the red-green bloc's 171 seats.<sup>7</sup> One of the coalition's election promises was to change the taxation on real estate property. For co-ops this meant that the governmental income taxation of 28 percent levied on received governmental interest contributions and an imputed rent of 3 percent of the assessed value of the co-op's property would be abolished.<sup>8</sup> In addition, the real estate tax of 0.5 percent of the property assessed value would be lowered to 0.4 percent. In the new government's first budget 16<sup>th</sup> October 2006 the change in taxation was suggested and 6<sup>th</sup> December 2006 the Swedish parliament accepted the budget. The new taxation law for co-ops took effect 1<sup>st</sup> January 2007.

Prior to the reform co-ops paid governmental income taxes of 28 percent. The governmental income tax was levied on received governmental interest contributions and an imputed rent amounting to 3 percent of the assessed value of the co-op's real estate property. Only three types of costs were deducted: Interest expenses, repayment of governmental interest contributions, and leaseholder's rent. After the reform, income attributable to the real estate property would not be taxed and costs attributable to the real estate property would not be deducted (Budgetpropositionen 2007 Page 81).

<sup>&</sup>lt;sup>7</sup> Valmyndigheten, 2006-09-21

<sup>&</sup>lt;sup>8</sup> Fler i arbete – mer att dela på Valmanifest 2006, p11

# **III Theoretical model**

#### The co-op and the traditional company

The member-owned co-op displays many similarities with the traditional company with shareholders. As the shareholder in a traditional company has the right to the future cash-flows of the company, the co-op member is also affected by the future cash flows of the co-op. Company cash flows determine the future dividends to the shareholder, as co-op cash flows determine the future yearly fee for the co-op member. In both cases the cash flow of the organization impacts the cash flow of the shareholder/member, and hence the value of the stock/co-op share. As we are looking to determine how co-op debt is priced into the market value of the co-op share (the apartment), we outline a theoretical pricing model similar to Modigliani and Miller's proposition I (1958). In the model we exclude the personal borrowing conditions when buying a co-op share. In order to exclude the buyer's personal financing we assume that buyers can lend and borrow in an efficient market with no borrowing constraints.

#### A world with no co-op taxes

For simplicity we consider two equivalent co-ops. The two co-ops each own one real estate property identical to one another. One of the two co-ops has debt in its capital structure, while the other has no debt in its capital structure. For simplicity we also assume that the costs associated with owning and administering the real estate properties are zero. The co-ops have no costs other than interest payments for debt. We denote this annual interest payment as  $r_dD$ , where  $r_d$  is the cost of debt and D is the co-op's debt. In a world with no taxes the difference in cash flows between the two co-ops will be  $r_dD$  each year.

The present value of all future cash flow differences  $(X_i)$  between the two co-ops is given by

$$X_{j} = \sum_{t=1}^{T \to \infty} \frac{r_{d} D_{t}}{(1+r_{f})^{t}}$$
(1)

Where  $r_f$  is the risk free rate and  $D_t$  is the debt at time t. If we add the assumption of no bankruptcy the co-op can borrow at the risk free rate  $(r_d=r_f)$ . Also assuming that debt is to be held constant  $(D = D_t$  for all t) we can rewrite equation (1)

$$X_j = \frac{r_d * D}{r_f} = D \tag{2}$$

The difference in present value between the two co-ops is *D*. Denoting the value of the unlevered co-op  $V^U$  and the value of the levered co-op  $V^L$ , in an efficient market, the value of the levered co-op is

$$V^L = V^U - D \tag{3}$$

#### **Co-op taxes**

In a world with taxes the difference in value between the two co-ops is somewhat different. Coops are not, like traditional companies, taxed on net income, but rather on a fraction of the assessed value of the real estate property. But just like the case for the traditional company, interest payments are tax deductible. In our example in a world with taxes both co-ops have annual costs. The unlevered co-op has tax costs equal to a fraction ( $\pi$ ) of the assessed value of the real estate property (*Y*) multiplied by the tax rate (*t*). The yearly tax cost for the unlevered co-op can be written as ( $\pi Y$ )\**t*. For simplicity we assume that  $r_d D \leq (\pi Y)$ \**t* for the levered co-op. Yearly costs for the levered co-op are now ( $\pi Y - r_d D$ )\**t* +  $r_d D$  or ( $\pi Y$ )\**t* +  $r_d D$ \*(*1*- *t*). The difference in the yearly cash flow between our two co-ops is  $r_d D$ \*(*1*- *t*).

Under the same assumptions as before, substituting the yearly difference in cash flows into equation (1) and (2), the value of a levered co-op in a world with taxes is

$$V^L = V^U - D + D * t \tag{4}$$

We see that the levered co-op can take advantage of a tax shield (D \* t) that is not present in equation 3.

The logical progression of equation 3 and 4 is that the difference in value between an unlevered co-op and a levered co-op is reflected in the value of the individual co-op member's share. The cash flow that the co-op member faces are the yearly fees to the co-op. To the individual co-op member the true price, or intrinsic value (V), of the co-op share is the sum of the sales price (P) and the present value of future yearly fees. The sales price should equal the intrinsic value minus the present value of future yearly fees. That is for co-op share i

$$P_i = V_i - PV(yearly fees_i) \tag{5}$$

As discussed previously, the yearly fee is comprised of a maintenance and administration fee and a cost of debt component. If we go back to our example of two identical co-ops (with equal distribution of fees among members) but with different capital structure the difference in yearly fee that the co-op member faces comprises only of the cost of debt component. The maintenance and administration fee in our example is equal for the co-ops. The difference in the value of two equal apartments one in each co-op is given by

$$V^{L} = V^{U} - PV(debt \ component \ of \ yearly \ fee)$$
(6)

where the present value of the debt component corresponds to the co-op member's share of debt in equation 3 and 4.

If we look closer at the governmental income tax that the co-op faces we see that it is in fact quite different from the taxation of a traditional company. Where the traditional company pays tax on the gross result, the co-op pays tax on an imputed rent of the property assessed value. For companies, the tax shield has no upper limit as long as the company's return on assets is bigger than the cost of debt. The tax shield is usually given by the amount of debt multiplied with the corporate tax rate as it is fairly rare that corporations fail to meet the cost of debt. The tax shield for the Swedish co-ops however has an upper limit. Since taxes are never lower than zero the tax deduction co-ops can make is never bigger than the imputed rent of the assessed property value multiplied by the tax rate. This case is fairly common. As co-ops have higher cost of debt than the imputed rent of the assessed property value they cannot take advantage of an increased tax shield if they put on more debt. In our model we calculate the effective tax rate for co-op i as

$$t_{effective,i} = \min\left(\frac{\pi Y_i}{rd * D_i}; 1\right) * t$$
<sup>(7)</sup>

Hence, the effective tax shield for a levered co-op is  $D * t_{effective,i}$  and the corresponding tax shield at the apartment level is  $s * D * t_{effective,i}$ .

Given that the assumptions of (i) no bankruptcy costs, (ii) co-op debt is held constant, in an efficient market the difference in value for a co-op share in a world with taxes and a world with no taxes is  $s^*D^*t_{effective,i}$ .

To test our model empirically we will run a regression specification that uses the 2006 tax reform as a natural experiment to determine whether the buyers of co-op shares account for the change in taxation and the resulting change in the cost of co-op debt. To try to mimic our theoretical example of two identical apartments we will control for apartment characteristics such as size, floor, and number of rooms in the regression specification. We also control for time fixed effects and co-op fixed effects. Next we present the data used in order to perform our empirical test.

# **IV Data**

For apartment sales data we use a dataset provided by Mäklarstatistik.se with sales price, apartment characteristics, and monthly co-op fee. For the co-op long-term debt, property assessed value, and number of square meters in the co-op we have constructed our own dataset using co-op annual statements for 2006 provided by boreda.se.

## Sales data

Mäklarstatistik.se has provided us with one set of data (proprietary) consisting of 4000 apartment sales during 2006 to 2008. The observations are apartment sales in Gothenburg and Uppsala, with 2000 observations in each city. We use sales price per square meter, contract date of the apartment sale, the number of apartment square meters, number of rooms, monthly fee, construction year of the building, floor, and co-op identification number for merging with the co-op data.

#### Co-op data

Boreda.se has provided us with the possibility to download co-op annual statements from their webpage. We have looked at 511 co-op's annual statements for the year 2006 and constructed a dataset consisting of co-op long-term debt, co-op property assessed value, co-op total number of square meters, and co-op identification number. Note that the information is taken for the year 2006. The 2006 data acts as a proxy for actual debt level and property assessed value in all time periods. It is reasonable to assume that the co-op debt is extremely serially correlated. The assessed property value increased in 2007 for all co-ops. The tax reform was partly a reaction to the anticipated increase in assessed property values. Since the increase in assessed property value correlated with the tax reform, using post reform property assessed values to compute the assumed co-op tax shields would create an endogneity problem in our specification. We use the 2006 assessed property value, since that was the only year in our sample when co-ops could in fact take advantage of the tax shield. The co-op number of square meters is taken from the last year available, in most cases 2009.

We join the two datasets on co-op identifier, and compute the following variables: Yearly fee per square meter as 12 times the monthly fee divided by number of apartment square meters, and debt per square meter as co-op debt divided by co-op total number of square meters. Finally we compute the effective tax rate by using the minimum of the yearly cost of debt and the imputed rent on assessed property value. We assume a cost of debt for the co-ops at 5 percent, 1.3 percent above the

2006 average 10-year Swedish governmental bond rate at 3.7 percent (Riksbanken). The co-op's effective tax rate variable is given by

$$Co_op \ effective \ tax \ rate = \min\left(\frac{0.03 * Ass. \ prop. \ value}{0.05 * \ Debt}; 1\right) * 0.28$$
(8)

where 0.03 is the imputed rent and 0.28 is the governmental income tax rate. We also compute the effective tax rate for cost of debt at 3 percent and 8 percent. We multiply the effective tax rate with co-op debt to get the co-op's assumed tax shield at three different cost of debt levels (See figure 5). We also compute a post dummy that equals 1 if the sale was after the 2006 general election.



**Figure 5.** Frequency of apartment sales by debt level as fraction of assessed property value and the tax shield as a fraction of assessed property value for three different interest rates. The tax shield limit is reached when the imputed rent (3 percent) on the assessed property value divided by the yearly interest payment equals one, which is represented in the figure where the cost of debt lines are capped.

### Table 1. Summary statistics data sample

Number of unique co-ops	511				
Variable	median	mean	sd	min	max
Price per square meter	17763	18433.88	8060.21	1250	57143
Apartment square meters	63	64.95	22.63	16	192
Co-op debt per square meter	2987.87	4109.82	3413.78	0.00	26308.26
Assumed tax shield per square meter	828.61	945.82	624.78	0.00	3397.92
Yearly fee per square meter	601.85	619.98	126.25	0.00	1359.71
Quarter	2007 Q2			2006 Q1	2008 Q4
Rooms	2	2.38	1.02	0	6
Construction year	1955			0	2007
Floor	2	2.34	1.65	0	12
Co-op property assessed value	62,000,000	95,400,000	105,000,000	2,452,000	700,000,000
Co-op debt	27,700,000	41,900,000	42,200,000	0	244,000,000
Log(Apartment square meters)	4.14	4.11	0.36	2.77	5.26
Log(Assumed tax shield per square meter)	6.72	6.61	0.75	3.60	8.13
Log(Price per square meter)	9.78	9.71	0.52	7.13	10.95
Observations	2581				

	4	Pre-election				Post-election				
Variable	median	mean	sd	min	Max	median	Mean	sd	min	max
Price per square meter	17458	17889.63	7944.95	1250	45161	17857	18648.52	8097.29	1327	57143
Apartment square meters	63	65.02	23.79	16	192	63	64.93	22.16	20	150
Co-op debt per square meter	3123.62	4266.57	3367.16	0.00	21434.61	2959.32	4047.99	3430.92	0.00	26308.26
Assumed tax shield per square meter	847.21	985.46	638.86	0.00	3397.92	812.15	930.18	618.62	0.00	3397.92
Yearly fee per square meter	591.88	609.81	128.01	174.00	1233.71	604.12	624.00	125.36	0.00	1359.71
Quarter	2006 Q2			2006 Q1	2006 Q3	2007 Q4			2006 Q3	2008 Q4
Rooms	2	2.38	1.04	1	6	2	2.38	1.01	0	6
Construction year	1955			0	2007	1955			0	2007
Floor	2	2.34	1.63	0	9	2	2.34	1.66	0	12
Co-op property assessed value	54,900,000	87,100,000	105,000,000	2,452,000	700,000,000	64,400,000	98,600,000	106,000,000	2,452,000	700,000,000
Co-op debt	24,700,000	39,700,000	41,500,000	0	244,000,000	28,500,000	42,800,000	42,400,000	0	244,000,000
Log(Apartment square meters)	4.14	4.11	0.38	2.77	5.26	4.14	4.11	0.36	3.00	5.01
Log(Assumed tax shield per square meter)	6.74	6.66	0.74	3.60	8.13	6.70	6.59	0.75	3.60	8.13
Log(Price per square meter)	9.77	9.67	0.56	7.13	10.72	9.79	9.72	0.50	7.19	10.95
Observations	730					1851				
Number of unique co-ops	409					498				

Table 2. Summary statistics data sample divided in pre- and post-election (i.e. the event date)

# **V** - Empirical Results

As stated before what we want to test is whether apartment buyers rationally account for the debt held by co-ops. If they do not account for this debt we will reject that the Swedish market for co-ops is efficient. To test this empirically we will use the tax reform of 2006 as a natural experiment. The change brought on by the reform that we are interested in is the abolishment of the governmental income tax. The tax reform lowered the cost for lowly levered co-ops meaning that the monthly fees either would be lowered or that the services offered by the co-op would increase. Rational buyers would anticipate this which should translate into a relative increase in price between apartments in lowly- and highly levered co-ops. With our data we fit a hedonic model (Rosen 1974) and run a difference-in-difference estimation with the election date 2006 as the event date. As the dependent variable we use the sales price per square meter. As independent variables we have an interaction term between the sale being post reform and the co-op debt per square meter, area of the apartment, and the log of area of the apartment, dummy variables for number of rooms, floor of the apartment and construction decade of the building. We report results running the regression both with and without yearly fee per square meter included. We also run fixed effects on a co-op level and time fixed effects on a quarterly basis. Thus our specification is:

$$y = \beta_0 + \beta_1 * Post * Debt + X'\delta_i + \gamma_i Orgnr + \theta_i Quarter + \varepsilon_i$$
(9)

Where X' is a vector containing the apartment specific characteristics. After the reform a rational buyer would realize that the tax shield enjoyed prior to the reform is gone. This would – in an efficient market and as our model states – translate into that the coefficient  $\beta_1$  will take on a negative value. That is to say that highly levered co-ops would decrease in value due to the reform. We expect a coefficient that equals the effective tax rate, somewhere just above -0.28. The initial debt per square meter is left out of the regression since it is perfectly correlated with the co-op and we control for co-op fixed effects in the regression.

As we see in table 3, the coefficient has the expected negative sign and is statistically significant at the 5 percent level. The coefficient is however surprisingly small, -0.0818, which means that the co-op market either (i) does not value debt held by the co-op according to our model or (ii) that the effective tax shield is significantly lower than expected. However this specification does not take into account the actual tax shield which for highly levered co-ops reaches the tax shield limit as illustrated in figure 5. In our main specification – presented below – we use an assumed tax shield (defined in section IV) as a proxy for the actual tax shield

We replace the debt per square meter in the interaction term with the assumed tax shield per square meter based on the calculated effective tax rate for the co-op. We have three different assumed tax shields each one at different cost of debt for the co-op. We do not know the exact interest rate paid by the co-ops, but the range 3-8 percent ought to cover all likely interest rates. The specification otherwise looks as in equation 9 and is our main specification:

$$y = \beta_0 + \beta_1 * Post * Assumed tax shield + X'\delta_i + \gamma_i Orgnr + \theta_i Quarter + \varepsilon_i$$
(10)

Where assumed tax shield equals the debt multiplied by the effective tax rate (cf figure 5). In this regression we expect that the coefficient of interest  $\beta_1$  will take on the value -1, i.e. that apartment buyers fully recognize that the tax shield would disappear due to the reform. This would mean that buyers in the co-op market value debt at the co-op level in a rational manner and that an increase in debt with 1 SEK would translate into a price decrease of 1 SEK. As in the previous regression, where the debt per square meter was left out, we exclude the debt per square meter minus the assumed tax shield since it is picked up by running fixed effects on co-op level.

Table 3 reports the results for three levels of cost of debt. The interaction term coefficient has the expected negative sign, *but is not statistically different from zero*. The estimates suggest that an increase in debt with 1 SEK results in a decrease in price of 0.28 to 0.56 SEK depending on the level of cost of debt. We can reject that the estimate is smaller or equal to -1 at a 5 percent significance level when we assume a cost of debt at 3 and 5 percent (p-value 0.0001 and 0.0112 respectively). With cost of debt at 8 percent we cannot reject that the interaction term is different from -1 at any reasonable significance level, however a cost of debt at 8 percent may seem unreasonably high. On the basis of these results we reject the hypothesis of an efficient Swedish co-op market.

There are some potential issues with our specification, in particular the effective tax shield calculation. For instance we do not account for the contributions paid out by the government to support new construction and rebuilds in Sweden. The governmental interest contributions are taken up for taxation just as the imputed rent on assessed property value. Similar, the leaseholder's rent and the interest repayment of governmental interest contributions are tax deductible, but also left out of the tax shield estimation. That the governmental interest contribution is taxed means that the

tax shield might be higher than our calculations, especially for highly levered co-ops. It is likely that the governmental interest contributions are primarily given to highly levered co-ops with relatively newly constructed buildings or recent renovations. To summarize; the potential problem with our specification is that it underestimates the limit of the assumed tax shield in figure 5, especially for highly levered co-ops.

However, regarding the governmental interest contribution it should be noted that in 2006 the total assessed property value for all co-ops was 381 250 MSEK, which means that the taxation base for co-ops (imputed rent of 3 percent) attributable to the assessed property value was 11 438 MSEK. The governmental interest contributions to co-op multiunit dwellings 2006 was 691 MSEK (Statistics Sweden, SCB). That is to say that the governmental interest contribution amounts to only 5.7 percent of the total taxation base (imputed rent on property assessed value and governmental interest contribution). This ought to make the impact of not including the governmental interest rate contribution in our tax shield estimation small.

Hjalmarsson and Hjalmarsson (2009) discuss buyer liquidity constraints and how it affects sale price and thereby market efficiency. They use apartment size as a proxy for buyer liquidity constraints, where buyers of smaller apartments are assumed to be more liquidity constrained. They find that the valuation of future yearly fees is more rational amongst buyers of bigger apartments and that this suggests that liquidity constraints are present in the Swedish co-op market, but they conclude that this alone cannot explain the market inefficiency. Similar to Hjalmarsson and Hjalmarsson we believe that certain buyers may face liquidity constraints and that this may impact our results away from market efficiency. Moreover, that liquidity constrained buyers may actually want to take on debt on the co-op level since they are unable to take on as much personal debt as they would like. We test for possible liquidity constraints by running our main specification but where we interact the coefficient of interest with a room dummy as to isolate the effect of the reform depending on number of rooms. Smaller apartments will proxy for liquidity constraints in this set up – the intuition behind this being that buyers of smaller apartments (i.e. with fewer rooms) are likely first time buyers whom probably are younger and thus have not been able to accumulate a cash buffer to use as down payment. Furthermore, younger buyers probably have lower income in general than older buyers since they have not had time to progress in their professional careers. This intuition is also in accordance with younger buyers having a higher debt level (see figure 4). The model specification is:

 $y = \beta_0 + \beta_1 * Room Dummy$ 

- +  $\beta_2 * (Debt Assumed tax shield) * Room Dummy$
- +  $\beta_3$  \* Post \* Assumed tax shield
- +  $\beta_4 * Post * Assumed tax shield * Room Dummy$
- + X' $\delta_i$  +  $\gamma_i Orgnr$  +  $\theta_i Quarter$  +  $\theta_i Quarter$  \* Room Dummy +  $\varepsilon_i$

We run this regression in four different set ups, where the variable *room dummy* takes on the value 1 if number of rooms is equal to 1, 2, 3, or 4+ respectively. We can view all apartments with number of rooms not included in the *room dummy* as a control group, and the treatment group being an apartment with number of rooms included in the *room dummy* (e.g. the *room dummy* takes on the value 1 if number of rooms equals 3. 3 room apartments will act as treatment group and all other apartments will act as control group).<sup>11</sup> We run the regression four times, each time with a different treatment and control group.

(11)

The  $\beta_1$  coefficient estimates the general effect of the dummy, i.e. how a square meter in apartments with 1, 2, 3, or 4+ rooms is valued. The  $\beta_2$  coefficient interacts with the *co-op debt minus assumed tax shield*, and should be interpreted as the effect of the *room dummy* interacting with *co-op debt minus assumed tax shield*. If  $\beta_2$  is positive when running the regression with 1 room apartments as treatment group, the interpretation would be that 1 room apartments are priced higher in co-ops with high debt level relative to co-ops with low debt level. It is important to state that the variables *room dummy* and *co-op debt minus assumed tax shield* are not exogenously given, and that any interpretation of the  $\beta_1$  and  $\beta_2$  coefficients would suffer from endogeneity issues. For the  $\beta_3$  and  $\beta_4$  we have exogenous variation since they interact with the *post dummy*. The  $\beta_3$  coefficient act as a control group consisting of all apartments with number of rooms not included in the *room dummy* variable. The  $\beta_4$  coefficient displays the additional effect of belonging to the treatment group.

If the market for co-op shares experience liquidity constraints and smaller apartments are a good proxy for this, we expect to see a positive  $\beta_4$  when running the regression with 1 room apartments as treatment group. This would mean that buyers of smaller apartments value co-op debt higher than buyers of other apartments, which would indicate that buyers of smaller apartments either (i) experience higher liquidity constraints than other buyers or (ii) are less rational. Correspondingly, we expect a negative  $\beta_4$  when running the regression with 4+ room apartments as treatment group

<sup>&</sup>lt;sup>11</sup> The control group/treatment group description is a simplification. That we include the assumed tax shield in the interaction term makes the terminology of control group and treatment group with respect to only number of rooms non-exhaustive. Bear in mind that our main dynamic "treatment group" still consists of apartments in co-ops with higher assumed tax shield.

assuming that buyers of 4+ room apartments are less liquidity constrained than other buyers. The  $\beta_3$  coefficient is also of interest as it reports the effect the reform had on the control groups.

Table 4 presents the results. The interpretation of the  $\beta_4$  estimate is the additional value of debt the buyers of apartments take into consideration, i.e. what we will see is if buyers of 1, 2, 3, or 4+ room apartments differ in the valuation of co-op debt. The total consideration of co-op debt for the control group will be  $\beta_3$ , and  $\beta_4$  will represent the additional effect of belonging to the treatment group. Contrary to our beliefs we find that the buyers of 1 room apartments seem to account for the debt rationally. The  $\beta_4$  estimate has the right sign and the size is in range of what we expect from rational buyers. However, the estimate is not statistically significant at the 5 percent level but on a 10 percent level. The results also show that buyers of apartments with 4 rooms or more account for co-op debt, the sign on the estimate is negative and the size of it almost minus 2 and statistically significant on a 1 percent level. The size of the coefficient is striking, it suggest that an increase in debt with 1 SEK corresponds to a decrease in price of 2 SEK. What is also striking when running the regression with 4+ rooms as the treatment group is the relatively small  $\beta_3$  coefficient estimate. This would suggest that the 4+ room apartments may explain the small amount of rationality that we were able to find using our main specification. Regarding 2 and 3 room apartments the estimates for the interaction coefficient is positive, albeit not significant, which indicates that buyers of these apartments do not seem to take into account the debt held by the co-op differently from the control groups.

#### Table 3. Main results, the valuation of co-op debt in apartment prices.

Dependent variable Sales price per square m	eter in all regr	essions	Cost of deb	ot 3 percent	Cost of deb	ot 5 percent	cent Cost of debt 8 per	
Including yearly fee per square meter	yes	no	yes	no	yes	no	yes	no
Post * Co-op debt per square meter	-0.0818*	-0.0821	-	-	-	-	-	-
	(-1.96)	(-1.95)	-	-	-	-	-	-
Post * Assumed tax shield per square meter	-	-	-0.286	-0.283	-0.334	-0.323	-0.578	-0.558
	-	-	(-1.54)	(-1.52)	(-1.27)	(-1.23)	(-1.54)	(-1.49)
Apartment square meters	79.87***	79.17***	79.87***	79.16***	80.12***	79.41***	80.26***	79.54***
	(3.43)	(3.39)	(3.42)	(3.39)	(3.43)	(3.40)	(3.44)	(3.41)
Log(Apartment square meters)	-15845.7***	-15428.8***	-15868.6***	-15447.6***	-15892.4***	-15468.5***	-15911.5***	-15484.5***
	(-12.42)	(-12.24)	(-12.40)	(-12.23)	(-12.42)	(-12.24)	(-12.45)	(-12.26)
Yearly fee per square meter	-3.139	-	-3.175	-	-3.2	-	-3.221	-
	(-1.57)	-	(-1.58)	-	(-1.60)	-	(-1.61)	-
Additional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Probability Post * Assumed tax shield $\leq$ -1			0.0001	0.0001	0.0112	0.0101	0.2616	0.2388
R2	0.9259	0.9257	0.9258	0.9256	0.9257	0.9256	0.9258	0.9256
Ν	2581	2581	2581	2581	2581	2581	2581	2581

Robust t statistics in parentheses

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

Note: Robust t statistics are clustered on co-op level. Each cell represents the coefficient estimate of the variable in the left column. Each column represent one regression. The main specification reported in columns 4 through 9 is estimated for three different cost of debt when computing the assumed tax shield per square meter. Additional controls include dummies for; floor, rooms, construction decade, and quarter.

Rooms	1	1 2 3		3	4+			
Including yearly fee per square meter	yes	no	yes	no	yes	no	yes	no
RoomDummy	-5083.8***	-4949.2***	-2821.7*	-2822.0*	-209.7	-251.9	1106.4	876.1
	(-4.26)	(-4.14)	(-2.42)	(-2.41)	(-0.16)	(-0.20)	(0.63)	(0.50)
Debt minus Assumed tax shield per square meter * RoomDummy	0.201*	0.201	-0.067	-0.070	-0.097	-0.098	0.015	0.025
	(1.97)	(1.94)	(-1.05)	(-1.09)	(-1.41)	(-1.43)	(0.17)	(0.29)
Post * Assumed tax shield per square meter	-0.212	-0.205	-0.573	-0.552	-0.414	-0.406	-0.040	-0.028
	(-0.83)	(-0.80)	(-1.62)	(-1.56)	(-1.40)	(-1.37)	(-0.14)	(-0.10)
Post * Assumed tax shield per square meter * RoomDummy	-0.809	-0.784	0.594	0.570	0.352	0.365	-1.946**	-1.951**
	(-1.87)	(-1.81)	(1.30)	(1.25)	(0.67)	(0.7)	(-2.78)	(-2.78)
Apartment square meters	84.56***	83.56***	80.32***	79.51***	78.38***	77.65***	83.55***	82.50***
	(3.63)	(3.58)	(3.46)	(3.42)	(3.33)	(3.3)	(3.56)	(3.51)
Log(Apartment square meters)	-16136.3***	-15681.6***	-15847.0***	-15427.6***	-15806.2***	-15395.4***	-16020.6***	-15569.4***
	(-12.55)	(-12.39)	(-12.42)	(-12.24)	(-12.26)	(-12.10)	(-12.44)	(-12.30)
Yearly fee per square meter	-3.297		-3.150		-3.072		-3.307	
	(-1.64)		(-1.60)		(-1.53)		(-1.63)	
Additional controls	Yes							
R2	0.9269	0.9267	0.9262	0.926	0.9262	0.926	0.9271	0.9269

#### Table 4. Results for main specification divided into groups depending on number of rooms

Robust t statistics in parentheses

Ν

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

Note: Robust t statistics are clustered on co-op level. In all regression we have assumed a cost of debt at 5 percent when computing the assumed tax shield. Each cell represents the coefficient estimate of the variable in the left column. Each column represent one regression. The columns 2 through 9 present the results depending on number of rooms. *RoomDummy* takes the value of one if number of rooms corresponds to the number of rooms reported in the first row. Additional controls include dummies for; floor, rooms, construction decade, and quarter\*RoomDummy.

# **VI Conclusion**

At the beginning of the thesis we stated a clear and simple question we wished to answer: is the Swedish market for co-op apartments efficient? Using the 2006 tax reform as a natural experiment we were able to test whether buyer of apartments took the debt held by the co-op into consideration when buying a co-op share. The results clearly showed that this was not the case. Based on this we can reject the hypothesis of an efficient market. This is line with much previous research (for instance Case and Schiller 1989, Englund et al 1999, Hjalmarsson and Hjalmarsson 2009). The results show that shares in highly levered co-ops are overvalued.

Given the ongoing debate about potential overvaluation and/or a bubble in the Swedish housing market one important implication is that we cannot reject a hypothesis about there being a bubble through an argument of an efficient co-op share market. The risks with a significant drop in prices or a potential bubble burst are large; firstly households may be driven into negative home equity and if this coincides with loss of income the household might be forced to sell their housing and realize a substantial loss. Secondly, given the standardized way that banks underwrite loans – which incorporates anticipated increases in interest rates that affect the customer's personal finances – they might fail to incorporate the debt held by the co-op in their lending decision. Many creditors calculate a so called left-to-live-on analysis (kvar-att-leva-på-kalkyl), where the customer's income and costs are accounted for.<sup>12</sup> When performing this analysis creditors use an interest rate between 6.5-8 percent, an interest rate level that customers should be able to withstand, which is significantly higher than the current interest rate level. However, this analysis does not take the co-op debt level into consideration and hence the effect of increasing interest rates on the co-op fee paid by the customer. If interest rates go up so will the yearly fees in highly levered co-ops. This means that there is a potential risk in banks' mortgage portfolios; some customers may default on their loans due to increasing costs that were not properly accounted for in the left-to-live-on analysis. We suggest that banks start taking into account the debt held by the co-op when underwriting loans.

The different tax treatment between loans held by individuals and loans held by co-ops and the fact that buyers of apartments do not take this into consideration implicates that the buyers miss out on beneficial tax treatment. As an example, consider an apartment financed through 1 MSEK of personal debt and 1 MSEK of co-op debt, compared to an apartment financed entirely of personal debt of 2 MSEK. The latter capital structure would save the apartment owner 300 000 SEK in present value of tax deduction at the personal level calculated with a cost of debt and a discount rate at 5 percent. This illustrates the potentially large cost reductions co-op share owners may enjoy if they substitute co-op debt

<sup>&</sup>lt;sup>12</sup> SEB, Handelsbanken, Nordea, Swedbank, SBAB, Skandiabaken, and Länsförsäkringar whom constitute 90 percent of the Swedish mortgage market all use this type of analysis. The information comes from a survey conducted by FI in September 2009. *Den Svenska bolånemarknaden och bankernas kreditgivning*, FI.

for personal debt. In light of this it is remarkable that buyers do not seem to take co-op debt into consideration when buying a co-op share.

Potential reasons for this – seemingly irrational – behavior can lie in borrowing constraints at the individual level. The debt level of primarily younger home buyers is high and most Swedish banks employ debt level limit policies (usually in the range of 75-95 percent of market value, FI (2010)). This suggests that some individuals are not able to substitute co-op debt for personal debt. Hjalmarsson and Hjalmarsson (2009) find that liquidity constraints may affect valuation of co-op fees. They find that buyers of smaller apartments are less likely to rationally account for the co-op yearly fee. Our results do not accord with these results; our results suggest that buyers of 1 room apartments are amongst the most rational. These conflicting results suggest that further research is needed regarding the impact of borrowing constraints on the Swedish housing market. One approach can be to use the recently passed mortgage limit (Bolånetak) as a natural experiment to study how prices of shares in highly levered co-ops was affected – this is preferably done with data on Stockholm apartments are sales as Stockholm housing prices are the highest in the country and therefore buyers of apartments in Stockholm most likely face higher borrowing constraints than in other regions.

Another possible explanation of the seemingly irrational behavior may lie in salience of debt. As suggested by Almenberg and Karapetyan (2010), owners of co-op shares seem to have a bias towards co-op debt. Our results concur with those of Almenberg and Karapetyan in that co-op owners do not take co-op debt into account meaning they fail to minimize cost of debt which could find its explanation in the salience of debt and mental accounting. We agree with Almenberg and Karapetyan in that further research is needed. They suggest that field experiments should be conducted were co-op debt per square meter is displayed in the advertisement for the apartment, and then analyze how salience may impact the price. We agree that such a field study would be one of the best methods of explaining inefficiencies in the Swedish co-op market; however we believe that such an experiment would be difficult to perform since it might be a tall order to convince real estate agents to participate.

Given the nature of the Swedish market for co-op shares it is not all that remarkable that the inefficiencies have not been arbitraged away. Since buying an apartment and subletting it is illegal in most cases and most likely unprofitable in others, speculative investors who are able to exploit market inefficiencies and drive prices towards equilibrium are non-existent in the Swedish market for co-op shares. The buyers in the Swedish housing market consists of individuals with behavioral biases towards their dwelling, and most likely not by rational agents. Buyers benefitting from these inefficiencies are people who can rationally account for the beneficial tax implications of no co-op debt.

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